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**ECONOMIC INSTRUMENTS FOR POLLUTION CONTROL AND
NATURAL RESOURCES MANAGEMENT IN OECD COUNTRIES:
A SURVEY**

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FOREWORD

The OECD Working Party on Economic and Environmental Policy Integration (WPEEPI) decided at its 12th Session on 6-7 November 1997, to launch a survey on the use of economic instruments for pollution control and natural resource management in OECD countries. The objectives of the survey were to update the OECD database on the use of economic instruments for pollution control in OECD countries (last updated in 1992-1993); survey the use of economic instruments in OECD countries for natural resource management; and survey the use of financial assistance schemes in OECD countries for both pollution control and natural resource management. The ongoing OECD work programme on statistics on environmental taxes provided information on the use of environmentally related taxes for pollution control.

Accordingly, a comprehensive questionnaire on the use of environmentally related economic instruments was sent to OECD countries in 1998, and responses were received from 24 of the 29 Member countries. This document presents the information contained in those submissions. The Secretariat wishes to acknowledge the important effort of Member countries in providing replies to the questionnaire and complementary data. The report was prepared by an external consultant, Dr. Hans B. Vos, and Jean-Philippe Barde and Helen Mountford of the OECD Secretariat. It is published under the responsibility of the Secretary-General of the OECD.

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EXECUTIVE SUMMARY

In the early 1970s, when environmental policies were still in their infancy, economic instruments were used in only a few instances and were subject to much controversy. Since then a slow, but continuous evolution has taken place, with the role of economic instruments increasing on several grounds. First, the number of applications of economic instruments has increased as economic instruments are increasingly used in OECD countries. Second, the variety of instruments in use has also grown: while user charges and subsidies were typically already in use in the 1970s, different types of charges (e.g. emission charges) have become more common. Other types of economic instruments (e.g. deposit-refund systems, performance bonds, or liability payments) have also appeared. Another aspect of this evolution has been the growing role of environmental taxes, and the increasing number of applications of tradable permit schemes. The main instruments now in use for environmental protection are charges, environmentally related taxes, tradable permit systems, deposit refund systems, non-compliance fees, performance bonds, liability payments, and subsidies for environmental protection.

This report describes the economic instruments currently being applied in OECD countries for pollution control and natural resource management. The relevant information was primarily gathered through Member country responses to a survey questionnaire circulated to OECD countries in 1998/1999.¹ Complementary information on environmentally related taxes for pollution control was provided by the ongoing OECD work programme on statistics on environmental taxes.

All of the countries that responded to the questionnaire report the use of economic instruments for pollution control: almost all countries report the use of some type of pollution charges, and many use deposit-refund systems or subsidies for environmental protection. Non-compliance fees and liability payments are also used in a number of countries for pollution control, while tradable permit systems and performance bonds appear to be less common.

OECD countries are increasingly using environment-related taxes for pollution control. The revenues from environmentally related taxes in the countries for which sufficient data is available represented 2.5% of GDP in 1995, or just under 7% of total tax revenues in these countries (arithmetic average). The majority of identified taxes that were levied under a specific tax base relate to transport and energy, with waste management taxes also common.

Economic instruments for *natural resource management* are almost as widely applied as economic instruments for pollution control. Only a few of the questionnaire respondents did not report any use of economic instruments for natural resource management.

Many countries apply economic instruments (primarily abstraction charges or taxes) for *water quantity management*, and two report the use of transferable water quota schemes. In the field of *fisheries*, the use of some taxes or fees was reported, but transferable fishing quotas were found to be the most frequently used economic instrument. Many countries use economic instruments in *forestry management*, primarily in the form of charges or subsidies. The use of economic instruments for *wetland management* is

1. 24 of the 29 OECD Member countries responded to the questionnaire.

less common, but where it does exist it appears to be primarily in the form of financial assistance to wetland owners or users. Wetland compensation fees and wetland mitigation banking are also found in the United States.

Economic instruments aimed at preserving the quality of *land and soil* are more widespread. Some of these instruments are related to restructuring the agricultural sector and may have a predominantly economic character. Many of the instruments reported in the category of *natural species and wildlife* relate to hunting and sport fishing permits and fees. Entrance fees for national parks and subsidy programmes for conservation purposes are also found, with almost all countries reporting their use.

Information was also gathered through the survey on the environmental effectiveness of the economic instruments in use. Evaluating the performance of economic instruments is a complex task and few reliable and systematic assessments have been made to date. Furthermore, many of the existing evaluations are based on (sometimes remote) proxies for environmental effectiveness, rather than effectiveness itself. However, replies to the questionnaire indicate that the number and quality of evaluations, albeit still scarce, seem to be increasing. While the overall conclusion from the reports on environmental effectiveness of economic instruments is positive and indicates that these instruments are generally fairly effective in achieving their environmental objectives, evidence remains limited and further analysis is required.

1. INTRODUCTION

1.1 Background and purpose of the OECD project

Pursuant to the *OECD Recommendation on the Use of Economic Instruments in Environmental Policy* (OECD, 1991), the OECD carried out a comprehensive survey on the use of economic instruments in 1992-1993. The results were published in *Managing the Environment: the Role of Economic Instruments* (OECD, 1994). As that publication provided data only for 1991, the OECD Working Party on Economic and Environmental Policy Integration (WPEEPI) decided in November 1997 to launch a new survey with the following objectives:

- to update the OECD database on the use of economic instruments for pollution control in OECD countries;
- to survey the use of economic instruments in OECD countries for natural resource management; and
- to survey the use of financial assistance schemes in OECD countries for both pollution control and natural resource management.

This survey is based on a questionnaire that was sent to OECD Member countries in 1998. The questionnaire was split into two parts: Part 1 addressed the use of economic instruments for pollution control; Part 2 addressed the use of economic instruments for natural resource management. Member country replies to the two parts of the questionnaire are summarised in Chapters 3 and 5 respectively of this report.

Environmentally related taxes for *pollution control* were not included in the questionnaire as data on these are already collected as part of a separate work programme on statistics on environmental taxes. Chapter 4 of the report thus presents a summary on the use of these taxes, based on this separate database. Data on environmentally related taxes for *natural resource management* (currently not included in the separate work programme on environmental taxes) was collected in Part 2 of this survey, and the results are presented in Chapter 5.

1.2 Definitions

This survey covers the economic instruments listed below. Box 1 indicates the differences between environmentally related taxes and (emission, user, or product) charges.

- **Emission charges:** direct payments based on the measurement or estimation of the quantity and quality of a pollutant. Emission *taxes* are addressed separately in the summary of environmental taxes for pollution control presented in Chapter 4.

- **User charges:** payments for the cost of collective services. They are primarily used as a financing device by local authorities e.g. for the collection and treatment of solid waste and sewage water. In the case of natural resource management, **user fees** are payments for the use of a natural resource (e.g. park, fishing, or hunting facility).
- **Product charges:** applied to products that create pollution either through their manufacture, consumption, or disposal (e.g. fertilisers, pesticides, or batteries). Product charges are intended to modify the relative prices of the products and/or to finance collection and treatment systems. Product *taxes* are addressed separately in Chapter 4.
- **Taxes** for natural resource management are unrequited payments for the use of natural resources. Information on these taxes was collected for the survey, but data on natural resource royalties were not.
- **Marketable (tradable, transferable) permits, rights, or quotas** (also referred to as “emissions trading”) are based on the principle that any increase in emission or in the use of natural resources must be offset by a decrease of an equivalent, or sometimes greater, quantity. Two broad types of tradable permit systems are in operation: those based on emission reduction credits (ERCs), and those based on *ex ante* allocations (“cap-and-trade”).
 - The former approach takes a “business as usual” scenario as the starting point, and compares this baseline with actual performance. If an emitter/user performs better than the anticipated baseline, a “credit” is earned. This credit can then either be used by the emitter/user himself, either at the current location or elsewhere, or sold to some other emitter whose emissions are higher than the accepted baseline (and presumably at a lower price than what it would cost the latter to abate on his own).
 - The “cap-and-trade” approach sets an overall emission/use limit (i.e. the “cap”) and requires all emitters to acquire a share in this total before they can emit. Emitters may be allocated their shares free-of-charge by a relevant environmental authority, or the shares may be auctioned. Regardless of how the initial allocation of shares is determined, their owners can then either utilise them as emission permits in current production, save them for future use (if “banking” is allowed), or trade them with other emitters.
- **Deposit-refund systems:** payments made when purchasing a product (e.g. packaging). The payment (deposit) is fully or partially reimbursed when the product is returned to the dealer or a specialised treatment facility.
- **Non-compliance fees²:** imposed under civil law on polluters who do not comply with environmental or natural resource management requirements and regulations. They can be proportional to selected variables such as damage due to non-compliance, profits linked to reduced (non-) compliance costs, etc.
- **Performance bonds:** used to guarantee compliance with environmental or natural resources requirements, polluters or users may be required to pay a deposit in the form of a “bond”. The bond is refunded when compliance is achieved.
- **Liability payments²:** payments made under civil law to compensate for the damage caused by a polluting activity. Such payments can be made to “victims” (e.g. in cases of chronic or accidental

2. Neither non-compliance fees nor liability payments can be construed as fines, which are lump sum legal sanctions.

pollution) or to the government. They can operate in the context of specific liability rules and compensation schemes, or compensation funds financed by contributions from potential polluters (e.g. funds for oil spills).

- **Subsidies:** all forms of explicit financial assistance to polluters or users of natural resources, e.g. grants, soft loans, tax breaks, accelerated depreciation, etc. for environmental protection. *The survey only addresses financial assistance aimed at direct pollution control or natural resource management. Economic subsidies which do not directly lead to pollution control or natural resource management (e.g. subsidies for energy conservation) were not included.*

Box 1. Environmentally -Related Taxes And Charges

Taxes

The OECD classification (as used in the annual OECD publication, *Revenue Statistics*) defines taxes as “compulsory, unrequited payments to general government. Taxes are unrequited in the sense that benefits provided by government to taxpayers are not normally in proportion to their payments.”

The term “general government” is defined as “supra-national authorities, the central administration and the agencies whose operations are under its effective control, state and local governments and their administrations, social security schemes and autonomous governmental entities, excluding public enterprises”.

Note that a tax (unrequited) *can* be earmarked if it is decided that a certain percentage of the revenue will be affected to a specific purpose (e.g. when part of a gasoline tax is earmarked for road building).

Charges/fees

The OECD classification also uses the terms “fees” and “user charges” (as opposed to “taxes”) and “levies” without giving a precise definition of these terms. In practice, the terms charges and fees are often used interchangeably. Therefore, charges and fees will be defined as compulsory required payments to either general government or to bodies outside general government, such as for instance an environmental fund or a water management board.

The general term “levy” could be construed as covering all types of compulsory payments.

Note that, according to the OECD classification there are “borderline-cases” where a levy could be considered as “unrequited”, i.e. as a “tax” (if the payment is made to “general government” as opposed to a charge or fee):

- a) where the levy greatly exceeds the cost of providing the service;
- b) where the payer of the levy is not the receiver of the benefit (e.g. a fee collected from slaughterhouses to finance a service which is provided to farmers);
- c) where government is not providing a specific service in return for the levy which it receives even though a license may be issued to the payer (e.g. where the government grants a hunting, fishing or shooting license which is not accompanied by the right to use a specific area of government land);
- d) where the benefits are only received by those paying the levy but the benefits received by each individual are not necessarily in proportion to his payments (e.g. a milk marketing levy paid by dairy farmers and used to promote the consumption of milk).

Instruments issued at the supra-national level, for example the agri-environmental measures of the EU Common Agricultural Policy (CAP) reforms, have not been included in this survey in a systematic manner, although some individual countries have provided information regarding their use of the measures. Financial support for restructuring a particular sector, or other general measures that have more of an economic than an environmental character, have also been excluded.

2. OVERVIEW OF THE USE OF ECONOMIC INSTRUMENTS

2.1 Response to the questionnaire

The questionnaire was sent to all 29 OECD Member countries in January 1998, and replies were received from 24 countries. Some replies included reference to other documents relating to the application of economic instruments. In addition to these sources, some further information was available through OECD *Environmental Performance Reviews* and other relevant OECD documents. In particular, information has been drawn from papers produced for the OECD “Workshop for Domestic Tradable Permit Systems for Environmental Management: Issues and Challenges”, held in September 1998 in Paris.

Data on environmentally related taxes were drawn from the specific database that is maintained on environmental taxes, and a summary of this information is presented separately in Chapter 4.

Responses to the questionnaire represent the most up-to-date information available (generally covering the years 1997-1999), as do the recent auxiliary documents used. The *Environmental Performance Reviews* which were produced before 1995 do not add much to the previous survey of economic instruments (OECD, 1995), and so only more recent *Environmental Performance Reviews* were drawn upon; furthermore, these reviews generally do not provide the level of detail and specificity required in the questionnaire. As a result, data from these sources were only used as supplementary data to the questionnaire responses, with no data incorporated for those countries that did not respond to the questionnaire.

Some countries have a (con)federal state system, with economic instruments applied at the federal level and at the sub-federal level. Wherever this was reported, instruments at both levels were included in the report. Instruments applied at the sub-national or sub-state level were reported in only a very few instances.

2.2 A general overview of the use of economic instruments in pollution control, by type and country

Economic instruments for pollution control were reported to be in place in all of the countries that responded to the questionnaire. Other sources show that such instruments are applied — at least to some extent — in all of the countries for which information is available. Some differences are obvious, however, with respect to the types of economic instruments used. Table 2.1 shows a general overview of the economic instruments used in OECD countries for pollution control. It has been based exclusively on the questionnaire replies, and thus may be incomplete to some extent.

Table 2.1. General overview of the use of economic instruments for pollution control, based on questionnaire replies (excluding taxes)

COUNTRY	Charges	Tradable permits	Deposit-refund systems	Non-compliance fees	Performance bonds	Liability payments	Subsidies
Australia	•	•	•		•		•
Austria	•		•				•
Belgium	•						
Canada		•					
Canada (Quebec)	•		•		•	•	•
Canada (Ontario)		•					
Canada (New Brunswick)	•		•	•	•		•
Canada (British Columbia)	•		•				
Canada (Alberta)	•				•		
Czech Republic	•		•	•			•
Denmark	•	•	•			•	•
Finland	•		•			•	•
France	•	•					•
Germany	•					•	
Greece	•			•			•
Hungary	•		•	•			
Iceland	•		•				
Ireland							
Italy	•		•				
Japan	•					•	•
Korea	•		•	•			
Luxembourg							
Mexico	•		•				
the Netherlands	•		•				•
New Zealand							
Norway	•		•	•			•
Poland	•	•	•	•			•
Portugal							
Spain							
Sweden	•		•	•		•	•
Switzerland	•	•					•
Turkey	•		•	•		•	•
UK							
US	•	•	•		•	•	•

Note: based entirely on questionnaire replies and the EPA report on economic incentives for the US (Anderson *et al.*, 1997); non-respondents are shaded.

Almost all countries apply environmental charges. Exceptions are Canada (federal level and Ontario) and the UK. Tradable permits were included in this survey insofar as they include the option of external trading. Tradable permits are found in seven countries: Australia, Canada, Denmark, France,

Poland, Switzerland, and the US. A majority of OECD countries report the use of deposit-refund systems. Non-compliance fees are in place in nine countries: Canada (New Brunswick), the Czech Republic, Greece, Hungary, Korea, Norway, Poland, Sweden, and Turkey.

Performance bonds are found only in Australia, the US and three of the Canadian provinces. Eight countries — Canada (Quebec), Denmark, Finland, Germany, Japan, Sweden, Turkey, and the US — report the use of liability payments. Subsidies for pollution control are widespread in different forms. Appendix 1 provides a more detailed overview of the economic instruments reported, listed by each country.

Environment-related taxes are increasingly used in Member countries. Chapter 4 provides an overview of their use for pollution control in 20 Member countries. The majority of identified taxes that were levied under a specific tax base relate to energy and transport, with waste management taxes also common. The revenues from environmentally related taxes in the countries for which data is available represented 2.5% of GDP in 1995, or just under 7% of total tax revenues in these countries (arithmetic average).

2.3 A general overview of the use of economic instruments in natural resource management, by type and country

Economic instruments for natural resource management are almost as widely applied as economic instruments for pollution control. Of the questionnaire respondents, only Belgium, Canada (some provinces), and Turkey reported no use of economic instruments for natural resource management at all. Remarkably, the Canadian province of Quebec listed about 30 instruments, applied in all fields discerned, while other provinces did not report any. Table 2.2 provides a general overview.

Many countries apply economic instruments (primarily abstraction charges or taxes) for water quantity management. Transferable water quotas are found in Australia and Canada (Alberta). In the field of fisheries, some taxes or fees have been reported [Finland, Canada (Quebec), Iceland, Sweden], but transferable fishing quotas are the most frequently used economic instrument (Australia, Canada, Iceland, the Netherlands, and the US). Some of these instruments relate to adjustments of the fishery fleet, which is primarily an economic measure. Such adjustment measures were not included in the survey.

Many countries use economic instruments in forestry management. The applied instruments mainly include charges and subsidies. The use of economic instruments for wetland management is rare. Only Canada (Quebec), Denmark, Sweden, Switzerland, the UK, and the US operate such instruments, all of which are forms of financial assistance to wetland owners or users. In addition, wetland compensation fees and wetland mitigation banking are also found in the US.

Instruments aimed at preserving the quality of land and soil are more widespread. Some of these instruments are related to restructuring the agricultural sector and may have a predominantly economic character. Such measures were excluded from the survey. Included in the survey are those instruments that are more directly related to the preservation of ecologically valuable (and vulnerable) areas and to important landscapes, and so have a primarily environmental character. Many instruments reported in the category of natural species and wildlife relate to hunting and sport fishing permits and fees. Entrance fees for national parks and subsidy programmes for conservation purposes are also common, with almost all countries reporting their use.

Table 2.2. General overview of the use of economic instruments for natural resource management, based on questionnaire replies

COUNTRY	Water quantity	Fisheries	Forestry	Wetlands	Land/soil	Natural species/wildlife
Australia	•	•				•
Austria	•		•		•	•
Belgium						
Canada		•				
Canada (Quebec)		•	•	•	•	•
Canada (Ontario)						
Canada (New Brunswick)						
Canada (British Columbia)						
Canada (Alberta)	•		•			•
Czech Republic	•		•		•	•
Denmark	•		•	•	•	•
Finland		•	•		•	•
France	•		•		•	•
Germany	•					•
Greece	•				•	•
Hungary	•	•	•		•	•
Iceland		•	•		•	•
Ireland						
Italy	•					
Japan	•					•
Korea			•			•
Luxembourg						
Mexico	•					•
the Netherlands	•	•	•		•	•
New Zealand						
Norway*						
Poland	•		•			•
Portugal						
Spain						
Sweden	•	•	•	•	•	•
Switzerland			•	•	•	•
Turkey						
UK	•		•	•	•	•
US		•		•	•	

Note: based entirely on questionnaire replies and the EPA report on economic incentives for the US (Anderson *et al.*, 1997); non-respondents are shaded. * Indicates countries that responded, but not on instruments for natural resource management.

Appendix 2 provides a more detailed overview of the economic instruments reported for natural resource management.

3. ECONOMIC INSTRUMENTS FOR POLLUTION CONTROL

3.1 Charges

Charges are a quasi universal policy instrument and are applied in different ways and in a range of different fields. Three main types of charges are utilised: emission charges, with user charges as a special category, and product charges. For this survey, each of these categories has been further subdivided as appropriate. The reported application of individual instruments has been summarised in tables utilising a common structure. In addition to information about the country (province) in which they are applied, important information concerning these instruments is provided regarding the charge base, charge rate, their main purpose (incentive or financial), and the revenues collected from the charge in 1997 (or the most recent year). The distinction between incentive and financial purposes was not made for user charges, as their main function is financial by definition.

Emission charges

Emission charges are applied in several environmental fields on the basis of pollutant emissions or waste. Tables 3.1 through 3.8 present reported information on:

- Charges on air pollution
- User charges on municipal waste collection and treatment
- Charges on hazardous waste
- Other charges on waste disposal
- Water effluent charges
- Wastewater user charges
- Charges on aircraft noise, and
- Miscellaneous charges

Table 3.1. Charges on Air Pollution

Country	Charge base	Charge rate	Main Purpose		Revenues	Destination
			Inc	Fin	Amount	
Canada (Quebec)	Annual amounts for several pollutants	CAN\$ 2 per ton multiplied by a weighting factor, ranging from 1-1 000	-	+	Nil (scheme effective only recently)	Government environmental funds
Czech Republic	Particulates, SO ₂ , NO _x , CO, VOC, toxic substances (Classes I-III), freons from large and medium sources	CZK 600-20 000 per ton	+	+	CZK 1.3 billion (1996)	State Environmental Fund for financing environmental protection
	Air pollutants from small sources	Flat rates for different types of sources; levied on fuels	+	-	..	Municipal budget
Italy	SO ₂ and NO _x emissions	euros 53.195/ton/year for SO ₂ ; euros 104.84/ton/year for NO _x	+	-	euros 80 million estimated for 1998	..
Korea	Pollution in excess of established permissible limits	Treatment expenses for excessive pollution	+	-	US\$ 8.5 million (1996) (together with air emission charges)	Ministry of Environment
	Owners of large buildings or diesel vehicles	Dependent on size of building, emission volume, or years of use of vehicle	-	+	US\$ 159 million	Ministry of Environment and local governments
Poland	62 polluting substances	14 different rates, from PLZ 0.15 per ton of CO ₂ to PLZ 210 for toxic substances	-	+	PLZ 670 million (1996)	Municipal, provincial, and national environmental protection funds

Sweden	NOx	SEK 40/kg paid by power plants (combustion plants)	+	+	SEK 501 million (1995)	The charge is refunded to the combustion plants in proportion to their share in total energy output
Switzerland	Landing aircraft	SF -35 to +4 100 on landing fee, for class 5 to class 1 emission (NO _x , VOC) types	+	-	SF 1.5-2 million	Financing anti-pollution measures around airports
Turkey	Motor vehicles	1/5 of regular inspection costs	..	+	..	Environmental Pollution Prevention Fund
	Aircraft	0.5% of passenger ticket prices and a prefixed rate per ton of goods transported	..	+	..	Environmental Pollution Prevention Fund
US (States)	Substances requiring a permit	US\$ 20-30 per ton	-	+	..	Financing permit issuing activities
<u>Symbols</u> + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

The Canadian Province of Quebec recently introduced a scheme for air pollution charges applied to several pollutants. The Czech Republic and Poland operate charge schemes for a broad range of pollutants, while Italy charges for SO₂ and NO_x emissions. In Korea, different schemes exist: one levies charges on pollution levels in excess of certain limits; another charges owners of large buildings and diesel vehicles as proxies for the air pollution they cause. Switzerland surcharges aircraft landing fees, according to five classes of pollution characteristics. The US finances the permitting procedure by levying a charge.

Since charges are, by definition, required, their main purpose is to finance some type of service. Most of the schemes have an explicit financial purpose. Air pollution charge systems in the Czech Republic, Italy, Korea, Sweden, and Switzerland are incentive by purpose. Schemes with both incentive and financing functions may be somewhat ambiguous as these functions can conflict, for example through resulting in an over-capacity or over-spending on pollution control. The Swedish NO_x charge is an interesting combination of both financing and incentive functions (see Box 2).

Box 2. The Swedish NO_x Charge

An interesting approach is the Swedish charge on NO_x emissions. The charge, paid by combustion power plants (SEK 40/kg of NO_x), is redistributed amongst the emitters in proportion to their share in the total energy output. Therefore, the global cost of the charge for this sector of activity as a whole is nil. But each individual plant is incited to minimise its emission of NO_x per unit of energy output in order to maximise the net "return" they gain from the charge.

Between 1990 and 1992, the charge triggered a 50% reduction in NO_x emissions, and accelerated innovations in combustion technologies.

Source: Swedish Environmental Protection Agency (1997), *Environmental Taxes in Sweden*.

For the purpose of air pollution control, taxes (mostly energy-related taxes) play a particularly important role (see Chapter 4).

Table 3.2. User charges on municipal waste collection and treatment

Country	Charge base	Charge rate	Revenues
Austria	Municipal waste; flat rates or variable charges based on weight or volume	ATS 2 per day per inhabitant on average	..
Canada (Quebec)	Flat rate based on type of user, volume, and other methods	CAN\$ 20-163 per user, or individual calculations based on volume and type of waste	CAN\$ 213 million
Czech Republic	Collection of municipal waste	..	..
Denmark	Municipal waste	DKK 1 378 per household per year on average (1996)	..
Finland	Ton or m ³ of waste; varies by type of waste	Treatment: FIM 200/ton on average (1998) (+VAT 22%); range: 30-700 FIM/ton Collection: FIM 300/ton (average 1998) (+VAT 22%)	FIM 1 200 million
France	Volume of collected waste	Varies by municipality	FF 1 734 million
	Waste from camping resorts, based on number of collection points	Varies by municipality	..
Greece	Municipal waste	..	..
Hungary	Volume of waste collected	HUF 3 000-5 800/ton outside Budapest; HUF 1 545/m ³ in Budapest	HUF 14 580

	Waste disposal	HUF 295-1 000/m ³ outside Budapest	..
Italy	Volume of waste, level of service, and operating costs of treatment	..	To be introduced January 2000
	Waste charge based on surface area of dwelling	..	..
Japan	Type and volume of waste	Varies according to municipalities	..
Norway	Volume of collected waste (per container, size of bag, number of collections per week)	Municipalities are urged to apply full cost charging	..
Sweden	Municipal waste (household and industry)	..	..
Switzerland	Waste bags	SF 1.5 per 5 kg bag	..
Turkey	Varies according to type of residential building and social situation of the region	..	..
US (States)	Flat rates, or partly fixed and partly variable charges based on weight or volume	..	..
<u>Symbol</u> .. = no data available		Charge rates/revenue amounts valid for 1997 if not otherwise stated.	

User charges for the collection and processing of municipal waste are calculated in various ways. Most schemes use flat rate tariffs, differentiated as to the volume of waste, the type of users (households, municipal firms), or the type of the building. Switzerland incorporates the user charge in the price of the waste bag; in Finland, France, Hungary, Italy, Japan, and Norway, the charge is also calculated according to the volume of collected waste. Charges in Austria, Canada, and the US may be partly variable, based on the actual waste volumes collected. In Finland, municipal waste management is partly carried out through contracts with private companies, so charge revenues do not show up in municipal accounts.

Table 3.3. Charges on hazardous waste

Country	Charge base	Charge rate	Main Purpose		Revenue	
			Inc	Fin	Amount	Destination
Czech Republic	Hazardous waste	CZK 250-5 000/ton	-	+	CZK 840 million (1996) (also includes revenues from the solid waste charge)	Partly to municipalities where landfills are located (compensation), partly to State Environmental Fund
Denmark	Hazardous waste	DKK 250-50 000/ton; varies largely according to the type of waste	+	+	..	Financing of treatment, recycling, and destruction of hazardous waste
Finland	Hazardous waste	..	..	+	..	Processing company (jointly owned by State, municipalities, and industry)
Hungary	Hazardous waste	<u>Incineration:</u> HUF 60-80/kg solid hazardous waste; HUF 50-60/kg hazardous fluid waste <u>Disposal:</u> HUF 45 000-160 000/ton	-	+	..	..
Iceland	Toxic substances	Rate differentiated according to 11 product categories (e.g. mercury, batteries, paint, ODS); rate: ISK 0.1/kg (crude oil) to 900/kg (mercury)	-	+	ISK 163 million (1999)	Financing of collection, treatment, recycling, and destruction of toxic waste

US (States)	Hazardous waste	Varies largely; US\$ 21 on average (1990)	+	+	..	Clean up and other toxic waste control activities
Symbols + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Specific charging schemes for hazardous waste are applied in the Czech Republic, Denmark, Finland, Hungary, Iceland, and the US. The Czech charge revenues are allocated in the same way as the charge on waste disposal. The charges in Denmark, Iceland, and the US are used for financing treatment, recycling, destruction, clean up and other related activities. In Finland, hazardous wastes are processed and charges are collected by a processing company jointly owned by the state, municipalities, and industry.

Table 3.4. Other charges on waste disposal

Country	Charge base	Charge rate	Main Purpose		Revenue	
			Inc	Fin	Amount	Destination
Austria	Landfilling of solid waste	ATS 80-1 000/ton (1998) varies by waste and landfill type	+	+	ATS 600 million (1998)	Identification and clean up of contaminated sites
Czech Republic	Solid waste	CZK 0-640 per ton	-	+	CZK 840 million (1996) (includes also revenues from the hazardous waste charge)	Partly to municipalities where landfills are located (compensation), partly to State Environmental Fund
France	Volume of waste from industrial/residential/business	Varies by locality	..	+	..	Municipalities or waste collection firms
Germany	Weight of dangerous waste	DM 100-300/ton	..	..	..	..
Greece	Industrial waste	..	-	+	..	..

Hungary	Volume of industrial waste collected (not Budapest)	HUF 2 600-4 700/ton	-	+	..	Waste collection firms
	Waste disposal charge for industrial waste (not Budapest)	HUF 360-780/m ³	-	+	..	Waste disposal firms
Italy	Weight and kind of waste disposed of as landfill (landfill tax)	Varies by region and type of waste: euros 0.1033-2.5823 per 100 kg	+	+	euros 208.65 million (1996)	..
Poland	Industrial waste	19 rates for (hazardous) substances, between PLZ 6-84 per ton	-	+	PLZ 195 million (1996)	National, provincial and municipal funds for Environmental Protection and Water Management
US (States)	Solid waste	..	+	+	..	State solid waste control activities
Symbols + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Waste disposal charges, levied mostly on industrial waste, were identified in Austria, the Czech Republic, France, Germany, Greece, Hungary, Italy, Poland, and the US. The revenues of the Czech system are partly allocated to the municipalities in which dumps are situated, as compensation; the other part is fed into the State Environmental Fund from which many environmental activities are subsidised. The revenues of the Polish charge are also used for financing environmental financial aid schemes, while revenues from the landfill tax in Austria are earmarked for use in the identification and remediation of contaminated sites. In most other countries, revenues are used to finance the waste collection and disposal systems.

Table 3.5. Water effluent charges

Country	Charge base	Charge rate	Main Purpose		Revenue	
			Inc	Fin	Amount	Destination
Australia	Volume, salinity factor, pollutant class factor	AUS\$ 0 - 240 000	-	+	..	To cover administrative

	and impact area factor					and enforcement costs
Belgium (Flanders)	Quantity and quality of pollution	BEF 980 per pollution unit	+	+	BEF 9.5 billion (together with wastewater user charge)	Financing environmental policy in general
Canada (Quebec)	Annual amounts of several pollutants	CAN\$ 2 per ton multiplied by a weighting factor, ranging from 1-1 000	-	+	Nil (scheme effective only recently)	Government environmental funds
Czech Republic	Volumes of BOD, oil substances, alkaline and acid substances, and dissolved inorganic salts in excess of certain limits	Varies according to the cost of pollution abatement; a surcharge is imposed in case of deterioration of the water course	+	+	CZK 570 million (1996)	State Environmental Fund
France	Volume of pollutants discharged by households	Varies by municipality	..	+	FF 6 021 million (1995)	Water Agencies
	Volume of pollutants discharged by industries	Varies by Water Agency, area, and type of pollutant	..	+	FF 1 018 million (1995)	Water Agencies
Germany	Pollution load (noxiousness)	DM 70 per unit of noxiousness	+	+	DM 655 million (1997)	Measures to maintain or improve water quality
Korea	Pollution in excess of established permissible limits	Treatment expenses for excessive pollution	+	-	US\$ 8.5 million (1996) (together with air emission charges)	Ministry of Environment
Mexico	Quantity of wastewater in excess of permissible contents of COD and TSS, and disposal zone	..	-	+	MXN 52 million (1994)	Government

Poland	BOD, COD, suspended solids, chloride and sulphate ions, heavy metals, volatile compounds	Varies; PLZ 1.13 per kg COD to PLZ 33.6 per kg heavy metals	-	+	PLZ 290 million (1996)	National, provincial and municipal Funds for Environmental Protection and Water Management
US (States)	Flat rate per type of source, or volume (and sometimes toxicity) of wastewater discharge	Variable	-	+	..	State Water Board programmes mainly
Symbols + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Water emission charge systems are reported in ten countries. Almost all systems differentiate the charge rates according to the volume and quality of the wastewater discharged. Belgium (Flanders), Czech Republic, Germany, and Korea report their systems to be incentive by purpose. Other systems are mainly financial. In Korea and Mexico, the charge is levied on volumes of wastewater in excess of certain standards only. The revenues of the Canadian (Quebec), Czech and Polish charges are allocated to environmental funds, while the Belgian (Flanders) is used to finance general environmental policy.

Table 3.6. Wastewater user charges

Country	Charge base	Charge rate	Revenues
Austria	Water consumption of households and enterprises	ATS 5-30/m ³ drinking water	..
Belgium (Flanders)	Water consumption	..	BEF 9.5 billion (together with water emission charge)
Canada (Quebec)	Flat rate based on type of user and volume and other methods	CAN\$ 0.1-5.38 per user, or individual calculations of volume and type of wastewater	CAN\$ 96 million
	Industrial waste water sewerage charges (Rule 129 of CUM)	By wastewater volume (CAN\$ 52/1 000m ³) or pollutant type (CAN\$ 170-4 051/1 000 kg)	CAN\$ 1.6 million (1998); CAN\$ 3.0 million (1999)
	Sewerage certificate charges	CAN\$ 2/tonne, multiplied by a weighting factor depending on pollutant type	..

Czech Republic	Volume of wastewater discharged into the sewer	CZK 17-40/m ³ levied as a surcharge on the price of drinking water	Public utility
Denmark	Water consumption	DKK 10.6/m ³ on average (1996); full cost charging	Municipal wastewater treatment plants
Finland	Water consumption or waste water volume/quality (larger sources) + fixed components (connection charge, meter)	FIM 7.60/m ³ on average for volume and FIM 8.40/m ³ total charge including fixed components (1998); higher charges for heavy polluters; wastewater charges billed into the water bill	FIM 2 300 million
France	Water consumption	Varies by municipality	FF 20 050 million (1995)
Greece	Municipal and industrial wastewater	..	..
Hungary	Water consumption	HUF 26.7-163/m ³ for residents; HUF 26.7-866/m ³ for industrial users	..
Italy	Volume and quantity of waste water	..	Local water company
	Volume and quantity of polluted water released directly to the environment	..	Local water company
Japan	Sewer charge based on volume of water consumption or volume of waste water	¥ 2 114 average yearly payment (1996)	¥ 5 965 billion (1996)
	Users of municipal multi-purpose septic tanks	Varies by municipality	..
Norway	Flat rate, based on size of housing	Varies between municipalities	..
Poland	Household: water consumption	PLN 0.9- 5/m ³	..
	Industry: toxicity	Up to 10 PLN/m ³	..
Sweden	Wastewater and drinking water	Varies by municipality; full cost charging	SEK 9.4 billion (1997)
Turkey	Municipal and industrial wastewater volumes	Varies by municipality	Public utility

US (States)	Water consumption, or discharge toxicity (larger sources)	US\$ 16 per month for households on average (1994)	Municipal wastewater treatment plants
<u>Symbol</u> .. = no data available		Charge rates/ revenue amounts valid for 1997 if not otherwise stated	

Wastewater user charges are widely used. The charges are either based on water levels [Austria, Belgium (Flanders), Denmark, France, Hungary, and some cases in Finland, Japan, Poland, Sweden, and the US], or on the type of user or volume of waste water discharged into the sewer [Canada (Quebec), Czech Republic, Greece, Italy, Turkey, and some cases (generally larger or industrial sources) in Finland, Japan, Poland, Sweden, and the US]. In Norway, a flat rate is levied based on the size of the housing unit.

Table 3.7. Aircraft noise charges

Country	Charge base	Charge rate	Main Purpose		Revenues	
			Inc	Fin	Amount	Destination
Australia	Landing aircraft	AUS\$ 162 per landing minimum; B737-300 costs AUS\$ 228	-	+	AUS\$ 37 million (1996-1997)	Recovers costs of noise amelioration programmes (acquisition and insulation of homes and certain public buildings)
Germany	Landing aircraft	Varies according to airport	+	-	..	No specific allocation
Italy	Landing aircraft (level of noise)	..	..	+	Not yet in place	Regional environmental authorities; to subsidise and compensate municipalities and citizens near the airport
Japan	Landing aircraft	Varies according to airport	-	+	..	..
Norway	Landing aircraft	..	+	+	..	Revenue collected and used by airport authorities
Switzerland	Landing aircraft	SF 0-800 per landing; depends on noise level	+	-	SF 2-3 million	Financing airport service and maintenance

Turkey	Aircraft	0.5% of passenger ticket prices and a prefixed rate per ton of goods transported	..	+	..	Environmental Pollution Prevention Fund
Symbols + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Australia, Italy, and Switzerland charge landing aircraft according to their noise level. The revenue of the Australian, Norwegian, and Swiss charges are used by airport authorities, in particular to finance noise protection and abatement programmes. The Italian revenues are used by regional environmental authorities to compensate local citizens or municipalities affected by the noise, and the Turkish revenues go to an Environmental Pollution Prevention Fund. The German, Norwegian, and Swiss charges have an incentive purpose.

Box 3. Restructuring of environmental charges and taxes in France

A green tax reform was initiated in France in 1998. One key aspect of this reform is to merge a number of existing charges into a “General Tax on Polluting Activities” (Taxe générale sur les activités polluantes, TGAP). In this context, former charges on air pollution, waste, and aircraft noise — initially levied and managed by the Environment and Energy Agency (ADEME) — are now paid to the general Government budget (FF 1 935 million in 1999); a budget is then reallocated to ADEME. The next steps are to include existing water-related charges levied by Water Agencies into the new TGAP.

Table 3.8 shows a variety of charges levied on polluting activities that are mainly designed to finance specific environmental protection programmes.

Table 3.8. Miscellaneous charges

Country	Charge base	Charge rate	Main Purpose		Revenues	Destination
			Inc	Fin	Amount	
Canada (British Columbia)	Quantity and quality of discharge in waste management permits	..	-	+	CAN\$ 14 million	Various environmental protection programmes
Czech Republic	Motor vehicle entry charges	..	..	..	CZK 29 million (1998)	Local government

Finland	Water protection charge; quantity and quality of discharge in waste water permits	Annual charge, fixed case by case by Water Right Courts; large polluters only	-	+	FIM 3 million	Water protection, in particular research
	Fish management charge; quantity and quality of discharge in waste water permits	id.	-	+	FIM 6 million	Preservation of fish stock
France	Granting of licences for polluting activities	FF 12 000 per licence	..	+	FF 18 million (1986)	Licencing and control authority
	Cost of monitoring and control	FF 1 800-18 000	..	+	FF 53 million (1996)	Licencing and control authority
	Production capacity of nuclear power plants	..	..	+	FF 535 million (1997)	Authority in charge of nuclear safety
	Production capacity of petrol refineries	FF 1 600 per quarter and million tons of capacity	..	+	FF 0.6 million (1996)	Ministry of Industry
Sweden	Exemption charge	SEK 2 000-20 000 for exemption from the vehicle exhaust regulations; SEK 600/kg for ozone depleting substances; SEK 30/kg sulphur emission	+	-	..	Designed to offset the financial benefit from exemptions from specific regulations
Turkey	Fisheries law charge to prevent water pollution	..	+	..	..	..
	Registration of water pollution control charge	..	..	+	..	Municipalities
Symbols + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Product charges

A broad range of product charges have also been reported, and can be classified in the following product categories:

- Motor vehicles
- Ozone depleting chemicals
- Batteries
- Lubricant oils
- Packaging
- Charges on agricultural inputs
- Other product charges

Information on the use of these charges in OECD countries is presented in Tables 3.9 through 3.15. These tables follow the same format as those presented in the section above on emission charges.

Table 3.9. Charges on motor vehicles

Country	Charge base	Charge rate	Main Purpose		Revenues	Destination
			Inc	Fin	Amount	
Switzerland	Car bodies	..	+	+	..	Relevant firms
US	Fuel-inefficient motor vehicles	US\$ 1 000-7 700 per car dependent on efficiency	+	-	US\$ 144 million (1992)	Highway Trust Fund
Symbols + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Charges on motor vehicles (not including taxes and duties) were reported by Switzerland and the US. The Swiss “advance” product charge on car bodies (and on batteries, packaging, refrigerators, and computers) is an incentive charge meant to realise and finance voluntary take-back of waste streams. If take-back objectives are not obtained, a mandatory deposit-refund system might be installed. The US charge intends to hit fuel-inefficient cars and is differentiated accordingly. Both schemes are incentive by intention, although the Swiss charge is also explicitly meant as a financial support for properly scrapping car bodies.

The small number of *charges* on motor vehicles should not imply that economic instruments do not play an important role in this field: in fact, many countries apply specific *taxes* on vehicles (see also Chapter 4).

Table 3.10. Charges on ozone depleting chemicals

Country	Charge base	Charge rate	Main Purpose		Revenues	Destination
			Inc	Fin	Amount	
Australia	Ozone depleting chemicals	AUS\$ 2/kg HCFC imported; AUS\$ 0.09/kg methyl bromide imported	+	-	AUS\$ 0.5 million	Financing administration and awareness programmes
Czech Republic	Ozone depleting chemicals	CZK 200 per kg	+	-	CZK 38 million (1998)	Abatement programmes
Hungary	Refrigerators and coolants	Refrigerators: HUF 600-2 800 per unit Coolants: HUF 250/kg CFC and hard freon, HUF 100/kg soft freon	..	+	HUF 500 million	Central Environmental Protection Fund
Iceland	Kg of ODS as toxic waste (see Table 3.3)	..	-	+	See Table 3.3	Collection and disposal
Symbols + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Charges on ozone depleting chemicals were identified in Australia (on imports), the Czech Republic, Hungary, and Iceland. They are incentive charges in support of programmes for phasing out these substances, or to finance their disposal (Iceland) or an environmental fund (Hungary). The revenues are used for administration and awareness programmes (Australia) and abatement (CR).

Box 4. Controlling ozone depleting substances (ODS) by quotas: the Canadian case

Under the Canadian Environmental Protection Act, Environment Canada has been controlling the supply (defined as the production plus the import, minus the export) of ODS emissions since 1989. Since 1994, trade in the ODS emission allowances given to ODS manufacturers, distributors, and users has been allowed (see Section 3.2 on tradable permits). Each allowance corresponds to a percentage of the baseline year consumption of ODS by the manufacturer, distributor, or user. In 1997, the market price for the allowances was CAN\$ 1.50-2.00 per pound of methyl bromide, and 30-40 trades were made.

Table 3.11. Charges on batteries

Country	Charge base	Charge rate	Main Purpose		Revenues	Destination
			Inc	Fin	Amount	
Austria	Batteries and accumulators	Weight	-	+	..	Private collection and treatment systems
Denmark	Lead batteries	DKK 12 (< 100 Ah) for car batteries DKK 24 (>100 Ah) for car batteries DKK 18 (other)	-	+	DKK 20 million	Collection and recycling
Hungary	Batteries	HUF 38/kg	..	+	HUF 700 million	Central Environmental Protection Fund
Italy	Lead batteries (sales)	..	-	+	..	Consortium for lead battery and lead waste
Switzerland	Batteries	..	+	+	..	Relevant firms
<u>Symbols</u> + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Denmark, Hungary, Italy, and Switzerland levy a charge on batteries. In Austria, an ordinance requires the take-back of batteries by the producers and distributors, with the private systems responsible for the collection determining the charges. The charge rates in the other countries are set according to weight (Austria or Hungary) or capacity of the batteries (Denmark). The revenues are used for financing collection and treatment systems, or go to a central environment fund (Hungary).

Table 3.12. Charges on lubricant oil

Country	Charge base	Charge rate	Main Purpose		Revenues	Destination
			Inc	Fin	Amount	
Finland	Lubricant oil	FIM 0.25/kg	-	+	FIM 20 million	Waste oil collection and treatment; clean-up of contaminated soil
Hungary	Lubricant oil	HUF 69.9/kg	..	+	(Introduced 1999)	Central Environmental Protection Fund
Italy	Lubricant oil sale	ITL 5/litre	-	+	..	Consortium for used oil

US (Rhode Island): see Table 3.15			
Symbols + = yes - = no .. = no data available	Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing	Amount in 1997 if not otherwise stated

Charges on lubricant oil are operated in Finland, Hungary, Italy, and in the State of Rhode Island, US (as part of a package of charges on "hard to dispose of" products). The purpose of the charges is primarily financial: to finance the collection and disposal of the oil or to clean up contaminated soils.

Table 3.13. Charges on packaging

Country	Charge base	Charge rate	Main Purpose		Revenues	Destination
			Inc	Fin	Amount	
Austria	Packaging	In accordance with actual collection and recycling costs	+	+	..	Collection and recovery of packaging waste
Hungary	Plastic, aluminium, metals, paper, wood, textiles of natural origin, glass, other	Plastics: HUF 10/kg Combined: HUF 8/kg Aluminium: HUF 5/kg Metals: HUF 4/kg Paper, wood, textiles of natural origin: HUF 3/kg Glass: HUF 2/kg Other: HUF 5/kg	..	+	HUF 2 000 million	Central Environmental Protection Fund
Italy	Plastic bags (number of units on national market)	ITL 100/bag	+	-	ITL 55 billion (1990)	State
	Plastic containers and packaging for liquids	..	+	-	..	National Consortium
Japan	Packaging and containers	Rate differentiated according to containers; ¥ 2 549-95 135 per ton for different types of bottles	+	+	¥ 1 700 million	Cover recycling costs

Switzerland	Al and Fe packaging, PET bottles	..	+	+	..	Relevant firms
<u>Symbols</u> + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Packaging charges were identified in Austria, Hungary, Italy, Japan, and Switzerland. An Austrian ordinance requires the take-back of packaging by the producers and distributors. The private systems, which are responsible for the collection and recovery, determine the charges. The revenue of the Japanese charge is allocated to the Japan Container and Packaging Association. Similarly, the revenues of one of the Italian charges (applied to plastic containers and packaging for liquids) are allocated to a National Consortium. Hungary levies a charge on a full range of packaging materials, the proceeds of which go to the Central Environmental Protection Fund. Switzerland has a charge on aluminium, iron and PET beverage containers. All the systems for which information was provided have an explicit incentive purpose.

Table 3.14. Charges on agricultural inputs

Country	Charge base	Charge rate	Main Purpose		Revenues	Destination
			Inc	Fin	Amount	
Canada (British Columbia)	Pesticides	CAN\$ 1.20/litre for pesticides	-	+	..	To fund the Residuals Stewardship Program including depots
Finland	Pesticides	FIM 5 000 for market entrance + 35% of price (excl. VAT) (1998)	-	+	FIM 6 million	Financing of registration (administrative charge)
US (States)	Fertilisers	US\$ <1-4 per ton	-	+	..	Inspection activities
<u>Symbols</u> + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Canada (British Columbia) levies a charge on pesticides, with revenues used to fund a Stewardship Program. The US charge on fertilisers (operated by several States) and the Finnish charge on pesticides are both designed to cover administrative costs.

Table 3.15. Other charges on products

Country	Charge base	Charge rate	Main Purpose		Revenues	Destination
			Inc	Fin	Amount	
Austria	Refrigerator; air conditioners	ATS 100 as an advance payment for treatment	-	+	..	Proper treatment of old devices; system is a substitute for a deposit-refund system
Canada (British Columbia)	Leftover paint and paint containers	CAN\$ 0.50/4 litres of paint	-	+	..	To fund the paint and coatings collection programme
Canada (British Columbia)	Solvents/flam-mable liquids	CAN\$ 0.40/litre for solvents and flammable liquids	-	+	..	To fund the Residuals Stewardship Program including depots
Canada (New Brunswick)	Scrap tyres	CAN\$ 3/tyre (cars, light trucks, and motorcycles)	+	+	CAN\$ 2 million	Tyre recycling and dump clean up
Denmark	New, used, and retreated car tyres	DKK 8/tyre (new and used) or DKK 4 (retreated)	-	+	DKK 20 million	Financing of collection and recycling
	Gasoline	DKK 0.05/litre	-	+	..	Financing the clean-up of contaminated (discontinued) retail petroleum sites
Finland	Crude oil and oil products imported by ship (oil pollution combating charge)	FIM 2.20/ton; double rate if not double hull	-	+	FIM 33 million	Fund; prevention and clean-up in case of oil accident
	Nuclear waste (indirectly); nuclear waste management charge	Based on estimates of future expenditures (FIM 10-15/MWh)	-	+	Accumulated contribution: FIM 5 500 million (1998)	Fund for (future) nuclear waste management
	Tyres (cars, motorbikes, trucks etc.	FIM 5.80-250/unit (1998)	-	+	..	System run by private sector; financing of tyre reuse and waste management
Hungary	Tyres	New tyres: HUF 30/kg Imported used tyres: HUF 120/kg	..	+	HUF 700 million	Central Environmental Protection Fund

Switzerland	Refrigerators, computers	..	+	+	..	Relevant firms
US	Crude oil, chemicals and gross business profits	US\$ 0.097/barrel; resp. US\$ 0.22-4.87/ ton and 0.12% of profits over US\$ 2 million (1995)	-	+	..	Superfund for clean up of inactive hazardous waste disposal sites
US (States)	Car and truck tyres (Texas)	US\$ 0.25-2 per car tyre; US\$3.50 for truck tyres (Texas)	-	+	..	Financing disposal and clean up
US (Rhode Island)	Lubricants	US\$ 0.05/quart	-	+	..	"Hard-to-dispose material account" for financing educational and technical programmes
	Antifreeze	US\$ 0.1/gallon				
	Organic solvents	US\$ 0.0025/gallon				
	Tyres	US\$ 0.50/piece				
<u>Symbols</u> + = yes - = no .. = no data available		Charge rate valid for 1997 if not otherwise stated	Inc = Incentive Fin = Financing		Amount in 1997 if not otherwise stated	

Several other product charges were reported. They include charges on durable (household) appliances (Austria and Switzerland) as an advance payment for proper treatment of the obsolete product at the end of their life cycle. The Austrian system was voluntarily adopted by the private sector, and it substitutes for the implementation of deposit-refund systems for the products concerned.

Charges on crude oil in Finland and the US are designed to finance clean up funds. The US Superfund, established to finance clean up of inactive hazardous waste sites, is fed by a charge on crude oil and chemicals and on gross business profits exceeding a certain level. In Denmark a charge is levied on gasoline for financial support of the clean up of contaminated retail petroleum sites and sites of mineral oil enterprises which are permanently closed down.

In a number of countries [Canada (New Brunswick) Denmark, Finland, Hungary, and in some of the US States] a charge on car (in some cases also motorcycle and truck) tyres is found. This is generally used to meet the costs of collection, recycling and disposal. Other product charges relate to chemicals applied in households and firms, particularly solvable and flammable liquids, (leftover) paint and containers, and lubricants.

3.2 Tradable permit systems³

Tradable permits for air pollution

The US was the first country to apply tradable permits (TPs) widely in the context of its environmental protection programme, and even today, most applications of the TP tool can be found in that country. Applications so far have mainly related to the emission of air pollutants. The US currently runs two major TP schemes for air quality management: the Acid Rain Allowance Trading Scheme (in which power plants are the main parties) and the Californian RECLAIM scheme, a system of tradable permits for NO_x and SO₂, introduced with the intention of making ozone abatement programmes more efficient. Trading schemes for lead and ozone depleting substances have worked quite successfully. Other schemes for mobile sources have been recently implemented. A local application (Colorado) concerns the right to place and operate woodstoves in residential (holiday) buildings; the number of woodstoves had to be restricted in order to improve air quality in the mountainous area concerned.

In Canada, trade is allowed in the ozone depleting substances (ODS) allowances allocated to ODS suppliers (see Box 4). In addition, a voluntary pilot scheme for NO_x and VOCs is operating in Ontario for power plants and large industries.

In Europe a few schemes exist, but they are generally operating only on a very small basis. This includes the TP system of the Basel Canton in Switzerland (for VOCs and NO_x), one in Denmark for CO₂ emissions from power plants, and an experimental project in Chorzow (Poland).

Table 3.16. Tradable permits in air pollution policy

Country	Object /Name	Purpose	Initial issue of permits	Trading parties	Trade level
Canada	Ozone Depleting Substances	Restrict consumption of ODS	G	Manufacturers , distributors, users	..
Canada (Ontario)	NOx and VOC emissions (voluntary pilot scheme)	Reduction of smog in Windsor-Quebec corridor	G	Power plants and large industry	..
Denmark	CO ₂ emissions from power plants	Reduce emissions of CO ₂	G	Power plants	To be introduced in 2000
Poland (Chorzow)	VOCs control (demonstration project 1991-1992)	Reduce emissions of 6 air pollutants	G	Industrial plants	..

3. This section is partly based on the outcome of the OECD Workshop on “Domestic Tradable Permit Systems for Environmental Management” (24-25 September 1998), published in OECD (1999a), *Implementing Domestic Tradable Permits for Environmental Protection*.

Switzerland (Basel Canton)	Control of VOCs and NO _x	..	G	Industries	Very few trades
US	Acid Rain Allowance Trading	Reduction of SO ₂ emissions from electricity generation by 50 %	G/A	Industrial sources (mainly power plants)	1997: 15.2 million allowances, 1 429 transactions
	Lead in gasoline (1983-1987)	To reduce average lead content in gasoline to 0.1 gram/gallon	G Quarterly production of leaded gasoline	Oil refineries	10.6 billion grams of lead
	Ozone depleting substances (ODS)	Meet the target of the Montreal Protocol	G	Manufacturers and importers	321 million kg; 561 trades (1989-1995)
	Mobile sources averaging banking and trading (1998)	Reduction of exhaust emissions of mobiles sources (HC and NO _x)	Production volumes	Firms	
US (California)	RECLAIM (NO _x and SO ₂)	Declining cap of emissions from 1993 to 2003	G	NO _x : 370 sources SO ₂ : 40 sources	1 200 trades totalling 244 000 tons of NO _x and SO ₂ (1994-1997)
US (Northeast)	Ozone Transport Commission NO _x programme	Reduce NO _x emissions by 75% below 1990 levels	G (emission rates)	Stationary sources	To be implemented
US (Colorado)	Tradable permits for woodstoves and fireplaces	To improve air quality in some mountainous areas	G	Owners of mountain cabins	“Lively” trade with prices up to US\$ 2 000 for a permit
<u>Symbol</u> .. = no data available			G = Grandfathered A = Auctioned		

Tradable permits for water management

Experience with trading in the *water* sector is quite limited. In the US, the Lower Fox River Trading Scheme (Wisconsin) aims to reduce BOD effluent discharge from waste treatment facilities and pulp and paper plants. The market appears to be very small, with only one trade established to date. The Dillon Reservoir (Colorado) scheme has not really been operational yet because critical loads have not been exceeded (1988). In 1992, only a few trades were proposed, and none implemented.

The Australian system attempts to regulate saline discharges into the Hunter River. Parties include mines and electricity generation plants. Prices for the credits are considered high; although several parties wanted to sell, only one trade has been established so far.

Table 3.17. Tradable permits for water quality management

Country	Object /Name	Purpose	Initial issue of permits	Trading parties	Trade level
Australia	Hunter River Salinity Trading Scheme	Control saline discharges from various sources along the river	G	Mining operations and electricity generators	Several sellers, one actual trade
US (Colorado)	Dillion Reservoir	Control of phosphorus	G	Point/non-point sources	No trades
US (Wisconsin)	Lower Fox River Trading Scheme	To reduce BOD effluent discharge in the river	G	Waste treatment and paper and pulp plants	Only one trade so far
<u>Symbol</u> .. = no data available			G = Grandfathered A = Auctioned		

Tradable permits for land management

There exist a few applications of TPs in *land use management*. Most existing experiences (again, mainly in the US) are in the area of “Tradable Development Rights” (TDRs). A key feature of TDR systems is that trades can occur only once: after a development right has been transferred and used, it cannot be used another time (or even be returned to the original seller).

Table 3.18. Tradable permits for land management

Country	Object /Name	Purpose	Initial issue of permits	Trading parties	Trade level
France (Alps mountains)	..	Landscape preservation	Urban housing density limits	Land owners	Small number of transactions (small urban areas)
New Zealand	Revised district scheme	Management of urban density, protection of historic sites	Density allowances	House owners	..
US	Lake Tahoe	Watershed preservation and recreation	Coverage (construction) coefficients	Land owners	372 transactions (7 000 m ² preserved since 1987)
	Montgomery County	Agricultural preservation	Housing density limits	Land owners	4 300 transactions (34 000 acres preserved since 1980)

	Pinelands	Cohansey Aquifer and Forest Conservation	Zone assessment	Land owners	1 424 transactions (12 538 acres preserved since 1980)
<u>Symbol</u> .. = no data available			G = Grandfathered A = Auctioned		

3.3 Deposit-refund systems

Deposit-refund systems (DRS) traditionally concerned glass drink containers. In recent decades, other products have also been brought under such systems. These include other food packaging (cans, PET bottles), (car) batteries, lamp bulbs, pesticide containers, home appliances, and lubricant oil. Tables 3.19 through 3.21 list the deposit-refund systems identified in OECD countries for:

- Beverage containers
- Batteries
- Other products

These tables contain information on the object of the DRS, the rates of deposit (and refund, if different), its objective, and the return level of the deposited products.

Table 3.19. DRS for beverage containers

Country	Object	Deposit/Refund	Objective	Return level
Australia	Beverage containers	Beer cans: AUS \$ 0.05 Bottles: up to AUS\$ 0.20	To increase recycling and discourage improper disposal	PET containers: 62% Glass containers: 96% (exceeds stated targets)
Austria	Refillable plastic bottles (<5 litre)	ATS 4 per packaging	Prevention of packaging waste	..
Canada (Quebec)	One-way beer and soft drink bottles	Glass, plastic and Al: < 0.45 l: CAN\$ 0.05 > 0.45 l: CAN\$ 0.20	Collection and proper treatment	73%
Canada (New Brunswick)	Beverage containers (excl. milk)	< 0.46 l: CAN\$ 0.05 0.45-1 l: CAN\$ 0.20 > 1 l: CAN\$ 0.30	Collection and proper treatment by industry	Beer: 98% other: approx. 85%

Canada (British Columbia)	All beverage containers	<u>Deposit</u> Beverages and beer: CAN\$ 0.1 Spirits: CAN\$ 0.2 <u>Refund</u> 100% for refillables 50% for recyclables	To encourage recycling, waste diversion, to reduce litter	Beverage: 75% Spirits: 66% Beer: 96%
Czech Republic	Glass and PET bottles	Glass: CZK 3-5 PET < 1 l: CZK 5 PET > 1 l: CZK 10	Waste minimisation and saving on raw materials	> 95% for beverage containers
Denmark	Beer and PET bottles	Glass 25 cl: DKK 1.25 Glass 33 cl: DKK 1.25 Plastic 0.5 l: DKK 2.50 Id. 1.5 l: DKK 4.50	Limit scrapped containers, limit use of resources	Approx. 99%
Finland	Soft drinks, beer, wine, spirit containers	Glass bottles: FIM 0.50-2.50 Plastic bottles: FIM 0.50-2.50 Metal cans: FIM 1 Bottle cases: FIM 14	Incentive for refilling and recycling	Very high
Hungary	Glass and plastic bottles	Glass wine and beer bottles: HUF 10/bottle 1.5-2 litre plastic bottles: HUF 28-65/bottle	..	70-80%
Iceland	Bottles, aluminium cans, plastic containers	<u>Deposit:</u> ISK 7.35/container <u>Refund:</u> ISK 7.00/container	Increase collection and recycling	84% recycling rate
Korea	Food and drink containers	..	..	..
Mexico	Beer and soft drink containers	..	..	..

Netherlands	Bottles for beer, soft drinks, milk and dairy products	Beer 33 cl: DFL 0.15 Beer >33 cl: DFL 0.50 Soft drinks, milk, dairy products (glass, PET) 1 l: DFL 0.50 Soft drinks (PET) 1-2 l: DFL 1.00	Waste prevention	95-99%
Norway	Bottles	NOK 1.00-2.50, according to volume of bottle; as a percentage of retail price, between 1% (for liquor) and 25% (for soda)	Collection and reuse of bottles	> 90% for soft drinks and beer
Poland	Glass and plastic bottles	Glass: 5-18% of price Plastic: 19-34% of price	Limit waste disposal	90%
Sweden	Glass and PET bottles, aluminium cans	SEK 0.5 (aluminium cans) to SEK 4 (reused PET bottles)	Increase recycling	90% recycling
Turkey	Glass, metal, laminate, plastic containers	25-50% of container price	..	Only active if industry does not meet take-back quota: laminates 15%; metal 25%; plastic 30%; glass 36%
US (States)	Beer and soft drink containers	US\$ 0.025-0.15; average US\$ 0.05	Promote proper recycling and discourage littering	At least 50%; most over 85%
<u>Symbol</u> .. = no data available		Amount in 1997 if not otherwise stated		In 1997 if not otherwise stated

Two-thirds of countries that responded indicate deposit-refund systems for various sorts of beverage containers, including glass bottles, cans, and PET bottles. These systems differ in their objectives. Many of the deposit-refund systems are aimed at returning an appropriate number of refillable containers for reuse; recycling is another common objective. Systems are also found where a deposit is placed on one-way containers, for which collection for refunding opens the way for proper treatment, recycling of the material, and disposal of residuals. In Canada, the Province of British Columbia differentiates the refund with a 100% refund for refillable bottles and a 50% refund for recyclable bottles, in an attempt to promote the use of refillable bottles over non-refillable ones.

A third type of system is optional: the private sector concerned may organise its own take-back facility in order to realise a certain level of return of the containers (Turkey). If the take-back targets are not met, a deposit-refund system may come into force. By contrast, the deposit-refund system for beer and

soft drink containers in Denmark is mandatory: no other containers are allowed on the Danish market. It is prohibited to sell beverages in metal containers in Denmark, and containers filled in Denmark must be refillable.

In Finland, drinks in containers that are part of a deposit-refund system gain favourable excise tax treatment.

Deposit-refund systems for drinks containers are usually quite successful. Return levels of glass and PET bottles of 60 to 99% are reported. Metal and laminate containers are returned in lower rates.

Table 3.20. DRS for batteries

Country	Object	Deposit/Refund	Objective	Return level/Result
Denmark	N-CD batteries	DKK 120/kg battery	Collection and recycling; target 75%	75%
	Lead accumulators	DKK 0.8/kg accumulator, minus value of used lead	Collection and recycling; target of 99.9% for 2000	Yearly target for 1997 was met
Korea	Batteries (see Table 3.21)			
Mexico	Car batteries	..	..	..
US (States)	Lead-acid batteries	US\$ 5-10	To promote recycling; used lead has a positive economic value	> 90%; seems to fluctuate with lead prices
<u>Symbol</u> .. = no data available		Amounts in 1997 if not otherwise stated		In 1997 if not otherwise stated

In a few countries, batteries for appliances are brought under a deposit-refund system. In Denmark, Mexico, and some US States, a deposit-refund system for car batteries also exists. The systems are generally reported to be successful. In the case of car batteries, the positive economic value of the lead may have contributed to the high percentages of return.

Table 3.21. Other deposit-refund systems

Country	Object	Deposit/Refund	Objective	Return level/ Result
Austria	Lamps	ATS 10	Proper collection and treatment	60% (1996)
Finland (Åland Islands)	Car hulks	..	..	..

Italy	CFCs	..	Promoting CFC collection and recycling or disposal	..
Korea	Tyres, home appliances, batteries, lubricants	(\$36.8 in total, 1996)	Promotion of recycling	Has increased recycling
Norway	Cars and belt-driven vehicles	Deposit: NOK 1 200 per vehicle. Refund: 1 500 (1999). Revenue NOK 100 million	Collection and proper handling of car hulks	85-90 %
Sweden	Motor vehicles (max. weight 3 500 kg)	Charge: SEK 700 Premium: SEK 1500	Prevent abandonment of motor vehicles	No figure available, but probably strong incentive to return vehicles to authorised disposal facilities
US (Maine)	Containers of pesticides for restricted use	< 10 gallon: US\$ 5 > 30 gallon: US\$ 10	To divert used containers from waste sites	..
US (Rhode Island)	Vehicle tyres	US\$ 5	..	..
<u>Symbol</u> .. = no data available		Amounts in 1997 if not otherwise stated		in 1997 if not otherwise stated

A number of other deposit refund systems were identified. In Finland, a deposit on car hulks is applied in the Åland Islands (a self-governing territory). In Korea there is a DRS that applies to a variety of products (batteries, home appliances, tyres, and lubricants). Other deposit-refund systems include lamp bulbs (Austria), CFCs (Italy), some pesticides containers (US, Maine), vehicle tyres [US (Rhode Island) and Korea], and motor vehicles (Norway and Sweden).

The rate of return of the Austrian system is over 60% and between 85-90% for the Norwegian.

3.4 Non-compliance fees

Non-compliance fee systems reported in the questionnaire replies are presented in Table 3.22. Basic information about these systems include their field of application, the method of calculating the fee, the fee rates and the number of occasions in which the fee is imposed, and the revenues generated by the system.

Table 3.22. Non-compliance fees

Country	Field	Calculation	Rates	Number of Occasions/Revenues
Canada (New Brunswick)	General	Environmental damage estimation	..	..
Czech Republic	Air pollution	Environmental damage estimation	Max. in 1996: CZK 10 million	502 occasions; CZK 10.9 million (1996)
	Waste	Environmental damage estimation	CZK 0.3-10 million dependent on the nature of non-compliance	552 occasions; CZK 9.7 million (1996)
	Wastewater	Environmental damage estimation	CZK 0.02-1 million; dependent on the nature of non-compliance	448 occasions; CZK 14.2 million (1996)
Greece	General	..	< DRS 10 million; < DRS 100 million (extreme cases)	..
	Air polluting combustion sources	Volume of emissions, history of source, and environmental damage	DRS 1 million on average	24 occasions
	Car emissions	Standard rates	DRS 5 000 or 10 000	2 851 occasions; approx. DRS 55 million
	Marine environment	Environmental damage estimation	Max. DRS 100 million	1 occasion; DRS 10 million
Hungary	Air pollution	When stationary or diffuse industrial and building sources exceed standards (enforced for over 200 pollutants)	..	HUF 420 million
	Sewer damage	For emitting substances into the sewerage system and damaging it	..	HUF 221 million
	Water pollution	Paid by point sources discharging into surface waters that exceed emission standards (enforced for over 32 water pollutants)	..	HUF 240 million collected (out of HUF 415 million imposed in fines)

Korea	General	Size of firm and excess level of pollution	..	584 occasions; US\$ 2 million
Poland	Air pollution	10 times the regular charge rate on excess pollution	..	Occurs quite commonly; PLZ 9.3 million (1996)
	Wastewater	Quantity and quality (pH, radioactivity, temperature) of excess pollution	..	Occurs quite commonly; PLZ 52 million (1996)
	Waste disposal	5% of appropriate charge for each day of disposal without permit	..	Occurs quite commonly; PLZ 1.3 million (1996)
	Noise	Excess level	PLZ 8.25-33 per decibel in excess of permitted level	Exceptional; PLZ 1.7 million (1996)
Sweden	General environmental protection charge	Offsets benefits of non-compliance	SEK 25 000-11 473 000	10 cases since 1981; poor effectiveness
	Sea dumping of oil from ships	Amount of discharge and tonnage of ship	SEK 35 000-3 500 000	20 times (mainly small discharges in ports); SEK 1 056 000 (1996)
Turkey	General	Violation of environmental law	..	Revenues to Environmental Pollution Prevention Fund
<u>Symbol</u> .. = no data available			Amounts in 1997 if not otherwise stated	

Non-compliance fees are found in 8 countries. Basically, there are two methods used to calculate the fees. One system starts from calculating the environmental damage done after non-compliance by the subject concerned. This method is found in Canada (New Brunswick), the Czech Republic, and in some cases in Greece. In Greece, the history of the violating source is also taken into account. The other system is based on the extent to which permitted pollution levels are exceeded. Such systems are operated in Hungary, Korea, and Poland. In Poland a fee is imposed for every day a firm disposes of waste without a proper permit. Korea includes the size of the firm in violation in its fee rate calculation, and in Sweden the sea dumping charge includes the ship tonnage. In Greece, a standard rate is applied to cars that do not meet the required emission characteristics. In Sweden, the fee for the general environmental protection charge is calculated to offset the profit made by non-compliance.

3.5 Performance bonds

Performance bonds are found in a few countries and their details are given in Table 3.23. Important information about this type of instrument includes the object or activity of the bond, its purpose and level, and the number of occasions where it has occurred.

Table 3.23. Performance bonds

Country	Object	Purpose	Level of Bond	Number of Occasions/ Volume
Australia	Mine sites	To create adequate rehabilitation without adversely affecting economic viability of mining operations	Estimation of real costs of rehabilitation, including risks, in six categories	..
Canada (Quebec)	General	To guarantee compliance with issued permits in several fields	Variable	Jointly with all issued permits
Canada (New Brunswick)	Mine sites, landfills	To ensure compliance with rehabilitation and clean up obligations	Variable	3 occasions; CAN\$ 5.5 million
Canada (Alberta)	Mines, pits, oil production sites	To ensure availability of funds for reclamation	Estimation of costs of reclamation	CAN\$ 170 million
Canada (Alberta)	Hazardous waste sites	To dispose of waste in case of insolvency	CAN\$ 4 000-2 million per site	35 sites; CAN\$ 93 million
US	Open pits	To ensure reclamation	Minimum of US\$ 10 000/site	..
<u>Symbol</u> .. = no data available			Amounts in 1997 if not otherwise stated	

The use of performance bonds was reported by only three countries. They relate to mining and rehabilitation of mine sites, including open pit mining and oil production sites, and to landfills including hazardous waste sites [Australia, Canada (Provinces of New Brunswick and Alberta), and the US]. Canada (Quebec) has a more general system, applying to many activities that are potentially harmful to the environment.

The level of the bonds are usually calculated by estimating the real costs of rehabilitation after closing down the operations.

3.6 Liability payments

Liability payments reported in the questionnaire responses are presented in Table 3.24. Information provided about the systems include the object of the payment, its purpose, the level of the payment, and the number of occasions of actual application.

Table 3.24. Liability payments

Country	Object	Purpose	Level of payment	Number of Occasions/ Volume
Canada (Quebec)	Tioxide Canada	Fund to restore fish habitats near St. Laurent River (24 projects)	CAN\$ 2.2 million (1994-1996)	Specific regulation for this occasion; CAN\$ 5.3 million in total
Denmark	General	The Environmental Damage Act (1994) states the liability for environmental damages caused by industries listed in the Act; the Act on Contaminated Soil (1999) states the liability in certain cases; in general, fault liability is applied according to Danish case law.	..	..
Finland	Water	In permit procedure, "allowed" pollution damage to private property is estimated and the polluter is liable to pay compensation accordingly	Case specific	Hundreds of compensated victims p.a.; payments by industry to victims approx. FIM 5-10 million p.a.
	General	Damage compensation to victims; strict liability law since 1995	Case specific	..
	General	Compulsory environmental damage insurance for large polluters; a complementary system to compensate damage where the polluter is unknown or insolvent	Insurance premium: FIM 1 000-200 000	System started in 1999
Germany	Noise	Damage compensation for noise of certain installations (defined by law)	..	..

Japan	Waste	Restoration of sites polluted by illegal dumping of waste (fund)	¥ 200 million (1998), paid by potential polluters and Ministry of Health and Welfare	Started in 1998
	Air, water	Compensation for pollution-related health damage	Case specific	¥ 80 billion (1974-1997) to 70 000 certified victims
Sweden	Water	Prevent/reduce damage from hydro-power stations	Function of size of power station	..
	General	Environmental damage insurance for industry for permanent and accidental damage	Insurance premium: SEK 800-80 000	..
Turkey	General	To ensure clean up of polluted areas; revenues go to the Environmental Pollution Prevention Fund	The cost of clean up	..
US	Hazardous waste sites	To ensure clean up of sites posing a threat to human health and environment	Clean up costs	Numerous; billions of US\$
<u>Symbol</u> .. = no data available			Amounts in 1997 if not otherwise stated	

Eight countries reported liability payment systems. In the case of Tioxide Canada (Quebec), CAN\$ 2.2 million was levied and used for restoration of fish habitats in the St. Laurent River. The Japanese system of compensation for air and water-related health damage is a long-standing and wide-ranging instrument in Japan's environmental policy (see Box 5). In Denmark, Finland, Sweden, and Turkey, there are general provisions for liability payments by environmental polluters. In Canada, Japan, and Turkey, liability payments are made into a clean-up fund. In the US, hazardous waste sites are subject to liability payments if the sites need to be cleaned up in order to ameliorate danger to human health and the environment. Numerous cases have occurred under this system, involving billions of US\$.

Box 5. Japan's Pollution-related Health Damage Compensation System

During the 1970s, courts in Japan ruled on the existence of joint liability for unlawful pollution acts and stated that enterprises should take preventive measures, using the highest level of technology and knowledge, while sacrificing profitability, to control the emission of pollutants known to be potentially dangerous. Strict liability was introduced into the 1972 Air Pollution Control Law and the Water Pollution Control Law, which specified that the polluter must compensate physical damage caused by pollution.

Business, recognising the need to compensate sufferers, supported the establishment of administrative relief measures (compensation funding) under which persons with bronchial asthma and other respiratory diseases in the designated areas are regarded as sufferers from air pollution and compensated without any judicial procedures, whether the cause can be established or not. A compensation fund for air pollution sufferers was created in 1974 with financial resources related to smoke-emitting facilities throughout Japan (80%) and to cars (20%). It provided ¥ 13 billion in 1975 to 29 797 sufferers, ¥ 108 billion in 1988 to 108 489 sufferers, and a total of ¥ 1 390 billion between 1974 and 1992. In 1997, a total of ¥ 80 billion was paid to 70 000 sufferers. The number of certified sufferers from air pollution at the end of March 1997 was 718 989 in the whole of Japan. In 1988, the system was amended so that new sufferers would no longer be eligible for compensation, because it could no longer be proved that air pollution was the main cause of diseases such as asthma.

Sources: OECD (1994a), *Environmental Performance Review: Japan*, and Japanese reply to the questionnaire

3.7 Subsidies (for environmental protection)

Subsidies include a wide array of schemes providing financial assistance to different categories of parties in various circumstances, and under various conditions. Information on subsidies used in OECD countries for environmental protection is presented in Table 3.25, which includes information on the field or object of financial aid, its purpose, the type and level of assistance and the number of occasions or the volume of the aid available.

Table 3.25. Subsidies

Country	Field/Object	Purpose	Type and Level of Assistance	Number of Occasions/Volume
Australia	Greenhouse challenge subsidy	..	..	..
Austria	Air pollution, hazardous waste, noise (except traffic)	To provide financial aid for voluntary environmental measures undertaken by existing (domestic) firms	Up to 30% or 35% (for small and medium-sized enterprises)	129 granted applications; approx. ATS 200 million in total (additional fund for foreign investment available)
	Water	Support of water supply, sewerage networks, wastewater treatment measures	Grants; up to 60% for municipalities and up to 30% for enterprises	988 applications; ATS 6 million
Canada (New	Water	Support for construction of wastewater systems in	Grants; up to 50% of costs	Budget: CAN\$ 5 million; about 30 applications

Brunswick) Canada (Quebec)	Waste/Agriculture	municipalities To promote and support measures, practices and consultation for improving manure disposal, treatment and application	Grants; 50-90% of costs	443 disposal and 21 consultation groups organising 600 producers; CAN\$ 19.2 (1997-1998)
	Waste	To promote reuse and recycling of used tyres	Recovery: CAN\$ 3 Recycling: CAN\$ 35-125 per ton Energy generation: CAN\$ 50 per ton	29 firms (16 recovery, 10 recycling, 3 energy generation) CAN\$ 3.2 million (1998-1999)
	Wastewater	To support municipal wastewater treatment facilities	85% of costs	Approx. 50 municipalities; CAN\$ 588 in total
Czech Republic	General	State Environmental Fund: a special facility for providing financial means for environmental protection	Loans up to 50% of total project costs against 7% interest; soft loans (3-80%) of costs	Budget CZK 7.1 billion; applications for wastewater treatment, energy change, and nature conservation projects
Denmark	Traffic	To encourage local governments to develop traffic and environment plans	Grant	DKK 5 million per year for 1997-1999
	General	To encourage environmental projects that create new employment	Grant	DKK 57.2 million per year (1998-2000); 261 applications, 47% granted
	General	Encouragement of environmentally sustainable development, <i>inter alia</i> changes in life style	Grant	DKK: 41 million (1997), 49 million (1998), 21 million (1999), 24 million (2000), 19 million p.a. (2001-2002); 510 applications in 1997, 52% granted
	General	Environmental revision and auditing	Grant	DKK 12 million; 33 applicants, 42% granted
	Building	To promote ecological building	Grant	DKK 4.9 million per year (1997; DKK 9.3 million per year (1998-2000)
	General	Integrated product policy, i.e. promote development and demonstration of cleaner products and waste recycling projects	Grant	DKK: 97 million (1997), 49 million (1998), 59 million (1999), 70 million (2000), 77 million p.a. (2001-2002); 215 applications in

				1997, 66% granted
Finland	General	To promote environmentally sound technology and products	Grant; max. 50% of costs	>100 projects granted annually; FIM 27 million (1998)
	Water	To support municipal sewerage and wastewater treatment	Grant; max. 50% of costs	50-100 projects granted annually; FIM 7 million (1998)
	Air, water	Support to pollution control equipment	Accelerated depreciation: 25% annually	..
	General	Support to pollution control in industry	State guarantee for loans	Small
	General	Support to pollution control in small and medium-sized enterprises	Soft loans; interest about 2 percentage points below market rate	FIM 37 million
	Air	Support to renewable and clean energy	Grant; max. 50% of cost	..
	General	Support to industry and municipalities for pollution control	Interest subsidy for loans	FIM 21 million; not available after 1994 except for old (diminishing) loan capital
France	Energy saving, treatment of industrial wastewater, air pollution, and noise abatement	Support related investments	Accelerated depreciation	..
Greece	General	To support environmental investments favouring regional development	25-40% of total eligible investment costs	(1990-1997) 109 projects; total budget of DRS 26.3 billion
	General/clean technologies	To promote environmentally sound and clean technologies, and new and innovative products	Up to 40% of costs	..
Japan	General	Support use of pollution control equipment	Grant; 40% of expenditure, provided recipient abates pollution 10% below required level	..

	General	Support pollution control	Grant; loans from 5-100% of cost; interest rate of 2.2-2.8% (1999)	¥ 18.3 billion for 28 facilities
	General	For new construction or relocation of installations designed to reduce pollution	Grant; up to 50%	¥ 33.9 billion for 15 facilities
	Low emission vehicles (electric, natural gas, methanol) and related service stations	To promote low emission vehicles	Grant; 50% of price differential with conventional vehicles (min. purchase of 5 units in designated areas)	¥ 450 million; 102 vehicles, 12 service stations (1998)
	Low emission automobiles	For transport businesses to use low emission automobiles	Grant; 25% of price	¥ 167 million (1999)
	Low emission trucks (NO _x)	For truck operators to induce use of lowest emission trucks	Grant; 4-5% of price	¥ 450 million (1998)
	General	Support use of pollution control equipment with a minimum performance of 70% emission reduction	Accelerated depreciation; 18-90% depreciation the first year, depending on type of equipment and size of plant	..
	Waste	Support use of equipment for recycling or for using recycled materials	Accelerated depreciation; 25-75% depreciation the first year, depending on type of equipment	Approx. ¥ 1 billion (1998)
Netherlands	General	To promote the development of clean products	40% of costs with a maximum of DFL 0.5 million per case and DFL 1 million per company, for companies with less than 500 employees	Budget: DFL 5.5 million
	Air/transport	To promote the use of clean buses for public transport	DFL 2 000-18 000 per bus with diesel or gas engine and a weight of at least 35 tons	Budget: DFL 10.1 million

	Waste/fishing industry	To promote clean processing of waste from the fishing industry	..	Budget: DFL 0.18 million
	General	Promotion of green projects	Soft loan for initiators of Green Projects (interest rate 1.5% below market rate), financed by income tax exemption on dividends from Green Funds	..
	General	For stimulation of environmental projects and activities	Companies, households, municipalities and civil organisations can apply	Budget: DFL 28 million
	Agriculture	To promote investment in environmental protection	Agricultural companies of more than 120 standard business units	Budget: DFL 100 000
Norway	General	Development of environment-friendly technologies	Grant	..
	Wastewater	Municipal sewerage systems	Grant	..
	Waste/wastewater	Education, planning for municipal waste and wastewater management	Grant	..
	Agriculture	Grants to ecological farming	Grant	..
	Agriculture	Agricultural landscape protection	Grant	..
Poland	General	To support implementation of the National Environmental Policy	Grants, soft loans, writing-off debts; Environmental Funds are established on the State, Voivodship (provincial), and local level	..
Sweden	Waste, water	Handling of oil waste from ships by harbours	Grant	..

	Air	Promote new technologies for the use of biofuels	Grants, soft loans	..
	Air	Reduce emission of hazardous substances from fuel tanks in houses	Grant to house owners, max. 30% of cost	..
Switzerland	Water, waste	To support building of waste incinerators and land fills, and wastewater treatment plants	..	Total budget since 1973: SF 3 billion
Turkey	General	Environmental Pollution Prevention Fund, a special facility for providing financial means for environmental protection	Grant and soft loans	..
	Treatment facilities	To promote investments in treatment facilities	25% discount on the costs of total electricity consumption	..
	Motor vehicles	To promote the use of lead-free gasoline	Lower sales prices compared to other gasolines	..
US	General	To support supplemental pollution prevention projects by industry	Reduction of proposed penalties on environmental law violation	US\$ 35 million in 1992 (164 cases); US\$ 104 million in 1995 (348 cases)
	General	To support pollution control and proper waste disposal	Low-interest loans, financed by tax-exempt bonds	US\$ 625 million in 1995
	Waste/soil	To encourage development of contaminated industrial sites	Grants, loans	Among others, 60 pilot projects by EPA with funding up to US\$ 0.2 million per project
	Waste	To promote establishment of recycling activities	Grants, loans	16 States created funds of up to US\$ 25 million
<u>Symbol</u> .. = no data available				Amounts in 1997 if not otherwise stated

The majority of countries indicated the use of subsidies for environmental protection, with most reporting the use of more than one scheme. Some of the schemes have a general scope, and financially support activities in the fields of air pollution control, wastewater treatment, waste management and noise reduction measures. These general environmental funds are fed by revenues arising from charges imposed on air and water pollution and waste generation.

A number of schemes — such as those found in Denmark, Finland, Greece, the Netherlands, Norway, and Sweden — are aimed at promoting the development and demonstration of clean technologies. Schemes are also in use that favour specific economic sectors. Examples include in Quebec, Canada (agriculture), Denmark (traffic, building sector), Japan (transport), the Netherlands (public transport, fishing, agriculture), Norway (agriculture), and Sweden (shipping). Denmark supports civil initiatives resulting in environmentally favourable changes in lifestyle. Most schemes provide support for costs of investment (capital costs, operating costs). The Danish scheme for promotion of clean technology also finances the costs of environmental consultancies for smaller firms.

Subsidies mostly come in the form of grants, soft loans and accelerated depreciation. Grants typically finance up to 50% of the costs of environmental measures, sometimes more. The Polish environmental fund provides the possibility to write off debts from earlier environmental investments. The Dutch commercial green funds, applicable for many different green projects, provides the possibility of soft loans, financed by an income tax waiver for dividends from the funds. A comparable system exists in the US where low-interest loans for pollution control and waste disposal activities are made possible by issuing tax-exempt bonds.

In the US funds are also become available through a (partial) waiver of penalties imposed for the violation of environmental laws. Penalties are reduced if the violator carries out supplemental projects for the benefit of the environment.

4. ENVIRONMENTALLY RELATED TAXES FOR POLLUTION CONTROL⁴

4.1 Scope and definition

Over the last decade a “new generation” of economic instruments has developed in OECD countries, in the form of an increasing use of environmentally related taxes. The “greening” of tax systems in a number of Member countries has generally followed three complementary approaches. First, the introduction of new environmentally related taxes, generally applied on environmentally harmful products such as pesticides, fertilisers, batteries, motor vehicles, or waste products. Second, a restructuring of some existing taxes with a strong environmental relevance (e.g. energy products), to include an environmental component; for instance, a CO₂ tax on energy products has been introduced in Denmark, Finland, Norway, Sweden, the Netherlands, and recently in Italy and the UK. Third, the modification or removal of tax provisions and subsidies with potential detrimental effects on the environment (e.g. agriculture subsidies, tax provisions in the transport sector)⁵. Some countries have implemented more comprehensive green tax reforms, consisting primarily of reducing or eliminating certain taxes (e.g. reduced income taxes or social security contributions), while introducing new environmentally-related taxes, but without increasing the overall tax burden.

OECD is developing a database with detailed information on environmentally-related taxes in Member countries. The database constitutes one part of a broader project for which OECD, in co-operation with the European Commission, EUROSTAT and IEA, has developed a statistical framework to this end.

As mentioned in Box 1, “environmentally-related taxes” are defined as any compulsory, unrequited payment to general government levied on tax bases deemed to be of particular environmental relevance. Taxes are unrequited in the sense that benefits provided by government to taxpayers are not normally in proportion to their payments. Requited payments to the government for pollution control activities, such as fees and charges that are more or less in proportion to wastes or emissions treated, are presented in Chapter 3.

Pollution-oriented environmentally relevant tax bases include energy products, transport equipment and transport services, as well as measured or estimated emissions to air and water, ozone depleting substances, certain non-point sources of water pollution, waste management, and noise. Table 4.1 and Figure 4.2 indicate the number of taxes levied and the revenues respectively of taxes applied on these different tax bases.

4. This section is based on “A Database on Environmentally-related Taxes in OECD Member Countries” in OECD (1999b), *Consumption Tax Trends*. Information concerning a substantial number of additional taxes is included here.

5. See OECD (1997a), *Environmental Taxes and Green Tax Reform*, and OECD (1998), *Improving the Environment Through Reducing Subsidies*.

The name, or the expressed purpose, of a given tax is not a criterion in this project. The focus is instead on the potential environmental effects of the given tax, which is determined by the impacts of the tax on the producer and consumer prices in question, in conjunction with the relevant price elasticities.

At this stage, the database only focuses on pollution-oriented taxes. This implies that, for example, taxes related to resource management, such as water extractions or petroleum exploration, are not included in the figures presented below. Instead, information on the use of taxes for the management of natural resources in OECD countries is presented in Chapter 5.

4.2 Overview of environmentally related taxes

Information concerning 144 taxes levied in 15 different countries has so far been entered into the database. The large majority of these taxes have been introduced by national parliaments, which in most cases also decide on the structure and rates of the taxes. This section summarises the available data.

Table 4.1 lists a number of the “general” tax bases that are used in the database. “General” refer to the fact that all specific, detailed tax-bases (for which tax rates are specified in the database) have been brought under one of these headings. Table 4.1 further specifies how many separate taxes are levied on each of the general tax-bases, and how many specific tax-bases identified in the database under the respective headings.

Table 4.1. Number of taxes levied on certain tax base

General tax base	Number of taxes	Number of specific tax-bases identified
Measured or estimated NO _x emissions	0	0
Sulphur content of fossil fuels	4	8
Other measured or estimated emissions to air	0	0
Ozone depleting substances	2	4
Non-point sources of water pollution: Pesticides	4	11
Non-point sources of water pollution: Artificial fertilizers	2	3
Non-point sources of water pollution: Manure	0	0
Waste management: General	4	7
Waste management: Individual products	27	62
Noise	1	3
Unleaded petrol	31	37
Leaded petrol	28	33
Diesel	30	35
Other energy products for transport purposes	28	70
Light fuel oil	16	21
Heavy fuel oil	9	12
Natural gas	11	13
Coal	5	7
Coke	4	4
Other fuels for stationary purposes	14	32
Electricity consumption	10	12
Electricity production	2	2
Transport: Motor vehicles, one-off import or sales taxes	11	115
Transport: Registration or use of motor vehicles, recurrent taxes	26	412

It can be seen from Table 4.1 that the largest number of specific tax bases (412) come under the heading “Transport: Registration or use of motor vehicles, recurrent taxes”. This reflects the fact that, in a number of countries, annual taxes on the use of motor vehicles vary between a large number of different types of vehicles. The database also contains definitions, tax rates, etc., for a large number of specific tax bases under the heading “Transport: Motor vehicles, one-off import or sales taxes”.

The heading “Other energy products for transport purposes” also contains a large number of specific tax-bases. This is in part explained by the differentiation of taxes on several types of aviation fuels in many Canadian provinces.

Finally, the heading “Waste management: individual products” contains a large number of specific tax bases. This reflects a large number of different tax rates on different types of packaging (e.g. various bottles and containers) in some Member countries. These taxes do not raise large revenues, but their use underlines the fact that the amount of revenue raised is not the only aspect to be taken into consideration regarding the role of environmentally related taxes.

It is noteworthy that only 7 and 4 specific tax-bases are identified for coal and coke respectively. Yet these are the types of fossil fuels that cause the largest CO₂ emissions per energy unit. It can also be noted that there are only a few tax bases related to ozone depletion and water pollution.

Table 4.2 shows which institutions are responsible for the overall administration of the taxes in question. This “overall” responsibility includes presenting proposals to the respective parliaments regarding possible changes in the taxes. As can be seen, almost half the taxes are administered by the Ministry of Finance. However, two countries (Denmark and Sweden) have separate ministries of taxation, and in these countries most (but not all) taxes are administered by these ministries. In Ireland (1 of 4 taxes), Hungary (9 of 15 taxes) and Finland (1 of 10 taxes), the Ministry of Environment is responsible for the overall administration of some of the environmentally-related taxes. The taxes administered by a state/regional/local institution are Canadian taxes levied at a provincial level.

Table 4.2. Institution responsible for the overall administration of a given tax

Name of the institution	Number of taxes	Number of countries
National / federal ministries of finance	73	15
National / federal ministries of taxation	267	2
National / federal ministries of environment	11	3
Other national / federal institution	13	6
State / regional / local institution	21	1

The existence of exemptions is quite important *inter alia* for the environmental effectiveness of taxes. For 12 taxes in the database, no exemptions have been identified.⁶ For the 100 taxes for which information on exemptions is available, more than 560 exemptions have been singled out. To provide a better overview, these exemptions have been grouped into 10 categories, with a separate field in the database providing further details, to help assess the economic and environmental impacts of each exemption. Table 4.3 shows the number of exemptions in each category:

6. In addition, information regarding exemptions are currently missing concerning most of the taxes levied at a provincial level in Canada.

Table 4.3. Exemptions in the taxes

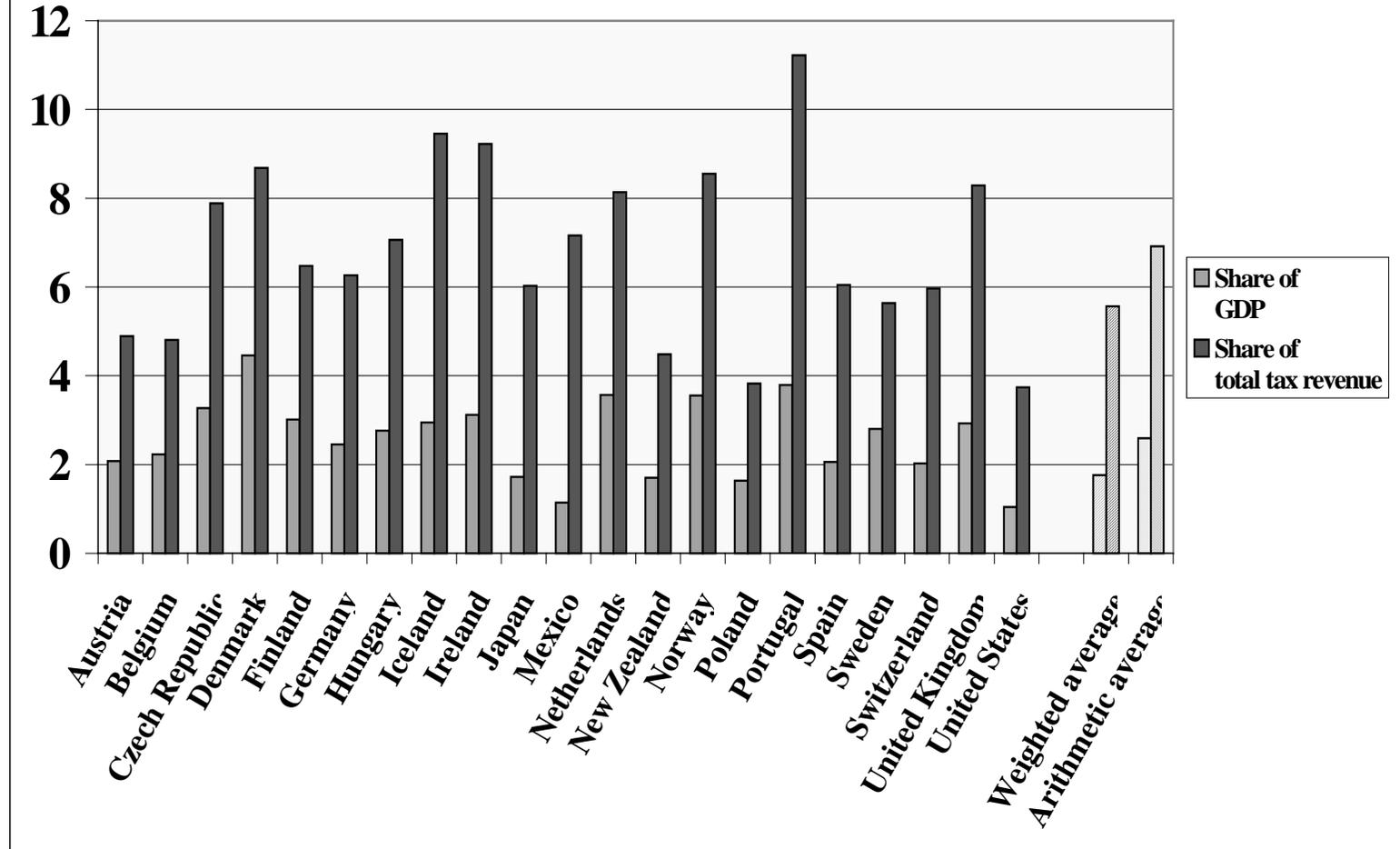
Exemption category	Number of exemptions	Number of countries
Product or activity	120	14
Sector of the economy	100	13
Parts of the country	9	4
Exemptions for public services	95	14
Exemptions for disabled persons	18	9
Exemptions for diplomats	46	12
Exemptions for exports	40	8
Exemptions for navigation	26	12
Exemptions for aviation	23	13
Other exemptions	86	14

The three largest categories of exemptions concern certain products or activities (for instance, mineral oils with a very low sulphur content), certain sectors of the economy (such as heavy industries), and public services (such as ambulances, vehicles used by fire brigades, or vehicles used in public transport). The “Other exemptions” category is rather diverse, and contains, *inter alia*, in several countries an exemption from vehicle usage taxation for vehicles used by amusement parks.

4.3 Revenues from environmentally related taxes

The revenues of environmentally related taxes (as defined in the database) for 21 Member countries represented in 1995 just over 2.5% of GDP, and slightly below 7% of total tax revenues in the respective countries (arithmetic average). As a weighted average, using the size of GDP as weights, the share of GDP was about 1.758% and the share of total tax revenue slightly above 5.5%. Figure 4.1 illustrates that shares in total tax revenues and GDP differ significantly from country to country.

Figure 4.1: Revenues from environmentally-related taxes in per cent of GDP and total tax revenue, 1995



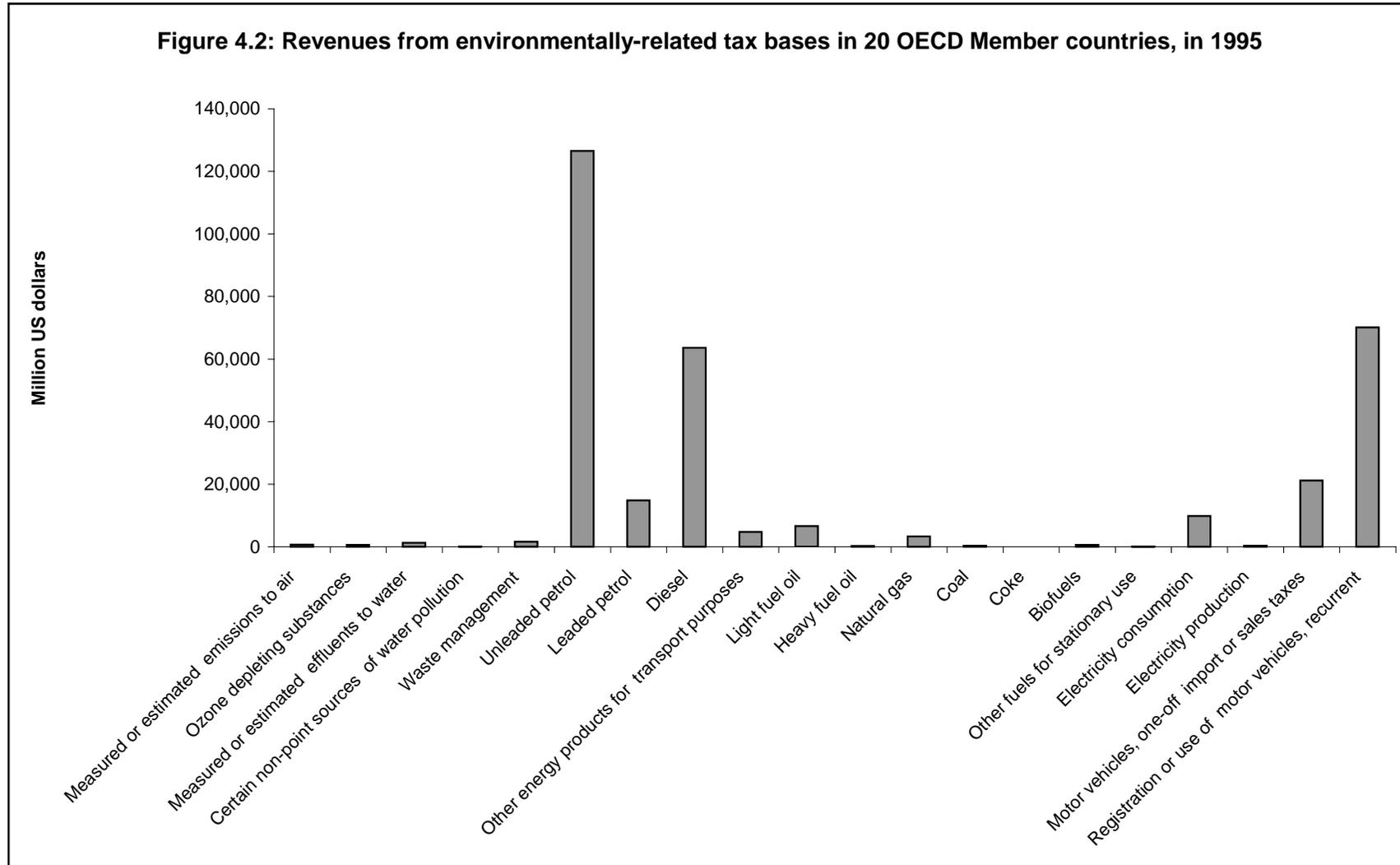
Again, the amount of revenues raised is not the only relevant statistic regarding environmentally related taxes. From an environmental point of view, the relevant data is the resulting changes in behaviour that lead to substitution away from environmentally harmful goods or activities, with the potential for subsequently reduced tax revenue (but improved environmental effects). However, this effect is difficult to measure.

Figure 4.2 shows *estimates* of the revenue raised from different individual *tax bases*. This figure is based on data from 20 countries.⁷ Revenues from a few relatively small taxes in some other countries have not been included.

Unleaded petrol is clearly the tax base on which the largest amount of revenue is raised. In 1995, almost 40% of all the revenue from the taxes included in this project was raised on unleaded petrol. Taxes on leaded petrol raised about 4% of the revenue. Of course, the fact that 10 times more revenue was raised on unleaded than on leaded petrol does not indicate that the tax rate per litre was higher for unleaded fuels. Instead, as a result of a combination of economic and regulatory measures, leaded petrol has more or less disappeared from the market in many countries.

In terms of revenues raised, the second most important tax-base is the use of motor vehicles, represented for example by annual taxes on the use of passenger cars. This tax base represents more than 20% of the total environmentally related tax revenues.

7. The reply from one country did not permit splitting the revenue between the different tax bases.



Altogether, taxes on petrol and diesel (the tax base generating the third largest revenue), and on the sale or use of motor vehicles, generated more than 90% of all the pollution control related tax revenue in the 20 countries in 1995. In other words, only a very small part of the revenue was raised on other tax bases, such as fossil fuels used for heating purposes and, especially, fossil fuels used in industrial processes.

4.4 Tax refunds

Table 4.4 provides an overview of the refunds that are available concerning the taxes in the database.⁸ It is evident that some of the refunds described can be significant, both from an economic and from an environmental point of view. The database also contains information on different types of ceilings that have been introduced on certain taxes, often significantly limiting the tax payments from certain sectors of the economy. Any analysis of the impacts of environmentally-related taxes should include a careful study of such refund mechanisms and tax ceilings.

Table 4.4. Refund mechanisms in environmentally-related taxes

<i>Country</i>	<i>Tax</i>	<i>Refund Criteria</i>	<i>Details</i>
Belgium			
	<i>Excises on mineral oils</i>		
	Article 22 of directive 92/12/CEE		Refunds authorised by the Directive.
	<i>Traffic Tax</i>		
	Motor vehicles		Tax rebates for commercial vehicles which are part of a fleet.
	Vehicles used exclusively inside ports		Tax rebates for commercial vehicles
	Vehicles in operation for a minimum of 5 years		Tax rebates for commercial vehicles
Canada			
	<i>Federal excise on motor fuels</i>		
	Air transportation companies		Refunds of the excise tax on aviation fuel are available to Canadian air transportation companies under certain circumstances.
	Impairment of locomotion		Refunds of 1.5¢/litre of the excise tax on gasoline are available to a person who has been certified by a qualified medical practitioner to be suffering from a permanent impairment of locomotion to such an extent that the use of public transportation by that person would be hazardous.
	Registered charity		Refunds of 1.5¢/litre of the excise tax on gasoline are available to a registered charity, within the meaning of the Income Tax Act.
	Athletic association		Refunds of 1.5¢/litre of the excise tax on gasoline are available to a registered Canadian amateur athletic association, within the meaning of the Income Tax Act.

8. Generally, these refund mechanisms and tax ceilings are reflected in the revenues included in Figures 4.1 and 4.2. Revenues are recorded on a cash basis, i.e. at the time at which the payment was received by government. Corrective transactions, such as refunds, repayments and drawbacks, are deducted from gross revenues of the period in which they are made.

Denmark

Duty on carrier bags made of paper, plastics, etc.

Exports from unregistered businesses

Bags from unregistered businesses delivered abroad, to boats and planes in foreign trade for private use or for sale to passengers, and to businesses which are granted customs and tax exemption can qualify for a refund.

Duty on certain chlorinated solvents

Use in closed plants

Businesses can be granted a refund of the duty for solvents used in closed plants where the solvents are decomposed to substances that do not contain organically bound chlorine, free chlorine or hydrogen. However, the tax paid in a year has to be at least DKr 500 for a refund to be granted.

Duty on certain mineral oil products

Registered businesses

Businesses which are registered under the VAT law may obtain repayment of duty paid on goods consumed.

Duty on certain retail containers

Certain glass containers

A refund can be given concerning glass containers if their content meet certain requirements and the containers in question are recycled in glass production.

Duty on CO₂

Registered businesses

Businesses registered for VAT can obtain a partial reimbursement of the CO₂ tax depending on the energy intensity of the production. When the tax is fully implemented in year 2000, VAT-registered businesses will be reimbursed as follows:

- Energy products used in energy intensive processing: 75% of the CO₂-tax is reimbursed. A further reimbursement can be obtained if an agreement is made with the Ministry of Energy to undertake an energy saving action plan.
- Energy products used in other processing: 10% of the CO₂ tax is reimbursed.
- Energy products used for heating purposes: No reimbursement.

Duty on coal

Registered businesses

Businesses which are registered under the VAT law may obtain repayment of duty paid.

Navigation

There is a refund for goods used in steam navigation.

Trains

There is a refund for goods used in steam trains.

Duty on electric bulbs

Exports from unregistered businesses.

Unregistered businesses can be granted a refund for exports of electric bulbs.

Duty on electricity

Businesses' use of electricity for other purposes than heating

Businesses registered under the VAT law can obtain reimbursement of the duty paid on electricity except for the electricity used for heating. Lawyers, accountants, advertising agencies etc. cannot obtain any reimbursement.

Duty on natural gas

Registered businesses

Registered businesses can normally receive some kind of refund of duty for gas which is used in firm-specific production.

Duty on pesticides

Exports from unregistered businesses

Unregistered businesses can be granted a refund for their exports of pesticides.

Duty on sealed NiCd-batteries

Exports from unregistered businesses

Unregistered businesses can be granted a refund for their exports.

Duty on sulphur

Sulphur extracted from smoke etc.

The excise duty of sulphur extracted from smoke etc. can be reimbursed if the business pays excise duty on the sulphur content in the energy products it uses.

Duty on waste

Recycled materials

The Ministry of Environment can grant businesses a compensation if the raw materials they use are to some extent based on recycling.

Duty on waste water

Fish processing, cellulose production, sugar production

Businesses registered for VAT can obtain a reimbursement of 97% of the duty exceeding DKr 20 000 a year if 80% of the production is connected to processing of fish, production of cellulose, or production of sugar.

Organic pigments, gelatine, vitamins

Businesses registered for VAT can obtain a reimbursement of 70% of the duty exceeding DKr 20 000 a year if 80% of the production is connected to production of organic pigments, production of pectic substances, gelatine etc. and starch under CN codes 1302 20 - 1302 39 or production of vitamins.

Road user charge

Part of the year

If a yearly certificate is not used the full year, the tax concerning the remaining months can be refunded.

Finland***Motor vehicle tax (Diesel tax)***

Combined transport

For lorries, if used as combined transport with train in Finland a refund of 300 FIM per trip is available.

Eurovignett

For lorries there is a refund of 80% of the amount paid as "Eurovignett".

Germany***Duty on mineral oils***

Test usage

Mineral oils and methane used for tests with biofuels.

Hungary***Air pollution fine***

Environmental investments started

If the emitter has started an investment in pollution control equipment, he/she does not have to pay a progressive levy during the time of installation.

Product charge on packaging materials

"Environmentally friendly" products

Only half the product charge is to be paid on products which are entitled to use the "environmentally friendly product" trademark.

Product charge on refrigerators and refrigerants

"Environmentally friendly" products

Only half the product charge is to be paid on products which are entitled to use the "environmentally friendly product" trademark.

Tax on motor vehicles

Electric or gas vehicles

A 50% refund is granted for motor vehicles driven exclusively by electricity or pure gas.

Low-pollution lorries

In the case of lorries fulfilling the "Euro-1" and "Euro-2" environment protection norms, a 50 or 25% tax deduction can be applied.

Catalytic converter

A tax deduction of 50 or 25% can be applied for motor vehicles equipped with a catalytic converter.

Combined transport of goods

Taxpayers effecting a combined transport of goods with their lorries are eligible to tax benefits amounting to 20, 35 or 50%

Ireland***Duty on other sorts of oil***

LPG used in horticulture production and mushroom tunnels

Heavy fuel oil used in horticulture production and mushroom tunnels attracts a repayment of £9.90 per 1 000 litres on the non-auto LPG rate and is effectively taxed at £4.40 per 1 000 litres.

Heavy fuel oil used in horticulture production and mushroom tunnels

Heavy fuel oil used in horticulture production and mushroom tunnels attracts a repayment of £6.20 per 1 000 litres on the HFO rate and is effectively taxed at £4.40 per 1 000 litres.

Marked as oil used in horticulture production and mushroom tunnels

Marked gas oil used in horticulture production and mushroom tunnels attracts a repayment of £32.90 per 1 000 litres on the MGO rate and is effectively taxed at £4.40 per 1 000 litres.

Diesel used in licensed passenger road services.

Diesel used in licensed passenger road services attracts a repayment of £238.24 per 1 000 litres on the auto-diesel rate and is effectively taxed at £17.90 per 1 000 litres.

Motor Vehicle Tax	
"Off road" vehicles	"Off road" vehicles, i.e. not used on public roads or areas, may be entitled to a refund.
Vehicle Registration Tax	
Vehicles used by severely disabled persons.	Remission and/or refund of the tax is possible for vehicles used by severely and permanently disabled drivers, passengers and certain philanthropic organisations responsible for the transport of such persons, subject to medical certification and subject to the vehicle being adapted to the person's disablement.
Vehicles used by driving schools	Partial refund of the tax is given for vehicles used by driving schools.
Vehicles used for leasing, etc.	Partial refund of the tax is given for vehicles used for leasing and short-term car hire. The short-term hire vehicles must be available at 31 August for 3 months and record mileage of 5 000 miles.
Vehicles used for demonstration purposes	Partial refund of the tax is given for vehicles used for demonstration purposes. The vehicles must be used for demonstration purposes for a period of 3 months. A deferred payment facility is also available.
Japan	
Aviation fuel tax	
International transport	Refunds can be given for aviation fuels which remain in aircrafts, the use of which has changed from domestic transport to international transport.
Disembarked from aircrafts	Refund can be given for aviation fuel that is disembarked from aircrafts.
Motor vehicle tonnage tax	
Certificate denied	Refunds can be given if the taxpayer does not get a motor vehicle inspection certificate or a registration number, even though they have paid the tax.
Petroleum tax	
Agriculture, forestry, and fisheries	Refunds can be given for specified domestic petroleum products (petroleum asphalt, petroleum coke, naphtha, heavy fuel oil) to be used in agriculture, forestry, or fisheries.
Mexico	
Special excise on products and services	
Diesel in agriculture	Taxpayers that buy diesel for final use in certain agriculture and livestock activities can request a refund.
Norway	
SO₂-tax on mineral oils	
Emission reductions	A user of mineral oils who can prove he has undertaken sulphur scrubbing may have the tax refunded according to the degree of pollution reduction.
Portugal	
Motor vehicle tax	
Exported vehicles	Exported vehicles.
Tax on petroleum products	
Diplomatic services	Goods provided to diplomatic or consular missions.
International bodies	Goods provided to recognised international bodies and their members, within the limits and conditions established by international conventions.
Spain	
Tax on electricity	
Exports	Provided that the tax has previously been paid, exporters of electricity can obtain a refund.
Tax on Mineral Oils	
Exports	Provided that the tax has been previously paid, exporters of these products and people that consign or send these products to other member states of the European Union can obtain a refund.

Tax on vehicle registration

Exports

Professional exporters of the vehicles can obtain a refund, provided that the vehicles have been taxed in Spain. The refund will be calculated according to the value of the vehicle at the moment of its exportation.

Sweden*Energy and CO₂ tax on fuels except petrol*

Manufacturing and greenhouses

Refunds are given for the whole energy tax and half the carbon dioxide tax when fuels are used in manufacturing industries and for commercial greenhouse cultivation.

Heat delivered to manufacturing and greenhouses

Refunds are given for the whole energy tax and half the carbon dioxide tax when heat produced from fuels is delivered for use in manufacturing industries and for commercial greenhouse cultivation.

Diplomats

Refunds are given to ambassadors, diplomats and the like.

Energy and CO₂ tax on petrol

Diplomats

Refunds are given to embassies, diplomats and the like.

Energy tax on electricity

Heat delivered to manufacturing and greenhouses

Electricity used for the production of heat that is delivered for use in manufacturing industries and for commercial greenhouse cultivation.

Tax on sulphur

Metallurgical processes

Tax refunds are given when taxable fuels are used in metallurgical processes or processes for the production of other mineral compounds than metals or in soda recovery units.

Emissions reduced

Tax refunds are given when sulphur dioxide emissions are reduced by treatment or absorption in any product or in ash.

Switzerland*Tax on mineral oils*

Agriculture, etc.

Fuels used in agriculture, forestry and professional fishing.

Professional transports

Fuel used by professional transport companies

United Kingdom*Duty on diesel*

Not used as road fuel

Duty paid on oil which is subsequently marked and dyed.

Exports

Duty paid on oil which is subsequently exported or destroyed.

Duty on leaded petrol

Exports

Duty paid on oil which is subsequently exported or destroyed.

Duty on ultra low sulphur diesel

Not used as road fuel

Duty paid on oil which is subsequently marked and dyed.

Exports

Duty paid on oil which is subsequently exported or destroyed.

Duty on unleaded petrol

Exports

Duty paid on oil which is subsequently exported or destroyed.

The landfill tax

Donations to environmental bodies

Credits are available to registered landfill site operators who make contributions to approved environmental bodies. Credits may be claimed to the value of 90 % of contributions, to a limit of 20% of the trade's annual landfill tax liability.

Vehicle Excise Duty

Unused months

Unused full months of the duty paid are refunded.

4.5 Earmarking

An important policy issue in some Member countries is the earmarking of taxes. Table 4.5 provides details regarding the 30 taxes in the database for which the revenues are fully or in part earmarked for any particular purpose, as well as some others identified in country responses to the questionnaire used for this study (indicated with an “*”). The Table specifies in each case the name of the tax, the share of the revenue that is earmarked and the purpose to which the earmarked revenue is earmarked. The purposes can generally be divided in two: either some specific environmental purpose or the building and maintenance of public roads.

Table 4.5. Earmarking of revenues from environmentally-related taxes

<i>Country</i>	<i>Tax</i>	<i>Earmarked share</i>	<i>Earmarked purpose</i>
Austria			
	* <i>Landfill tax on solid wastes</i>	100%	Identification and clean up of contaminated sites.
Belgium			
	<i>Ecotaxes</i>	100%	Additional environmental expenditures.
Canada			
	<i>Manitoba -- Non deposit containers tax</i>	100%	Support of multi-material recycling in the province.
	<i>Manitoba -- Tyres tax</i>	100%	Funds collected will go towards the "Tyre Stewardship Board", which supports tyre recycling.
	<i>New Brunswick -- Tyres Tax</i>	100%	Money collected will go to the "Tyre Stewardship Fund".
	<i>Nova Scotia -- Tyres Tax</i>	100%	The revenues are managed by the Resource Recovery Fund Inc. and help to pay the operating costs of a tyre recycling plant.
Denmark			
	<i>Duty on pesticides</i>	100%	Environment-improving investments in agriculture.
Finland			
	<i>Oil damage levy</i>	100%	All revenue is placed in an oil damage fund managed by the Ministry of Environment. When necessary, funds are used to cover costs of oil-related environmental damages.
	<i>Oil waste levy</i>	100 %	To cover the expenses caused by treatment of oil waste.
	<i>Strategic stockpile fee</i>	100 %	The strategic stockpile fund.

Germany*Duty on mineral oils*

About 20%

Building or maintenance of roads and for other traffic purposes, such as railways and other public traffic.

Hungary*Excise tax on diesel*

31.7% of revenues from diesel used as propellant

28.7% of the revenues are earmarked to the building and maintenance of motorways, 3% of the revenues are earmarked to environmental purposes.

Excise tax on petrol

31.7%

28.7% of the revenues are earmarked to the building and maintenance of motorways, 3% of the revenues are earmarked for environmental purposes.

Tax on foreign registered vehicles

100%

Maintenance and development of the public road network.

Tax on motor vehicles

40%

Maintenance and development of the public road network.

** Fuel tax*

Introduced in 1992 at a rate of HUF 2/litre for petrol and gas oil. The revenue goes to the Central Environmental Protection Fund (via the Excise Tax Bill) to finance environmental protection or related activities.

Italy** Landfill tax*

20%

Earmarked for interventions in the environmental field, especially waste management.

** Aircraft noise tax*

To subsidise and compensate municipalities and citizens living in areas close to airports.

Japan*Automobile acquisition tax*

100%

All revenues are allocated to prefectural governments' expenses for construction and maintenance of roads.

Aviation fuel tax

100%

All revenues are allocated to the central governments' expenses for the construction of airports (84.6%) and for prefectural or municipal governments' expenditures related to airports (15.4%).

Gasoline tax

100%

All revenues are allocated to the central government's expenses for road construction.

Light oil delivery tax

100%

All revenues are allocated to prefectural governments' expenses for construction and maintenance of roads.

Liquefied petroleum gas tax

100%

All revenues are allocated to the central (50%) and prefectural (50%) governments' expenses for road construction.

Local road tax

100%

All revenues are allocated to prefectural (43%) and local (57%) governments' expenses for road construction respectively.

Motor vehicle tonnage tax		
25%		The local governments' share of the revenues are allocated to construction and improvement of local roads.
Petroleum tax		
100%		All revenues are allocated to the central government's expenses for various programmes to secure a stable supply of petroleum and to develop and introduce alternative energy sources.
Promotion of power resources development tax		
100%		Central government expenses for measures to promote 1) the establishment of atomic power plants, thermo-electric power plants and hydroelectric power plants, and 2) the development and introduction of petroleum-substituting electric power resources.
Mexico		
<i>Surcharge on petrol sold in Mexico City 1995-1997</i>		
100%		The revenue was earmarked for financing the introduction of new technology in gas stations that would allow the recovery of organic fumes.
Portugal		
<i>The Circulation tax</i>		
100%		Construction and maintenance of the road network.
<i>The Truck tax</i>		
100%		Construction and maintenance of the road network.
Sweden		
<i>Energy and CO₂ tax on fuels except petrol</i>		
		From the income of the energy tax, a small portion (called "Special tax against acidification") corresponding to SEK 9 per m ³ heating oil, diesel and kerosene, is used to add limestone to rivers and lakes to raise the pH value.
Switzerland		
<i>Charges for use of national roads</i>		
100%		Construction and maintenance of the road network
<i>Traffic charge on heavy trucks</i>		
100%		Construction and maintenance of the road network
United Kingdom		
<i>Non-fossil fuel obligation levy</i>		
100%		Support for electricity generation from renewable sources under Non Fossil Fuel Obligation (NFFO) arrangements.

5. ECONOMIC INSTRUMENTS FOR NATURAL RESOURCES MANAGEMENT

Previous OECD surveys on economic instruments did not include natural resources management. The overall picture provided by the present survey shows a wide use of economic instruments in this area. The instruments have been classified according to their environmental objectives, relating to:

- Water quantity
- Fisheries
- Forestry
- Wetlands
- Land and soil
- Natural species/wildlife

Work is underway in the OECD Joint Working Party on Agriculture and Environment to develop a comprehensive classification of policy measures addressing environmental quality in agriculture, including drawing on the detailed data base on agricultural support measures in the OECD, with a view to providing information on levels of payments or charges, the conditions applying to each policy measure, and their environmental, production and trade effects. As such, agri-environmental measures (subsidies) connected to, for example, the EU Common Agricultural Policy, were mainly excluded from the survey. While some are included in the Tables below, this information is based entirely on the questionnaire replies and is incomplete in many cases. It is hoped that the work on policy classification in the Joint Working Party on Agriculture and Environment will generate a tool which can be used to indicate how instruments for environmental policy are actually implemented, what they cost, and what are the environmental, production, and trade effects of the policies.

5.1 Water quantity

Economic instruments in water resource management are widely used and come in many forms. In addition to standard municipal water user charges⁹, there are also other charges, taxes, transferable rights, liability fees, non-compliance fees, and performance bonds. Charges (or a tax, in the Netherlands) on water abstraction are the most widespread [the Czech Republic, Denmark, France, Germany, Greece (irrigation water), Hungary, Italy, Japan, Mexico, Poland, Sweden, and the UK]. Rates differ, for example with respect to the abstraction of surface or groundwater.

9. This questionnaire was restricted to water abstraction taxes and charges. For general water pricing practices in the household, industry, and agriculture sector in OECD countries, see OECD (1999c), *The Price of Water: Trends in OECD Countries*.

In Australia, a tradable permits system regulates the abstraction of water for irrigation purposes. The system consists of temporary rights valid for one year and rights that have an indefinite validity. The latter are 10 to 40 times more expensive when traded than the former. Transferable rights are expected to be put in place in Canada (Alberta). Alberta operates a range of instruments, apart from transferable rights, including performance bonds, liability fees, and non-compliance fees.

Table 5.1. Reported instruments for water quantity

Country	Instrument	Purpose	Rate/Price/Level	Remarks
Australia	Tradable rights	To promote efficiency of supply and use of water in irrigation	Temporary transfers: AUS\$ 10-20 per million litres Permanent transfers: AUS\$ 100-775 per million litres	Rights were grandfathered; prices appear to decline over time
Austria	Subsidy	For infrastructure	..	..
Canada (Alberta)	Transferable rights	..	..	In force Autumn 1998 (expected)
	Performance bond	To ensure compliance with licences issued for water infrastructure works	..	Court cases
	Liability fee	Compensation for damage from non-compliance with Water Act	..	Court cases
	Non-compliance fees	In case of non-compliance with Water Act	..	Court cases
Czech Republic	Charge	To use water from surface and ground water resources in accordance with set standards	Different rates set on volumes of <u>surface water</u> abstraction exceeding standards: 15 000 cubic metre per year or 1 250 cubic metre per month; and for <u>ground water</u> CZK 2 per cubic metre for volumes over 1 250 cubic metre per month or 15 000 cubic metre per year	Revenues (groundwater charge): CZK 36.1 million; allocated to State Environmental Fund

Denmark	Charge	Finance expenditures of Regional Water Supply Companies (both private and owned by the municipalities); prime cost principle	Average DKK 3.53/m ³ ; min. 0.50/m ³ ; max. 11.25/m ³ (1996)	..
	Tax on water	Reduce water consumption	DKK 5.00/ m ³	Revenues: DKK 1.3 billion; the tax is only paid by households
	Subsidy	Pollution threatened water abstraction by small water supply companies	..	Total: DKK 62 million (1998)
France	Charge	On water abstraction and consumption to regulate water use	Different rates according to water origin (surface or ground water) and “sensitivity” of the area	Revenue: FF 1 505 million (1995); paid to Water Agencies to finance water quantity management
	Charge	On water supply to finance investments for water supply	FF 0.105/m ³	Revenues: FF 542 million (1997)
	Charge	On consumption of public potable water to finance public water supply	Varies by municipality	Revenues: FF 34 201 million (1995)
	Surtax	On mineral waters to raise revenue for municipalities	Varies by municipality; max. FF 0.023/l	Revenues: FF 110 million (1995)
Germany	Water extraction charge	Reduce water extraction	DM 0.01-0.40/m ³ (depending on land legislation and use of water)	Revenues: DM 500 million (1996)
Greece	Charge	Use of irrigation water	..	..
Hungary	Water abstraction charge	..	Effective rate of HUF 0.001-10/ m ³ ; varies by water source (surface/ groundwater) and region	Revenues: HUF 4 236.3 million
Italy	Combined integrated water services charge	Covers the cost of water provision and wastewater treatment	Tariff formula determined by the monitoring committee	..

Japan	Charge on abstraction of water from rivers Fee for use of water in reservoirs (dams)	Recovery of river maintenance costs by prefectures Allocation of water between users	Differentiated according to water use ¥ 64.4 million	Exemptions for agriculture and domestic use ..
Mexico	Charge	Water use	..	..
Netherlands	Tax	On groundwater abstraction, to minimise volumes	DFL 0.37 per cubic metre for drinking water companies; DFL 0.17 for other companies; abstraction of less than 40 000 cubic metre and groundwater used for irrigation and sprinkling and for emergencies (fire) exempted	Revenues (general budget): DFL 307 million
Poland	Charge	Water abstraction	Between PLN 2.05 per 1 000 m ³ for surface water and PLN 80.75 for 1 000 m ³ for groundwater	Differentiated rates according to type of user and resource availability
Sweden	Abstraction charge	See Table 3.6	Full cost pricing	..
UK	Charge	Recovery of government costs of managing water resources	Based on licensed (not actual) abstraction of water; about GBP 0.004 per cubic metre on average	Revenues: GBP 83 million
<u>Symbol</u> .. = no data available			Amounts in 1997 if not otherwise stated	

5.2 Fisheries

Tradable fishing quotas are the most commonly used economic instruments in fisheries management. Charges are also applied in Canada (Quebec), Iceland (user charge), and in Sweden. Their primary purpose is to limit commercial fishing activities, reduce costs of fishing, and maximise sustainable yields.

In a number of countries, financial or other support is provided to encourage the sustainable use of fisheries. These support measures have not been included in this survey, as information on their use in OECD countries is already being collected by the OECD Committee for Fisheries.¹⁰

Table 5.2. Reported instruments for fisheries

Country	Instrument	Purpose	Rate/Price/Level	Remarks
Australia	Transferable quota permits	To control commercial fishing in South East Fishery	..	151 permits for 16 species available (grandfathered) in 1995; 29 inactive
Canada	Transferable quotas	Regulate fishing	..	..
Canada (Quebec)	Permit charge	On fish farming	CAN\$ 50 per farm p.a.	Revenues: 10 800; 216 permits
	Permit charge	On commercial fishing permits in freshwaters for anadromous and catadromous species	Between CAN\$ 30-300 per permit	Revenues: CAN\$ 50 200; 1 428 permits
Finland	Fee	On fishing	..	..
Iceland	Individual transferable fish quota	Regulate fishing, reduce cost, maximise sustainable yield	..	Allocation of quota based on historical catch
	User charge on weight of allocated fishing quota	Fund for rationalisation of the fishing sector	Rate: ISK 1 200/ton of cod or cod-equivalent	Revenues: ISK 600 million (1999); no real effect on fish management as such (regulated through the quota system)

10. This Committee has produced a comprehensive review of the management of fisheries, *Towards Sustainable Fisheries: Economic Aspects of the Management of Living Marine Resources* (OECD, 1997c), and reports on changes in fishery management systems in OECD countries in its regular publication, *Review of Fisheries*.

Netherlands	Tradable quota	Management of sea fishery	..	..
Sweden	Fishing charge	Promote fishing in areas of hydro-power stations	..	..
United States	Fishing quotas	Regulate fishing	..	..
<u>Symbol</u> .. = no data available			Amounts in 1997 if not otherwise stated	

5.3 Forestry

Table 5.3. Reported instruments in forestry

Country	Instrument	Purpose	Rate/Price/Level	Remarks
Austria	Charge	Protection of trees in urban regions	ATS 8 000 per tree of over 40 cm circumference, if not replanted	Revenues: ATS 25 million (1996), used for planting new trees
	Subsidy	For forest management, e.g. for planting mixed forests	..	..
Canada (Alberta)	Charge	Management of timber harvesting	Exemption of the stumpage fee is granted for wood that can only be harvested against high cost	Reductions amount to CAN\$ 30 million (1996-1997)
	Non-compliance fee	To ensure reforestation after harvesting	CAN\$ 25 per ha per year, or CAN\$ 2.50 per ha per month in case of non-compliance with standards	Revenues CAN\$ 4 000 (1996-1997)
	Non-compliance fee	To manage forest resources at sustainable harvest volume levels	Fee on overcut: CAN\$ 30 per cubic metre for coniferous; CAN\$ 10 for deciduous	Revenues CAN\$ 490 000 (1996-1997)

Canada (Quebec)	Felling fee	To create a realistic market value for forestry products	CAN\$ 0.25 - 61.25 per cubic metre, dependent on quality and tariff zone; CAN\$ 11.08 on average	Revenues: CAN\$ 400 (1997-1998), partly reinvested in forestry works
	Charge	To finance forest protection	CAN\$ 0.45/m ³ or 0.36/ha for general fees; CAN\$ 0.06-1.00/m ³ against fire, insect invasion, or epidemics, depending on magnitude of disaster	Revenues for fire protection: CAN\$ 20.4 million Total for insect invasion prevention: CAN\$ 2.1 million
	Subsidy	For the development of forest-based resources	90% financed by the Government, through the proceeds of the felling fee	Budget: CAN\$ 23.5 million
	Subsidy	For forest development agencies	..	Budget: CAN\$ 34.5 million (1998); 10 000 applications granted (1997)
	Subsidy	Supply of tree seedlings for reforestation	Financed by the Forest Fund	Available for replanting of forests
	Land tax refund	To favour sustainable forest management	85% of eligible taxes	Total: CAN\$ 8 million; 10 000 applications (1997)
	Charge	To finance Forest Fund (for forest management and research)	505 paid by Fund users; 50% by Government; Tax: CAN\$ 1.03/m ³	Total: CAN\$ 35 million (1998-1999)
	Maple grove permits	Favours maple tree production	CAN\$ 30/ hectare	Revenues: CAN\$ 0.8 million (1997-1998)
Czech Republic	Levy	To prevent diversion from forests to other purposes	According to a formula with production, price of wood, and an environmental coefficient for parameters, and a discount rate of 2% for permanent sequestration	Revenues CZK 55 million (1998), to central and local governments
	Subsidy	Forest planting	..	..

Denmark	Subsidy	For improvement of forest stability, health, productivity, and biological diversity	Grant for permanent forests	DKK 110 million; 1 600 applications by private forest owners
Finland	Subsidy	To compensate forest owners for activities that encourage biodiversity, landscape values, multiple use	Losses in "pure yield" from environmentally friendly forestry practices	FIM 15 million; based on agreements with landowners (agreement period 10, 20, or 30 years)
France	Tax	For forest land clearing	FF 1.30 /m ² for bringing into cultivation; FF 4/m ² for other purposes	Revenues: FF 33 million in 1996; paid to the National Forest Fund
Hungary	Forest maintenance fee/ contribution	Paid by woodcutters	HUF 400-1 300/gross m ³ ; depending on tree species and region	..
Iceland	Subsidy	Facilitate afforestation for wood production, soil conservation, and CO ₂ sequestration	ISK 115 million in 1998 (450 applications)	The funding could increase 5 fold, as the Icelandic afforestation programme is under rapid development
Korea	Charge	Prevention of diverting forest areas to other purposes and raising funds for reforestation	KOR\$ 0.69 per m ² diverted	Revenues KOR\$ 23 million (1997); allocated to National Parks Authority
Netherlands	Subsidy	Enlargement of forestry area on agricultural land	DFL 2 950-5 000/ha for planting and DFL 1 200-1 500/ha for compensating loss of income, dependent on species	Budget: DFL 9.4 million
	Subsidy	Enlargement of forestry by public-private	..	Budget: DFL 12.1 million; 15 municipalities outside

	Subsidy	co-operation Maintenance of forests	DFL 35 or 140 per ha for forest owners, if forest is not open/open for public	urban agglomeration Budget: DFL 12.1 million
	Subsidy	Maintenance of forests	Income and corporate tax exemption for income of forestry owners	..
Poland	Primary charge	Protect forest land from production use	Market value of coniferous timber	Paid to State Forest Fund
	Annual fee	For non-agricultural or forestry usage of forest land	10% of primary charge	50% increase of fee for protected areas paid to State Forest Fund
	Liability payment	Prevent premature harvesting	Price differential between market price for premature and mature timber	Paid to State Forest Fund
Sweden	Subsidy	Finance broad leaved deciduous forests, habitat protection, liming	60-80% of cost	Budget: SEK 45 million; paid to forest owners and farmers
Switzerland	Subsidy	Forestry management and infrastructure	..	..
UK	Subsidy	Woodland creation and management	50 - 80% of the costs	Budget: GBP 35 million (1997-1998); about 4 600 applications
<u>Symbol</u> .. = no data available			Amounts in 1997 if not otherwise stated	

Forestry management is dominated by subsidies as far as economic instruments are concerned. All systems are aimed at extending or maintaining forestry areas and forest quality. Taxes and charges are also used to discourage forest degradation. The Netherlands, with relatively few and small woodland areas, operates four subsidy schemes. These schemes range from financial support for enlargement of forest areas on formerly agricultural grounds to support for encouraging public-private co-operation. Quebec (Canada) also utilises a number of forest management economic instruments, ranging from felling fees to subsidies to charges and permits. In Finland, the subsidy to compensate landowners for environmentally beneficial activities is paid in accordance with their actual yield losses that result from these activities.

Some cases were reported where the felling of trees is subject to a charge. In Austria, exemption from paying the charge exists if trees cut are replanted. In Alberta (Canada), the charge is not levied on wood that can only be harvested against high costs. This exemption should prevent wasting of wood. A

charge on the cutting of trees is found to have different purposes. In a number of cases, the charge revenues are used for reforestation. The charge in Quebec is also meant to create a more realistic market value for this natural resource. The Czech, Korean, and Polish charge systems aim to prevent woodland being diverted to other purposes by imposing a penalty on such diversions.

Finally, non-compliance fees are operated in Alberta in order to prevent overcutting and unsustainable harvesting practices. Similarly, Poland requires a liability payment to prevent premature harvesting of timber.

5.4 Wetlands

Table 5.4. Reported instruments for wetlands

Country	Instrument	Purpose	Rate/Price/Level	Remarks
Canada (Quebec)	Tax relief	For donations of land with high ecological value	..	..
Denmark	Subsidy	Environmentally-friendly agriculture (part of EU programme)	Grants	DKK 51 million (financed equally by national government and EU); grants to the farmers for areas which are taken out of agricultural production, e.g. meadows; duration of schemes either 5 or 20 years
	Subsidy	Restoration of streams	..	DKK 9 million
	Subsidy	Restoration of wetlands	..	DKK 100 million per year (1999-2002)
Sweden	Subsidy	Creation and restoration of wetlands and ponds	Farmers are paid compensation for additional related costs	SEK 2 800 million (50% paid by EU); agri-environmental programme, expires in 2000 (see also Table 5.5)
Switzerland	Subsidy	To protect wetlands from consequences of intensive farming of adjacent "litter" meadows	..	A grant is available for farmers who use the products (litter) from these meadows without intensive farming

UK	Grant	For maintaining high water levels	..	..
	Subsidy	For the maintenance of salt marshes	..	Paid to farmers
US	Transferable rights	Wetlands conservation	..	“Wetlands mitigation banking”
	Charge	Wetlands conservation	..	
<u>Symbol</u> .. = no data available			Amounts in 1997 if not otherwise stated	

As in the case of forestry, subsidies are the most widespread economic instrument used for wetland management and protection. Some schemes (Denmark Sweden, Switzerland, UK) operate in the context of agri-environment measures; for instance, in Switzerland a grant is available for farmers on meadows adjacent to wetlands. If the farmer does not intensively farm this meadow, but limits its use to cutting the grass of the meadow (“litter”) for feeding to cattle (i.e. protects the wetland), he receives a grant. In the UK, a subsidy is available for farmers who protect salt marshes by adapting their farming practices.

In Quebec (Canada), income tax relief is provided for donations of lands (including wetlands of high ecological value. In the United States, transferable rights under the “Wetlands Mitigation Banking” system and charges are used.

5.5 Land/soil

Table 5.5. Reported instruments for land and soil

Country	Instrument	Purpose	Rate/Price/Level	Remarks
Austria	Subsidy	Environmentally sound agriculture	..	..
Canada (Quebec)	Subsidy	Development and conservation of soil and water resources	Max. CAN\$25 000 for duration of programme on farms, or CAN\$ 60 000 p.a. for conservation groups	Budget: about CAN\$1 million (1996)
Czech Republic	Levy	On temporary withdrawal of land from agriculture	..	Revenues: CRK 70 million (1998)
	Levy	On withdrawal of land from agriculture	..	Revenues: CRK 512 million (1998)

Denmark	Subsidy	Ecological agricultural production	Grants	Total: DKK 83 million
	Subsidy	Environmentally friendly investments in smaller farms	Grants	Total: DKK 58 million
	Subsidy	Planting of wind breaks	..	Total: DKK 27 million
	Subsidy	Nature management	..	Total: DKK 1.4 million
	Tax on raw materials (sand, gravel, clay, chalk, etc.)	Reduce extraction of natural resources	DKK 5.00/m ³	Revenues: DKK 145 million
Finland	Soil (gravel) abstraction control fee	To cover administrative costs	..	..
France	Tax on ski lifts	Finance environmental protection, agricultural activities, and tourism activities in mountains	Varies by municipality; max. 3% of gross revenue	Total revenues: FF 163 million in 1995; only part of the revenue is allocated to environmental protection
Greece	Charge	To acquire grazing rights on public lands	..	..
	Subsidy	Conservation of landscape and nature	Grant	Budget: SF 20.8 million
	Subsidy	To promote pesticide-free cultivation of cereals/grain	Grant	Budget: SF 39 million, for farmers
	Subsidy	For installation of ecological areas	Grant	Budget: SF 100 million; for, among others, compensating farmers for extensively used meadows
	Subsidy	To promote installation of waste facilities on farms for protection of water quality	80% of costs to farmers; about SF 10 000-50 000 per case	Budget: SF 2.9 million

Hungary	Land protection contribution	In case of utilisation of arable land for other purposes (under the Law on Arable Land)	Once-off contribution	HUF 780 million
Iceland	Subsidy	Stop soil erosion and for revegetation of degraded land	..	ISK 236 million (including all government expenditure in this area)
the Netherlands	Subsidy	For protection of natural areas	..	..
	Various subsidies	For natural resources management	..	..
	Subsidy	For area and nature oriented environmental policies	..	..
Sweden	Subsidy	Protection of biodiversity, habitats, landscape, cultural heritage	Farmers get compensation for additional related cost	SEK 2 800 million (50% paid by EU); agri-environmental programme, expires in 2000 (see also Table 5.4)
	Tax on natural gravel	Increase the competitiveness of alternative materials, in particular, crushed rock	SEK 5/tonne	Revenue: SEK 120 million
	Excavation charge	Finance administrative (permit applications) and research costs	SEK 0.26/tonne of material permitted for extraction; SEK 0.004/tonne for limestone	Revenue: SEK 30 million (1996); charge collected by County Boards
	Charge for gravel abstraction on the continental shelf	Finance administrative costs for processing permits	..	Charge collected by County Boards and Geological Survey of Sweden
	Mineral Act charge	Administrative cost	Application charge: SEK 6 000, plus permit examination charge	..
	Licence fee for exploitation of peat	Administrative cost	Annual examination fee: SEK 7/ha plus annual tillage fee (SEK 5/ha), plus exploitation fee	Fee collected by County Boards

Switzerland	Subsidy	For protection of nature and landscapes	..	..
	Subsidy	For livestock production methods respecting the environment	..	..
	Subsidy	For extensive agricultural acreage	..	..
	Subsidy	For ecological compensation	..	..
	Subsidy	For installations of farmyard manure	..	..
UK	Subsidy	Conservation of sites of special scientific interest	..	Management agreement payments for owners to compensate for foregone profits
	Subsidy (grants)	To protect nitrate sensitive areas; protection of drinking water sources	..	Paid to farmers for compensation of management changes; 70% of eligible farmers participate
	Subsidy	Installation of improved farm waste facilities in nitrate vulnerable areas	25% of the costs; GBP 250-21 250 per applicant	Budget: GBP 800 000; 16 applications
US	Charge	Imposed on grazing on public lands	..	..
	Transferable rights	On land development	..	..
	Subsidy	Land preservation	Grants, loans for farmers who improve conservation practice or take land out of cultivation	Numerous federal and state programmes
	Liability fee	On damage to natural resources	..	..
<u>Symbol</u> .. = no data available			Amounts in 1997 if not otherwise stated	

A wide array of economic instruments are used to protect land and soil quality, and landscapes in OECD countries, with the most popular again being subsidies. Denmark and Greece each identified four subsidy schemes for land and soil in their respective countries, and Switzerland identified five, ranging

from support for farmers to refrain from pesticide use to support for planting wind breaks. Subsidy schemes were also noted in Austria, Canada, Iceland, the Netherlands, Sweden, the UK, and the US.¹¹ The UK schemes are directed at farmers in nitrate-sensitive areas and areas of scientific interest and aim to move agricultural management towards a sustainable direction, e.g. by providing financial support for waste facilities and for compensation of income losses. Switzerland also provides compensation for financial losses associated with ecological activities. The US executes a number of programmes encouraging farmers to improve conservation practices and to take land out of cultivation.

Charges are applied in the Czech Republic and Hungary on the withdrawal of land from agriculture, and in Greece and the US on those who acquire grazing rights on public land. Denmark, Finland, and Sweden levy taxes or fees on raw material extraction (including peat in Sweden).

5.6 Natural species/wildlife

Table 5.6. Instruments for natural species and wildlife

Country	Instrument	Purpose	Rate/Price/Level	Remarks
Australia	Charge	Financing management of the Great Barrier Reef	AUS\$ 4 per visitor, levied on tour operators running trips to the Reef	Revenues: approx. AUS\$ 3-6 million per year (expected)
Austria	Fee (provincial level)	Sport fishing	..	..
	Fee (provincial level)	Hunting	..	..
Canada (Alberta)	Charge	To regulate fur bearing animal trapping	CAN\$ 10 per 36 square miles, with CAN\$ 40 as a maximum	Revenues: CAN\$ 90-95 000 (1997-1998)
	Tradable permit	To regulate rights for outfitters to guide non-residents in big game hunting	About 8 800 rights active; prices range from CAN\$ 75-7 500 in auctions; trade volume not registered	..
	Charge	To regulate hunting	On hunting license, varies from CAN\$ 8-310 dependent on type of game	Revenues: CAN\$ 8.5 million (1997-1998); partly used for fish and wildlife conservation initiatives

11. A variety of subsidy schemes relating to natural resource management exist in most OECD countries, with only some of them listed here. Their effects on the environment are not always clear, and it is hoped that the work of the OECD Joint Working Party on Agriculture and Environment on policy classification will help to clarify this.

Canada (Quebec)	Charge	On issuing hunting permits	Varies from CAN\$ 13-252 based on resident/non-resident and type of game	Revenues: CAN\$14.5 million; small part of the charge (CAN\$ 1.60-3.25) is allocated to a fund for promoting habitat conservation
	Charge	Issued on fishing licences	Varies from CAN\$ 8-95 based on resident/non-resident and type of fish	Revenues: CAN\$9.9 million; small part of the charge (CAN\$ 2.25) is allocated for a fund for promoting habitat conservation
	Charge	Issued on permits for hunting with snares	CAN\$ 15 for residents; CAN\$ 244 for non-residents	Revenues: CAN\$ 108 000; small part of the charge (CAN\$ 1.60) is allocated for a fund for promoting habitat conservation
	Charge	For entrance to parks	Only for fishers and hunters; varies from CAN\$ 13-160 by resident/non-resident, and type of fish/game	..
	Charge	For entrance to wildlife reserves	Only for fishers and hunters; varies between CAN\$ 13-751 according to type of use	..
	Charge	For entrance to controlled exploitation zones (zec's)	Only for fishers and hunters; varies between CAN\$16-180	..
Czech Republic	Subsidy	For support of endangered species	..	..
Denmark	Charge	To cover the cost of hunting and game management	On hunting licenses: DKK 355 per year	Revenues: DKK 61 million
	Charge	Regulate sport fishing and angling; fishing permit	DKK 100/year; DKK 75/week; DKK 25/day	Revenues: DKK 22 million; the revenue is used for fish stock management
	Charge	Regulate sea water fishing (sport fishing and angling), fishing permit	DKK 250	Revenues: DKK 8.4 million; the revenue is for fish stock management

Finland	Charge	To cover costs of hunting and game management	Hunting licence: FIM 120 per year (1999)	Revenues: FIM 50 million (1999, est.)
	Charge	To cover costs of fish management	Fishing licence: FIM 90-150 per year (1999)	Revenues: FIM 50 million (1999, est.)
	Subsidy/compensation	Compensation from State for financial losses due to nature conservation, and for damage caused by protected species	Case specific	Total: FIM 80 million (1999, est.)
France	Tax	Levied on maritime passengers in protected natural areas	Max. FF 10 per passenger	Revenues: FF 3.2 million in 1997; allocated to finance National Park of Port Cros, Conservatory of Littoral, and National Forestry Office
Germany	Hunting and fishing tax	Luxury tax levied on hunting and fishing privileges	Differs by municipality; on average between 10-20% of annual value of hunting or fishing privilege	Revenues: DM 49 million (1996); independent districts are entitled to the revenues; no hunting and fishing tax is levied in Berlin, Bremen, Hamburg, or Bavaria
Greece	Charge	Entrance to national parks and monuments	DRS 200-1 200 per visitor	Revenues generally used for maintenance of the areas
	Charge	Levied on issuing hunting licences	Depends on geographical coverage (local, regional, national)	Special permits for controlled areas
Hungary	Game preservation fee/contribution	..	HUF 50-1 000/ piece of game; depends on the game species	..
	Fishing fees and fines	..	..	..
Iceland	Hunting fee	Regulate hunting and wildlife management	ISK 1 600 p.a for hunting permit (revenue ISK 17 million)	Revenue used for wildlife management; the fee is effective for regulating hunting
Japan	Hunting tax	Management and protection of wildlife	¥ 2 200-6 500 per person per season, depending on hunting gear	..

Korea	Charge	Management of natural parks	KOR\$ 0.71 per visitor	Revenues: KOR\$ 15 million (1997); allocated to National Parks Authority
	Fund	For ecosystem conservation	..	From 1999
Mexico	Tradable (hunting) permit	Hunting management of the Borrego Cimarron (<i>Ovis canadensis</i>)	12 permits, auctioned for MPS 52 000 each	Hunting permits can be traded nationally and internationally; prices of US\$ 50 000-200 000 were observed
Netherlands	Subsidy	Purchase of ecological areas by private conservation organisations	..	Budget: DFL 57.2
	Charge	To regulate wildlife hunting	Charge for hunting licenses	..
	Charge	To regulate fishing	Charge for fishing licenses	..
	Subsidy	To promote efficient control of protected areas	..	Budget DFL 1.8 million; for owners of protected areas
Poland	Charge	Usage/entrance national parks	Varies by park	..
	Charge	Hunting permits	Differentiated rates and conditions for Polish citizens and foreigners	..
	Charge	Fishing permits	..	..
	Liability payment (compensation)	Compensation for damage caused by protected species	..	Paid by State Treasury
Sweden	Subsidy	Finance liming of lakes and water courses	Up to 85 % of cost	Total: SEK 130 million; grants paid to municipalities and fisheries conservation associations
Switzerland	Subsidy	For biodiversity programmes	..	..
UK	Payments	For owners of sites of special scientific interest	According to management agreements	..

	Subsidy	To protect country wildlife	..	..
	Subsidy	To improve and extend wildlife habitats	..	..
<u>Symbol</u>			Amounts in 1997 if not otherwise stated	
.. = no data available				

The management of natural species and wildlife in OECD countries is supported by a number of economic instruments. Many schemes include charges, mostly to obtain hunting, fishing, or trapping licences. Other charges consist of entrance fees for natural parks or protected areas, for example in Australia (Great Barrier Reef), Canada (Quebec), France (maritime areas), Greece, Korea, and Poland. Revenues are used for protection and maintenance of the areas. A few tradable permits systems are found. In Alberta (Canada) rights to guide non-resident hunters in big game hunting are tradable among so-called outfitters. In Mexico, the hunting of the species *Borrego Cimarron* is subject to rights which are tradable, both nationally and internationally.

Some countries (the Netherlands and the UK) report financial assistance for conservation of wildlife habitats. In the Netherlands, grants are available for the purchase of ecologically valuable areas by private conservation organisations, and in the Czech Republic for endangered species conservation. Switzerland also provides subsidies to biodiversity programmes. In Sweden a large programme of liming lakes and watercourses is financed (up to 85%) by County Boards (since 1982); 6 900 lakes and 12 000 km of watercourses had been limed in 1997. Finland and Poland provide compensation for damage caused by protected species.

6. THE ENVIRONMENTAL EFFECTIVENESS OF ECONOMIC INSTRUMENTS

Evaluating the performance of economic instruments is a complex task and few reliable and systematic assessments have been made. This complexity stems from several reasons. First and foremost, in most instances economic instruments are used *in combination* with other policy instruments such as standards, voluntary agreements, and information and education campaigns. Thus, disentangling the specific contribution of the economic instrument as part of such a “policy package” is a complex, and sometimes impossible, task.

Second, data needed for performing *ex post* evaluations are most often lacking, simply because, as implementation of an economic instrument begins, there is often insufficient forethought about the data needed to conduct an evaluation. This is why OECD has elaborated guidelines for “*in-built evaluation systems*” whereby, at the inception and during the policy process, provision is made for collecting and processing relevant data.¹²

Third, economic instruments often serve multiple purposes. For instance, charges will always exert some *incentive* (as they add to costs and/or prices), but the primary purpose is often to *collect revenue* to finance specific pollution abatement programmes. Thus, the incentive and financing purposes are intermingled (e.g. the financing function makes up for a lack of incentive and, as the rate of financing charges increases, the incentive effect — intentionally or not — becomes more effective). *Cost savings* may also be the primary purpose of an economic instrument, as in the case of tradable permits. However, whilst one specific purpose may predominate, generally there will be others intermingled as well: environmental taxes are expected to contribute to the achievement of a given objective while at the same time providing cost savings by way of static and dynamic efficiency; tradable permits are primarily designed to yield cost savings, compared to command and control regulations, but should also accelerate the achievement of environmental goals.

A number of other factors explaining the lack of evaluation of the performance of economic instruments have been identified, such as the lack of practice and “culture” in evaluating policies, and the division of policy responsibility between different government bodies requiring interdepartmental co-operation to achieve a meaningful evaluation.¹³

Whilst replies to the survey questionnaire did not provide much data on evaluations, the number and quality of evaluations, albeit still scarce, seem to be increasing. For instance, Sweden has published a comprehensive evaluation of environmental charges and taxes.¹⁴ In the United States, tradable permit schemes are now subject to more systematic evaluations.

Economic (and other) instruments can, and should, be evaluated for a number of criteria: environmental effectiveness, economic efficiency, administration and compliance costs, revenue, wider

12. OECD (1997b), *Evaluating Economic Instruments for Environmental Policy*.

13. *Ibid.*

14. Swedish Environmental Protection Agency (1997), “Environmental Taxes in Sweden”.

economic effects (competitiveness, distributional effects etc.), dynamic effects (innovation) and “soft” effects (capacity building, awareness-raising, etc.).¹⁵ Many instrument assessments are second best for practical reasons. Ideally, the environmental effectiveness of any policy measure should be assessed by means of a model in which the state of the environment (reduced to relevant parameters) in a situation with the instrument in place is compared with a situation in which the instrument is not introduced. This is complicated at best, and probably not feasible in most cases.

This section will concentrate on environmental effectiveness, i.e. the extent to which instruments contribute to the achievement of environmental goals. The data presented in this section is mainly based on reported evidence provided in the questionnaire responses, but other available data sources have been used as appropriate. Although information regarding the environmental effectiveness of the economic instruments has been reported in a number of cases, the quality of this information varies. Some is just qualitative (e.g. “fairly effective”). Other data represent measured changes in terms of, for example, decreased air pollution emissions without reference to a “with-without” analysis. In only a very few cases, quantitative assessments of effectiveness are reported.

Assessments for tradable permit systems, for example, consist of an evaluation of the market in terms of actual trades and permit prices, as an indicator of their cost reduction impact. In the case of non-compliance fees, a reduction of the number of occasions in which a fee is imposed may indicate their success (assuming a constant level of enforcement). The effectiveness of subsidy programmes may be assessed against the achievement of the environmental objectives; but this criteria is unsatisfactory if no reference is made to the cost of achieving this objective (i.e. distinguishing too generous or poorly targeted subsidies).

6.1 Charges

Most of the replies about the effectiveness of economic instruments related to charge systems. As charges are primarily designed to collect revenue, their environmental effectiveness basically stems from well targeted uses of this revenue. For instance, a wastewater user charge will be effective if the revenue is able to finance an appropriate sewerage system and treatment of water. The effectiveness of an emission charge can be determined by the extent to which the redistribution of the revenue enables appropriate investments in treatment facilities. If the level of the charge is fixed to collect the revenue needed to achieve the objectives, the charge should, by definition, be effective. Yet, charges may also have an incentive effect if rates provide an incentive to reduce emissions. For specific charges on the use of resources, the effectiveness stems from both the revenue use (financing the supply and management facilities through the revenues collected) and the price elasticity of the demand for the resource (e.g. fresh water). The environmental effectiveness of charges should be assessed against both the financing and incentive effects. In all cases, the real purpose of charges should be made explicit and quantified to enable a meaningful assessment (as for any policy instrument). A few examples are presented below.

In **Austria**, three revenue raising charges are in place that collect funds for fulfilling take-back obligations, for batteries, packaging, and refrigerators and air conditioners, respectively. These charge systems contribute to realising certain return percentages, which were reported to be 50% for batteries and 40% for refrigerators. Collected volumes of packaging were 409 000 tons for paper, 180 000 tons for glass, 83 000 tons for plastic and 32 000 tons for metal packaging in 1996.

15. OECD (1997b), *Evaluating Economic Instruments for Environmental Policy*.

In **Denmark** the charge on car batteries, together with a deposit-refund system, should bring about a full collection of used batteries by the year 2000. The target set for 1997 was met. The charge on tyres enabled the achievement of the 80% collection and recycling target in 1997.

In **Poland**, the impact of the water effluent charge was assessed in terms of pollution reduction. In 1996 BOD decreased by 11 000 tons and insoluble substances by 71 000 tons. The primarily financially motivated charges on air pollution, waste water, water abstraction, and waste disposal were assessed in terms of charge "collection efficiency", and on their contribution to total environmental protection investment. Collection efficiency and share in total investment were 89 and 11% for the air pollution charge, for the waste water effluent charge 58% and 5% respectively, for the water abstraction charge 91% and 3%, and for the waste disposal charge 69% and 3%.

In **Canada (Quebec)** the charge on the cutting of trees provides financial means for the sustainable maintenance of forests. In 1997, CAN\$ 150 million was available for that purpose. In the Province of **Alberta** a reduction on the stumpage fee for timber that can only be harvested against high costs has contributed to an economic use of that timber.

In **British Columbia (Canada)** the permit fee system charges permit holders according to the amount of waste permitted. Some permit holders have changed their production processes in order to arrive at a lower permitted waste volume and consequently avoided high fee payments. A charge on leftover paint funds a programme that resulted in the diversion from landfill of 6.5 million equivalent litre containers with leftovers.

In **Germany**, all charges are reported as being effective, but no quantitative data was provided.

In **Sweden**, the NO_x charge was effective even before its actual implementation in January 1992 (early warning effect), and half of the reductions in NO_x emissions between 1990 and 1992 are attributed to the charge. Between 1990 and 1995, total emissions fell by 50%. It is estimated that, without the charge, emissions from the boilers subject to the charge would have been 80% higher in 1995.¹⁶

In **Switzerland**, the aircraft noise charge is claimed to have contributed to the use of quieter aircraft. The Swiss charge on bags for municipal waste has had a positive impact on the reduction of municipal waste supply (e.g. a reduction of 20% in Zürich). More waste is separated and collected for recycling or reuse.

6.2 Taxes

Environmental taxes for pollution control were not included in the questionnaire survey. However, to get a balanced picture, a few examples are mentioned below.

In **Denmark**, the tax on non-hazardous waste had the effect of doubling the cost of waste dumping and increased the cost of incineration by 70%. Between 1987 and 1993, household waste fell by 16%, construction waste by 64% and "miscellaneous" waste by 22%. Industrial waste, however, increased by 8%. Recycling also increased considerably: 77% for paper and cardboard, 50% for glass.¹⁷

In **Norway**, carbon dioxide taxes introduced in 1991 lowered CO₂ emissions of some stationary combustion plants by 21%, while in other sectors the reduction was more modest. It is estimated that CO₂

16. Swedish Environmental Protection Agency (1997), *op. cit.*

17. Andersen (1998), "Assessing the Effectiveness of Denmark's Waste Tax".

emissions produced by mobile household combustion devices fell by 2 to 3% as a consequence of the CO₂ tax.¹⁸ It is also estimated that CO₂ emissions per unit of oil produced by the Norwegian oil sector fell by 1.5% due to measures taken by the industry in response to the CO₂ tax.¹⁹

In **Sweden**, the sulphur tax (introduced in 1991) led to a fall in the sulphur content of oil-based fuels by more than 50% *beyond the legal standards*. The sulphur content of light oils has now fallen below 0.076% (i.e. less than half the legal limit of 0.2%). The tax also stimulated emission abatement measures in combustion plants. It is estimated that yearly emissions of sulphur dioxide (SO₂) have been reduced by around 19 000 tonnes by virtue of the tax.²⁰ Also in Sweden, a tax differentiation was introduced in 1991 on diesel fuels in order to stimulate the use of less polluting fuel oils. From 1992 to 1996, the proportion of “clean” diesel sold in Sweden rose from 1 to 85%, which led to a reduction of more than 75% on average in the sulphur emissions of diesel-driven vehicles. The Swedish CO₂ tax led to a reduction in emissions of 5 million tonnes in 1994, or 9% of total emissions.

In the **United States**, about 3 400 local communities in 37 states apply taxes on household waste, which are calculated according to the volumes discharged. The result has been a significant reduction in the volume of discarded waste and a significant increase in recycling.²¹

Not all taxes have been successful, however. The effects of certain ecotaxes in Belgium (on disposable razors, etc.) were hardly noticeable. Similarly, the Swedish tax on pesticides, which was too low, produced no incentive effect.²²

6.3 Tradable permits systems²³

There is growing evidence about the effectiveness and cost savings (compared to command and control instruments) of tradable permit systems.

In **Australia**, the Hunter River Salinity Trading System, introduced in 1995, has not been operating at full capacity to date. Targeted economic subjects are reported to be positive about the scheme, some sellers are on the market, and one trade was established. But the system needs time to fully mature.

A system of tradable quotas for ozone depleting substances (ODS) exists in **Canada**. It is claimed to be 100% effective since the amounts of ODS consumed do not exceed targets set by the government.

In **Switzerland**, the provisions for trade of VOCs and NO_x in the Basel Canton have barely been applied; only four internal trades (bubbles) and no external trades have occurred, due to the narrowness of the market and the restrictive conditions for trades.²⁴

18. Larsen and Nesbakken (1997), “Norwegian Emissions of CO₂ 1987-1994. A Study of Some Effects of the CO₂ Tax”.

19. ECON (1994), report 326/94.

20. Swedish Environmental Protection Agency (1997), *op. cit.*

21. Anderson, *et al.* (1997), “The United States Experience with Economic Incentives in Pollution Control Policy”.

22. Swedish Environmental Protection Agency (1997), *op. cit.*

23. Sources include papers from the OECD Workshop on Domestic Tradable Permit Systems, published in OECD (1999a), *Implementing Domestic Tradable Permits for Environmental Protection*.

In the US the *Acid Rain Trading Program* did create an effective market for SO₂ allowances. The number of transactions rose from 215 in 1994 (including 9.2 million allowances) to 1 429 in 1997, when 15.2 million allowances were traded. In that year, 810 transactions, including 7.9 million allowances, were traded among economically distinct organisations. Cost savings in 1995 were estimated at US\$ 225-375 million, or 25-34%, when compared with abatement without trading.²⁵ The **Californian RECLAIM** program is also claimed to be successful. Since its introduction in 1994, emissions were kept below the (decreasing) target. Among different firms, 29 000 NO_x reduction credits (tons) were traded in 352 transactions with a total value of US\$ 23.6 million. For SO₂, 51 trades were established, including 13 500 tons, and a total value of US\$ 18 million. Zero-price trades among different units of the same firm were about twice as high. The *lead in gasoline* and *ozone depleting chemicals* programmes have also been quite successful.²⁶ However, the tradable permits system for *water protection* (Fox River and Dillon Reservoir) have had limited success, mainly due to the narrowness of the markets for permits, and severe restrictions on trading.

Transferable fishing quotas generally seem to be successful in the majority of cases. An OECD study found that of 31 fisheries reviewed, catch in 24 cases was maintained at or below catch limits.²⁷ In a number of instances, transferable fishing quotas also seem to achieve improved economic performance, in terms of reduced cost and rationalisation of the fishing industry. In 23 cases, there was increased cost-effectiveness and profits.

6.4 Deposit-refund systems

The environmental effectiveness of deposit-refund systems is mostly described by means of the rates of return achieved for the products included in the systems. These have been described in Tables 3.19 through 3.21, on deposit-refund systems for packaging, batteries, and other products respectively. Deposit-refund systems are usually quite successful. Return levels of glass and PET bottles of 60 to 99% are reported. Metal and laminate containers are returned at lower rates.

6.5 Non-compliance fees

Non-compliance fees are applied in many instances; their environmental effectiveness should be measured by the increase in compliance (i.e. reduced emissions) caused by the fee (the threat of payment). Most available data concern the number of cases in which non-compliance fees have been imposed.

6.6 Performance bonds

Evaluating performance bonds in terms of their effectiveness in a second-best context is probably best done by assessing the number of times these bonds were activated. Thus, there is a similarity with the character of the deposit-refund system: the instrument does not cause any extra financial burden if proper conduct according to the environmental requirements is demonstrated. In that sense, the performance bond system in **Quebec (Canada)** that encompasses a number of potentially polluting activities is effective,

24. Jeanrenaud (1999), "Obstacles to the Implementation of Tradable Permits: the Case of Switzerland".

25. Harrison (1999), "Tradable Permits for Air Pollution Control: the US Experience".

26. *Ibid.*

27. OECD (1997c), *Towards Sustainable Fisheries: the Economic Aspects of the Management of Living Marine Resources*.

since no bond has been activated since the start of the system in 1984. Comparable success was reported for the performance bond system in **New Brunswick (Canada)** that covers rehabilitation of old mining areas and waste dump sites, introduced in 1994. No bonds were called in. A similar system was established in **Alberta (Canada)** in 1993, applicable for mines, pits, and oil production sites. The financial amount involved in bonds issued was CAN\$ 170 million at the beginning of 1998. In 1997, no bonds were called in. Since 1992, a performance bond system has also been used for the management of hazardous waste sites. It is claimed that over 95% of these sites are properly managed.

6.7 Liability payments

Liability payments are reported in a small number of countries. Their effectiveness is difficult to define. In some instances, the purpose of liability payments is to provide funds for compensation of environmental damage (e.g. air and water pollution in Japan, aircraft noise damage in Germany); in such cases, the effectiveness can be defined as the extent to which victims do have access to compensation. In other cases, liability payments are designed to finance protection measures such as clean up measures (e.g. waste sites in the US) or restoration funds (e.g. fund for restoration of fish habitats in Quebec); in that case, effectiveness is the level of achievement of the stated objective. Some incentive effect can also be expected (payment avoidance).

6.8 Subsidies (for environmental protection)

Indications of the environmental effectiveness of subsidies consist quite often of the number of occasions in which financial aid was granted; this is hardly a relevant indicator. It is rare that more direct parameters are available. One such case is the subsidy programme for the purification of municipal wastewater in **Quebec (Canada)**. It is expected that the wastewater of 98% of the residents connected to the sewer system will be treated in 1999. The equally successful Clean Water Grant Programme in **New Brunswick (Canada)** has supported the connection of residents in municipalities to sewer systems. Virtually all municipalities have state-of-the-art sewer systems and sewer overflow in fresh water bodies is drastically reduced. The financial aid for reuse and recycling of used car tyres in **Quebec** was also reported to be successful, since the objectives set for 1997 were met.

The National Fund for Environmental Protection and Waste Management in **Poland** covers a broad environmental field and is applied on the three government levels of state, province and municipality. The facility to write-off debts in this scheme has contributed to (projects finalised in 1997) the installation of equipment for air pollution reduction (SO₂ reduction: 134 000 tons per year), for water treatment (1 million m³), sewage systems (958 km), and waste management facilities (1.4 million m³).

A subsidy scheme in **Switzerland** for proper storage of farmyard manure contributed to reduced application of artificial fertiliser and to improvements in the quality of surface and drinking water. A similar scheme exists in the **UK** for farmers in "nitrate-sensitive" areas, preventing run-off into open water courses.

In the **UK**, a grant is available for the planting and management of woodlands. With the woodland grant scheme, 16 000 ha of new woodland was created in 1997-1998.

Two questions remain outstanding: what would have happened without the subsidy and the real cost of the schemes.

6.9 Concluding remarks

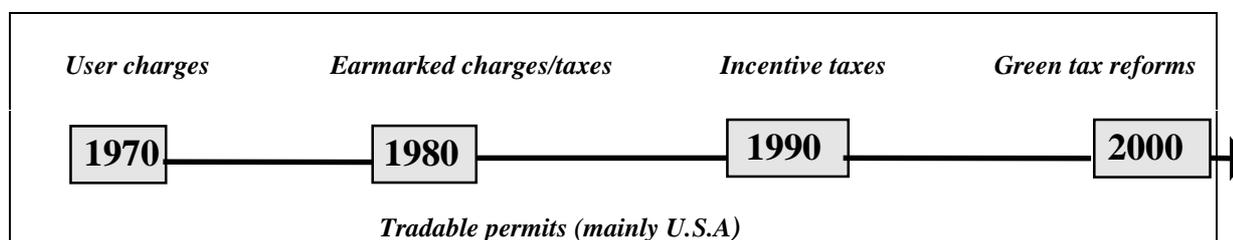
The overall conclusion from the reports on environmental effectiveness of economic instruments is positive. However, evidence is limited, assessments are based on scant data, and in-depth evaluations are scarce. It seems that more evaluations are carried out for environmental taxes and tradable permits. But the situation described in the 1997 OECD *publication Evaluating Economic Instruments for Environmental Policy* has not changed significantly. The main uncertainty about the real value of economic instruments seems to be the lack of knowledge about how to disentangle the impacts of these instruments. Almost all instruments — with deposit-refund systems probably as the main exception — operate as a supplement to a framework of command-and-control policy measures, many of which were already in place at the time of introduction of the economic instrument.

7. CONCLUSIONS: DEVELOPMENTS IN THE USE OF ECONOMIC INSTRUMENTS

A significant evolution

In the early 1970s, when environmental policies were still in their infancy, economic instruments were used in only a few instances and were subject to much controversy. Since then, a slow, but continuous evolution has taken place. The role of economic instruments has increased on several grounds. First, the number of applications have increased as economic instruments are increasingly used in more (in fact, all) OECD countries. Second, the variety of instruments has also grown: while user charges and subsidies were typically already in use in the 1970s, different types of charges (emission charges) have also become common. Other types of economic instruments (e.g. deposit-refund systems, performance bonds, liability payments) have also appeared. Another typical feature of this evolution is the growing role of environmental taxes and an increasing number of applications of tradable permit schemes.

Figure 7.1. The evolution of economic instruments



The present survey highlights specific features of this evolution.

Policy mixes

Economic instruments for pollution control are being operated in mixed approaches with command-and-control types of instruments as a — sometimes significant, sometimes minor — adjunct. No real change compared with the 1994 survey could be observed in that respect, except perhaps an increasing use of voluntary approaches in this policy mix.

A growing role for environmental taxes...

A significant evolution has been the increasing role of environmental taxes in the context of an integration between tax and environmental policies. In more and more countries, “green tax reforms” are implemented or contemplated. Environmental charges are increasingly brought under the fiscal framework. This is specifically true for incentive (i.e. not explicitly revenue raising) charges. For instance, the Netherlands have cancelled most charges with financing purposes and/or replaced them by taxes paid into

the general government budget. In 1998, France started a progressive transformation of earmarked charges into fiscal taxes paid to the central government budget.

...and tradable permits

Whilst market creations (tradable permits, transferable quotas) remain relatively scarce, there are more and more applications. This is a clear trend: on the one hand, long standing tradable permit schemes are reaching a level of maturity (smoother implementation, proven environmental effectiveness and economic efficiency); on the other hand, new experiments are being made in various areas. For instance, the US Emissions Trading Schemes that could be considered as forerunners in this field are being succeeded by new and substantial systems, and more are in preparation. A number of initiatives are also being taken for tradable permit schemes in water quality management, but results are modest so far. Other countries, notably Australia, Canada, and Mexico, continue to operate tradable permit systems. Countries that are considering their introduction for the first time include Denmark, Poland, the Netherlands, Norway and the UK. Furthermore, the potential use of tradable permits for reducing greenhouse gas emissions is high on the international political agenda.

Enforcement incentives

A clear growth in the field of enforcement incentives can be noted. In the 1994 survey, four countries mentioned non-compliance fees and/or performance bonds. The current survey shows that eight countries mention non-compliance fees, five countries operate performance bonds, and eight liability payments. Such enforcement incentives are also explicitly mentioned by the new Member countries of the Czech Republic and Poland.

Deposit-refund systems still strong

The application of deposit-refund systems have not shown much development in recent years, but still play a significant role. Many of the systems mentioned were already in place in 1994. Few new products have been brought under deposit systems. Car batteries are one exception. These systems are still quite successful, but the issue of the cost of operating these systems should be addressed.

Miscellaneous subsidies

Many countries report the existence of subsidy schemes of various types: grants, soft loans, accelerated depreciation. A comparison with the 1994 survey is not possible, but it is clear that subsidies still play an important role among economic measures.

New Member countries follow a similar trend

The new OECD Member Countries are applying economic instruments to a significant level. The Czech Republic and Poland appear to have full-grown charges-cum-subsidy schemes which play a structural part in bringing environment investments to substantially higher levels (in particular in the context of environmental funds). The number of pollutants addressed in the charge schemes is also larger than found on average in the OECD. Hungary is operating many environmentally-related taxes. Korea and Mexico also apply a range of economic instruments.

A significant role in natural resources management

This report presents the first comprehensive survey of the application of economic instruments in natural resource management. It is clear that extensive use is made of economic instruments in this field. Almost all of the countries that replied to the questionnaire reported the use of one or more economic instruments for natural resource management. Many countries levy water abstraction charges or taxes. A distinctive feature is the use of transferable fishing quotas in five countries. For the management of forestry, two types of economic instruments are generally used: charges and taxes (e.g. stumpage fees) and subsidies (for protection and reforestation). Relatively few economic instruments are used for wetlands protection, while a variety of subsidies are designed for the protection of soil, landscape etc., sometimes in the context of agri-environmental measures. Wildlife protection is primarily achieved through hunting and fishing fees, subsidies for the protection of biodiversity, and entrance fees for natural parks. The removal of adverse subsidies has also been used for natural resource management.

Limited, but increasing evidence on effectiveness

There is still a lack of evaluation on the environmental effectiveness of economic instruments, as well as their static and dynamic efficiency. However, more information is now available than in the 1994 survey. Effectiveness is rated positively in general, although the substance of this information is meagre. Many statements apply to — sometimes remote — proxies for environmental effectiveness, rather than effectiveness itself.

APPENDIX 1: ECONOMIC INSTRUMENTS IN POLLUTION CONTROL (excluding taxes)

Country	Charges	Tradable Permits	Deposit Refund Systems	Non Compliance Fees	Performance Bonds	Liability Payments	Subsidies
Australia	<ul style="list-style-type: none"> • Licence fee marine waters • Aircraft noise levy • Ozone depletion fee • Waste effluent charge 	<ul style="list-style-type: none"> • Hunter River Salinity Trading Scheme 	<ul style="list-style-type: none"> • South Australian beverage container deposit system 		<ul style="list-style-type: none"> • Mine site rehabilitation performance bonds 		<ul style="list-style-type: none"> • Greenhouse challenge subsidy
Austria	<ul style="list-style-type: none"> • Sewage charge • Waste fee • Landfill • Battery charge • Packaging charge • Advance payment for refrigerator and air conditioner treatment • Wastewater user charge 		<ul style="list-style-type: none"> • Deposit on refillable plastic packaging • Deposit on certain lamps 				<ul style="list-style-type: none"> • Um weltförderung im Inland • State Aid on Environmental Measures
Belgium (Fl.)	<ul style="list-style-type: none"> • Surface water pollution charge • Wastewater user charge 						
Canada		<ul style="list-style-type: none"> • Tradable allowances for controlling the supply of Ozone Depleting Substances (ODS) 					
Canada (Quebec)	<ul style="list-style-type: none"> • Air pollution charge (several pollutants) • Municipal waste • Water effluent charge (several pollutants) • Wastewater user charge • Industrial waste 		<ul style="list-style-type: none"> • Deposit on non reusable beer and soft drinks containers 		<ul style="list-style-type: none"> • Several rules of the Ministry of Environment and wildlife require financial guarantee, including performance bonds 	<ul style="list-style-type: none"> • Fund for the restoration of fish habitat (FRHAP) 	<ul style="list-style-type: none"> • Investment assistance program for agri-environment • Municipal water sewerage program (PADEM), • Program for the integrated management of

	<p>water sewerage charges (Rule 129 of CUM)</p> <ul style="list-style-type: none"> • Charge on sewerage certificates • Fee on the use of perchloroethylene by dry-cleaning firms 						used tyres
Canada (Ontario)		<ul style="list-style-type: none"> • Pilot Emissions Reduction Trading (NOx and VOCs) 					
Canada (New Brunswick)	<ul style="list-style-type: none"> • Scrap tyre levy 		<ul style="list-style-type: none"> • Beverage container deposit (excl. milk) 	<ul style="list-style-type: none"> • Administrative penalties 	<ul style="list-style-type: none"> • Rehabilitation, Mine Reclamation, and Environmental Performance Bond - Financial Assurance 		<ul style="list-style-type: none"> • Clean Water Grant Program
Canada (British Columbia)	<ul style="list-style-type: none"> • Waste Management Permit Fees • Levy on batteries • Levy on tyres • Waste Paint eco fee • Eco fees for solvents/flammable liquids and gasoline • Eco fees for pesticides 		<ul style="list-style-type: none"> • Beverage Container Deposit-Refund System 				
Canada (Alberta)	<ul style="list-style-type: none"> • Reclamation Certificate Application Fee 				<ul style="list-style-type: none"> • Cost of Reclamation Security • Surety bond 		
Czech Republic	<ul style="list-style-type: none"> • Emission charges of air pollution from large and medium sources • Fees for air pollution from the operators of small air pollution sources 		<ul style="list-style-type: none"> • Deposit-refund system for glass and PE bottles 	<ul style="list-style-type: none"> • Fines for Air Pollution • Waste fines • Fines levied for waste water 			<ul style="list-style-type: none"> • State Environmental Fund

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	<ul style="list-style-type: none"> • Charges on ODS • Effluent charges on wastewater • User charge for sewage use and sewage treatment • Charges on solid waste disposal • Payments for collection, transport, screening and disposal of communal waste • Hazardous waste • Motor vehicle entry charges 						
Denmark	<ul style="list-style-type: none"> • Charge on car tyres • Charge on starter batteries (lead accumulators) • Sewage discharge • Municipal waste • Hazardous waste • Fee on gasoline 	<ul style="list-style-type: none"> • CO₂ scheme for power plants 	<ul style="list-style-type: none"> • Bottle deposit scheme • Premium on Nickel-Cadmium Batteries • Premium on lead accumulators 			<ul style="list-style-type: none"> • Environmental Damages Act • Act on Contaminated Soils 	<ul style="list-style-type: none"> • Grants for Traffic and Environment • Green Employment Fund • Green Fund • Grants for ecological building • Programme for integrated product policy, i.e. cleaner products, waste and recycling projects • Environmental revision and auditing
Finland	<ul style="list-style-type: none"> • Waste water user charge • Municipal waste user charge • Water protection charge • Fish management charge • Charge on lubricant oil 		<ul style="list-style-type: none"> • Beverage containers • Car hulks (Åland) 			<ul style="list-style-type: none"> • Pollution payments under permit system • Compensation for damage to victims • Compulsory environmental damage insurance 	<ul style="list-style-type: none"> • Grant for clean technologies • Grant to municipalities for sewerage • Accelerated depreciation • State guarantee for pollution control loans • Soft loans and

	<ul style="list-style-type: none"> • Oil pollution combating charge • Charge on nuclear waste • Charge on tyres • Pesticides charge • Hazardous waste charge 						<p>interest subsidies for pollution control</p> <ul style="list-style-type: none"> • Grant for renewable and clean energy
France	<ul style="list-style-type: none"> • Water effluent charges • Wastewater user charge • Charges for pollution licenses • Municipal waste • Industrial waste • Charge on nuclear plant production capacity • Charge on petrol refinery production capacity 	<ul style="list-style-type: none"> • Transferable development rights (Alps) 					<ul style="list-style-type: none"> • Accelerated depreciation for investments related to treatment of industrial wastewater, air pollution, and noise abatement
Germany	<ul style="list-style-type: none"> • Waste disposal • Dangerous waste charge • Water effluent • Aircraft noise charge 					<ul style="list-style-type: none"> • Noise damage compensation 	
Greece	<ul style="list-style-type: none"> • Municipal waste • Industrial waste • Wastewater user charge 			<ul style="list-style-type: none"> • Air pollution • Car emissions • Environmental pollution • Recovery and restoration of marine environments 			<ul style="list-style-type: none"> • Financial aid for private environmental investment • Financial assistance for development of clean technologies and innovative products

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Hungary	<ul style="list-style-type: none"> • Water extraction charge • Wastewater user charge • Hazardous waste • Waste collection and disposal • Lubricant oil • Packaging materials • Tyres • Refrigerators and coolants • Batteries 		<ul style="list-style-type: none"> • Bottle deposit 	<ul style="list-style-type: none"> • Air pollution • Sewer damage • Water pollution 			
Iceland	<ul style="list-style-type: none"> • Charge on hazardous waste • Charge on ozone depleting chemicals 		<ul style="list-style-type: none"> • Beverage containers 				
Ireland							
Italy	<ul style="list-style-type: none"> • SO2 and NOx emission charges • Waste collection and disposal • Landfill charges • Wastewater user charges • Aircraft noise charge • Lead battery charge • Charge on lubricant oil • Packaging charges 		<ul style="list-style-type: none"> • CFCs 				
Japan	<ul style="list-style-type: none"> • Municipal waste collection • Sewer charge • Aircraft noise charge • Charge on packaging 					<ul style="list-style-type: none"> • Illegal dumping of waste • Compensation for pollution-related health damage (air, 	<ul style="list-style-type: none"> • Grant for pollution control • Soft loan (pollution control) • Grants for new construction • Grants for low

	<ul style="list-style-type: none"> Wastewater user charge 					waste)	<p>emission vehicles</p> <ul style="list-style-type: none"> Grants for low emission business cars Grants for low emission trucks Accelerated depreciation (pollution control equipment) Accelerated depreciation for recycling equipment
Korea	<ul style="list-style-type: none"> Emission charges for air (above certain limits) Air pollution charges (owners of large buildings or diesel vehicles) Water effluent charges 		<ul style="list-style-type: none"> Deposit-refund for beverage containers Deposit-refund for car tyres Deposit-refund for home appliances Deposit-refund for batteries Deposit-refund for lubricants 	<ul style="list-style-type: none"> Non-compliance fees for air pollution 			
Luxembourg							
Mexico	<ul style="list-style-type: none"> Federal Rights on Water Discharges 		<ul style="list-style-type: none"> DRS for beer, soft drinks and car batteries 				
the Netherlands			<ul style="list-style-type: none"> Deposit-refund on glass bottles for beer, soft drinks and milk and dairy products Deposit-refund on PET-bottles 				<ul style="list-style-type: none"> Credit facility for environment related product development (Subsidy for energy investment in the non-profit sector) (Subsidy for active sun-thermal systems) Subsidy for clean busses Subsidy for clean processing of waste of the fishing industry

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							<ul style="list-style-type: none"> • Financial contributions to the environment • Complementary facility for investments in agricultural companies
New Zealand		<ul style="list-style-type: none"> • Transferable construction rights (historic sites) 					
Norway	<ul style="list-style-type: none"> • Municipal waste collection • Waste water user charge • Aircraft noise charge 		<ul style="list-style-type: none"> • Motor vehicle • Bottles 				<ul style="list-style-type: none"> • Grant for environment friendly technologies • Grants to municipalities for sewers • Grants for education and planning for municipal waste management • Grants to ecological farming • Grants for agricultural landscape protection
Poland	<ul style="list-style-type: none"> • Charge on pollutant emissions to the air • Charge on waste water discharge • Charge on deposited solid waste 	<ul style="list-style-type: none"> • VOCs control (demonstration project in Chorzow) 	<ul style="list-style-type: none"> • Deposit on glass and plastic bottles 	<ul style="list-style-type: none"> • Air pollution exceeding permitted emission level • Wastewater discharge exceeding permitted discharge level • Waste disposed without permit • Excessive noise 			<ul style="list-style-type: none"> • National Fund for Environmental Protection and Water Management
Portugal							
Spain							

Sweden	<ul style="list-style-type: none"> • Charge on NO_x emissions • Municipal waste collection charge • Wastewater user charge • Charge on exemptions from certain regulations 		<ul style="list-style-type: none"> • Beverage containers • Motor vehicles 	<ul style="list-style-type: none"> • General environment protection charge • Sea dumping of oil 		<ul style="list-style-type: none"> • Prevention and reduction of damage from hydro-power stations • Environmental damage insurance 	<ul style="list-style-type: none"> • Grant for handling waste oil in harbours • Grants/soft loans for biofuels • Grant for reduction of emissions from household fuel tanks
Switzerland	<ul style="list-style-type: none"> • Charge on waste bags • Aircraft noise charge • Charge on aircraft pollution • (Tax differential leaded/unleaded gasoline) • Removal charge on packaging, batteries, refrigerators, computers and car wrecks 	<ul style="list-style-type: none"> • VOCs and NO_x trading scheme (Basel Canton) 					<ul style="list-style-type: none"> • Subsidy for investment in waste and waste water treatment plants
Turkey	<ul style="list-style-type: none"> • Air pollution charges on motor vehicles and aircraft • Wastewater user charges • Municipal waste charge • Fisheries law charge • Water pollution control registration charge • Aircraft noise charge 		<ul style="list-style-type: none"> • Deposit-refund system for glass, metal, laminates and plastic packaging 				
UK							
US (Federal)	<ul style="list-style-type: none"> • Superfund taxes [4-19] • Taxes on fuel-inefficient 	<ul style="list-style-type: none"> • Acid rain allowance trading • Lead in gasoline (1983-1987) 			<ul style="list-style-type: none"> • Surface mining control and reclamation performance 	<ul style="list-style-type: none"> • Liability for clean-up costs (hazardous waste sites) 	<ul style="list-style-type: none"> • Subsidies for • Pollution prevention and control

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	<ul style="list-style-type: none"> automobiles [4-20] (Tax on ozone-depleting chemicals [4-20]) 	<ul style="list-style-type: none"> Ozone depleting substances (1986-1998) Mobile sources averaging, banking and trading (1998) 			bond		<ul style="list-style-type: none"> Clean-up of contaminated industrial sites Supplemental pollution prevention projects by industry To promote establishment of recycling activities
<p>US (States)</p> <p>(State is indicated if the instrument is applied by that State only)</p>	<ul style="list-style-type: none"> Water effluent fees [4-3] Indirect water discharge fees [4-2] Air emission permit fees [4-6] Waste fees Landfill taxes [4-16] Hazardous waste taxes [4-17] Tyre charges [4-20] Fertiliser charges [4-20] Hard-to-dispose material tax (Rhode Island) [4-21] Advance disposal fees [4-22] Clean fuel incentive surcharge (Texas) [4-23] 	<ul style="list-style-type: none"> Lower Fox River trading scheme (Wisconsin) Dillion reservoir RECLAIM scheme (California) Ozone Transport Commission NO_x Programme (Northeast) Tradable permits for woodstoves and fireplaces (Colorado) Transferable development rights (Lake Tahoe, Montgomery County, Pinelands) 	<ul style="list-style-type: none"> Deposit-refund systems for beverage containers DRS for lead-acid batteries DRS for pesticides containers (Maine) DRS for replacement vehicle tyres (Rhode Island) 				

APPENDIX 2: ECONOMIC INSTRUMENTS FOR NATURAL RESOURCES MANAGEMENT

Country	Water Quantity	Fisheries	Forestry	Wetlands	Land/Soil	Natural Species/Wildlife
Australia	<ul style="list-style-type: none"> Transferable water entitlements 	<ul style="list-style-type: none"> Individual transferable quotas 				<ul style="list-style-type: none"> Environmental management charge for the Great Barrier Reef
Austria	<ul style="list-style-type: none"> Subsidies for infrastructure 		<ul style="list-style-type: none"> Tree protection tax Subsidies for forest management; e.g. for planting mixed forests 		<ul style="list-style-type: none"> Subsidies in the framework of the ÖPUL (Austrian programme for environmentally sound agriculture) 	<ul style="list-style-type: none"> Sport fishing fees (at provincial level) Hunting fees (at provincial level)
Belgium						
Canada		<ul style="list-style-type: none"> Transferable fishing quotas 				
Canada (Quebec)		<ul style="list-style-type: none"> Charge on fish farming Charge on commercial fishing permits in fresh waters for anadromous and catadromous species 	<ul style="list-style-type: none"> Felling fee Financing of forests protection Program for the development of forest-based resources Financing of forest development agencies Supply of forest plantations Program for refund of land taxes Forest fund charge Maple groves permits (charge) 	<ul style="list-style-type: none"> Preferential tax conditions for donations of ecologically valuable lands and easements 	<ul style="list-style-type: none"> Development and conservation of water and soil resources 	<ul style="list-style-type: none"> Hunting permit fees Fishing permit fees Trapping permit fees Parks entrance fees Fees for entrance in wildlife reserves Entrance fees in national parks Entrance fees to controlled exploitation zones (ZECs)
Canada (Ontario)						
Canada (New Brunswick)						
Canada (British Columbia)						
Canada (Alberta)	<ul style="list-style-type: none"> Security (performance bonds) Liability payments Non-compliance 		<ul style="list-style-type: none"> Stumpage fee Reforestation penalty Overcut penalty 			<ul style="list-style-type: none"> Registered fur management area fee Outfitter/guide allocations

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	<ul style="list-style-type: none"> fees Transferable rights 					<ul style="list-style-type: none"> Hunting licence fee
Czech Republic	<ul style="list-style-type: none"> Charges for the withdrawal of water from surface or groundwater sources 		<ul style="list-style-type: none"> Charges for sequestration of forest land Subsidies for planting 		<ul style="list-style-type: none"> Levies on withdrawal of land from agriculture 	<ul style="list-style-type: none"> Subsidies for support of endangered species
Denmark	<ul style="list-style-type: none"> Charge on water use Tax on water use Subsidy for pollution threatened small water supply companies 		<ul style="list-style-type: none"> Subsidies for good and multiple use forest management 	<ul style="list-style-type: none"> Subsidy for restoration of streams Subsidy for restoration of wetlands Subsidy for environmentally friendly agriculture 	<ul style="list-style-type: none"> Subsidy for ecological agricultural production Subsidy for environmentally friendly investment in small farms subsidy for planting wind breaks Subsidy for nature management Tax on raw materials 	<ul style="list-style-type: none"> Hunting license fee Charge for sport fishing and angling Charge for sea water fishing (sport fishing and angling)
Finland		<ul style="list-style-type: none"> Fishing fees 	<ul style="list-style-type: none"> Subsidy/compensation for multiple-use forest management 		<ul style="list-style-type: none"> Soil (gravel) abstraction control fee 	<ul style="list-style-type: none"> Subsidy/compensation for nature conservation Hunting license fee Fishing license fee
France	<ul style="list-style-type: none"> Charge on water abstraction and consumption Charge on water supply Charge on consumption of public potable water Surtax on mineral water 		<ul style="list-style-type: none"> Tax on forest clearing 		<ul style="list-style-type: none"> Tax on ski lifts 	<ul style="list-style-type: none"> Tax on maritime passengers in protected areas
Germany	<ul style="list-style-type: none"> Water extraction charge 					<ul style="list-style-type: none"> Hunting and fishing tax
Greece	<ul style="list-style-type: none"> Charge for use of irrigation water 				<ul style="list-style-type: none"> Subsidy to conserve landscapes and nature Subsidy to promote pesticide- 	<ul style="list-style-type: none"> Entrance fees for (some) national parks and forests (Lesvos, Samaria) Hunting licence Hunting permits in

					<ul style="list-style-type: none"> free agriculture • Subsidy for ecological areas • Subsidy to install farm waste facilities • Fee for grazing right on public land 	controlled areas
Hungary	<ul style="list-style-type: none"> • Water abstraction charge 		<ul style="list-style-type: none"> • Forest maintenance fee 		<ul style="list-style-type: none"> • Land protection contribution 	<ul style="list-style-type: none"> • Game preservation fee • Fishing fees and fines
Iceland		<ul style="list-style-type: none"> • Individual transferable fishing quotas • User charge on weight of allocated fishing quotas 	<ul style="list-style-type: none"> • Subsidy for reforestation 		<ul style="list-style-type: none"> • Subsidy for protection against soil erosion and for revegetation 	<ul style="list-style-type: none"> • Hunting fee
Ireland						
Italy	<ul style="list-style-type: none"> • Integrated water services charge 					
Japan	<ul style="list-style-type: none"> • Water extraction charge (rivers) • User fee (reservoirs/dams) 					<ul style="list-style-type: none"> • Hunting tax
Korea			<ul style="list-style-type: none"> • Reforestation charge • Charge for forest land diversion 			<ul style="list-style-type: none"> • Natural park entrance fees • Fund for ecosystem conservation (1999)
Luxembourg						
Mexico	<ul style="list-style-type: none"> • Charge for the use of water 					<ul style="list-style-type: none"> • Transferable hunting permit
the Netherlands	<ul style="list-style-type: none"> • Tax on groundwater abstraction 	<ul style="list-style-type: none"> • Transferable fishing quotas 	<ul style="list-style-type: none"> • Tax exemption for forestry owners • Green fund • Financial stimulation of enlargement of forestry on agricultural grounds • Financial contribution for 		<ul style="list-style-type: none"> • Subsidy for protection of natural areas • Various subsidies for natural resources management • Subsidy for area and nature oriented environmental policies 	<ul style="list-style-type: none"> • Hunting fees • Fishing fees • Subsidy for purchase of ecological areas by private conservation organisations • Subsidy to promote efficient control of protected areas

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			<p>enlargement of forestry by public-private co-operation</p> <ul style="list-style-type: none"> • Financial contribution for forestry and landscape • Functional reward for forestry and natural areas 			
New Zealand						
Norway						
Poland	<ul style="list-style-type: none"> • Charge on water withdrawals 		<ul style="list-style-type: none"> • Charge set on trees and bushes removal • Charge for non-agricultural or non-forestry use of forest land • Liability payment for premature forest harvesting 			<ul style="list-style-type: none"> • National Park entrance fees • Hunting permit charge • Fishing permit charge • Compensation for damage caused by protected species
Portugal						
Spain						
Sweden	<ul style="list-style-type: none"> • Abstraction charge 	<ul style="list-style-type: none"> • Fishing charge 	<ul style="list-style-type: none"> • Subsidy for forest protection 	<ul style="list-style-type: none"> • Subsidy for restoration of wetlands and ponds 	<ul style="list-style-type: none"> • Subsidy for biodiversity conservation • Tax on natural gravel • Excavation charge • Charge on gravel abstraction on continental shelf • Mineral Act charge • Licence fee for peat exploitation 	<ul style="list-style-type: none"> • Liming subsidy
Switzerland			<ul style="list-style-type: none"> • Subsidies for forestry management and infrastructure 	<ul style="list-style-type: none"> • Subsidies to protect wetlands from intensive farming in adjacent fields 	<ul style="list-style-type: none"> • Subsidies for protection of nature and landscape • Subsidies for production methods respecting the environment and livestock • Subsidies for 	<ul style="list-style-type: none"> • Subsidies for biodiversity programme

					extensive agricultural acreage <ul style="list-style-type: none"> • Subsidies for ecological compensation • Subsidies for installations of farmyard manure 	
Turkey						
UK	<ul style="list-style-type: none"> • Water abstraction charges (England and Wales) 		<ul style="list-style-type: none"> • Woodland grant scheme 	<ul style="list-style-type: none"> • Grants for farmers for maintaining high water levels • Subsidy for maintenance of salt marshes 	<ul style="list-style-type: none"> • Farmers waste grant scheme (in nitrate vulnerable areas) • Subsidy for conservation of sites of special scientific interest • Grants to protect drinking water sources in nitrate-sensitive areas 	<ul style="list-style-type: none"> • Management agreement payments for owners of sites of special scientific interest • Grants for country wildlife trusts • Subsidies to improve and extend wildlife habitats
US (States) (State is indicated if the instrument is applied by that State only)		<ul style="list-style-type: none"> • Fishing quotas 		<ul style="list-style-type: none"> • Wetland compensation fees [4-24] • Wetland mitigation banking [6-32] 	<ul style="list-style-type: none"> • Fee for grazing on public land [4-26] • Transferable development rights [6-33] • Subsidies for farming and land preservation [7-1] • Liability for damage to natural resources [8-2] 	

APPENDIX 3: NOMINAL EXCHANGE RATES (1988-1998)
National currency units per United States dollar, average of daily rates

	Currency	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
AUSTRALIA	DOLLAR	1.28	1.26	1.28	1.28	1.36	1.47	1.37	1.35	1.28	1.35	1.60
AUSTRIA	SCHILLING	12.34	13.23	11.37	11.67	10.99	11.63	11.42	10.08	10.58	12.20	12.36
BELGIUM	FRANC	36.77	39.40	33.42	34.16	32.15	34.55	33.46	29.50	30.98	35.76	36.24
CANADA	DOLLAR	1.23	1.18	1.17	1.15	1.21	1.29	1.37	1.37	1.36	1.39	1.48
CZECH REPUBLIC	KORUNA	..	..	..	29.47	28.26	29.15	28.79	26.54	27.15	31.70	32.13
DENMARK	KRONE	6.73	7.31	6.19	6.39	6.04	6.48	6.36	5.60	5.80	6.60	6.69
FINLAND	MARKKA	4.19	4.29	3.82	4.04	4.49	5.72	5.22	4.37	4.59	5.19	5.34
FRANCE	FRANC	5.96	6.38	5.45	5.64	5.29	5.66	5.55	4.99	5.12	5.84	5.89
GERMANY	DEUTSCHE MARK	1.76	1.88	1.62	1.66	1.56	1.65	1.62	1.43	1.50	1.73	1.76
GREECE	DRACHMA	141.66	162.08	158.23	182.06	190.47	229.07	242.24	231.58	240.66	272.95	295.44
HUNGARY	FORINT	..	..	..	74.77	78.99	91.91	105.12	125.72	152.61	186.63	214.86
ICELAND	KRÓNA	43.05	57.11	58.38	59.10	57.62	67.64	69.99	64.77	66.69	70.97	71.11
IRELAND	POUND	0.66	0.71	0.60	0.62	0.59	0.68	0.67	0.62	0.63	0.66	0.70
ITALY	LIRA	1301.71	1371.69	1198.38	1240.65	1232.03	1571.66	1612.66	1629.03	1543.04	1702.76	1733.61
JAPAN	YEN	128.13	137.97	144.80	134.50	126.67	111.18	102.23	94.07	108.82	121.00	130.95
MEXICO	PESO	2.28	2.49	2.84	3.02	3.10	3.12	3.39	6.42	7.60	7.92	9.19
NETHERLANDS	GUILDER	1.98	2.12	1.82	1.87	1.76	1.86	1.82	1.61	1.69	1.95	1.98
NEW ZEALAND	DOLLAR	1.53	1.67	1.68	1.73	1.86	1.85	1.69	1.52	1.45	1.51	1.88
NORWAY	KRONE	6.52	6.90	6.26	6.48	6.21	7.09	7.06	6.34	6.46	7.07	7.52
POLAND	ZLOTY	..	..	..	1.06	1.36	1.81	2.27	2.43	2.70	3.28	3.49
PORTUGAL	ESCUDO	143.95	157.10	142.31	144.35	134.79	160.65	166.04	149.93	154.21	175.16	179.88
REPUBLIC OF KOREA	WON	730.01	669.17	708.00	733.23	780.01	802.44	804.27	771.40	804.42	950.51	1411.95
SPAIN	PESETA	116.48	118.40	101.94	103.93	102.40	127.24	133.96	124.69	126.69	146.41	149.15
SWEDEN	KRONA	6.13	6.45	5.92	6.05	5.82	7.79	7.72	7.13	6.71	7.63	7.90
SWITZERLAND	FRANC	1.46	1.64	1.39	1.43	1.41	1.48	1.37	1.18	1.24	1.45	1.45
TURKEY	LIRA	1421.42	2119.96	2606.44	4168.87	6860.54	10964.45	29778.15	45738.44	81281.00	151594.91	268379.74
UNITED KINGDOM	POUND	0.56	0.61	0.56	0.57	0.57	0.67	0.65	0.63	0.64	0.61	0.60
UNITED STATES	DOLLAR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

REFERENCES

- Andersen, M.S. (1998), "Assessing the Effectiveness of Denmark's Waste Tax", in *Environment*, May 1998.
- Anderson, R.C., Lohof, A.Q., and A. Carlin (1997), "The United States Experience with Economic Incentives in Pollution Control Policy", Environmental Law Institute for the US EPA, Washington DC.
- ECON (1994), Report 326/94, Oslo.
- Harrison, D. (1999), "Tradable Permits for Air Pollution Control: the US Experience", in OECD (1997a), *Domestic Tradable Permits for Environmental Management*, OECD, Paris.
- Jeanrenaud, C. (1999), "Obstacles to the Implementation of Tradable Permits: the Case of Switzerland", in OECD, *Domestic Tradable Permits for Environmental Management*, OECD, Paris.
- Larsen, B.M. and Nesbakken, R. (1997), "Norwegian Emissions of CO₂ 1987-1994: A Study of Some Effects of the CO₂ Tax", *Environmental and Resource Economics* 9(3): 275-290.
- OECD (1994a), *Environmental Performance Review: Japan*, OECD, Paris.
- OECD (1994b), *Environmental Performance Review: Hungary*, OECD, Paris.
- OECD (1997a), *Environmental Taxes and Green Tax Reform*, OECD, Paris.
- OECD (1997b), *Evaluating Economic Instruments for Environmental Policy*, OECD, Paris.
- OECD (1997c), *Towards Sustainable Fisheries: Economic Aspects of the Management of Living Marine Resources*, OECD, Paris.
- OECD (1998), *Improving the Environment through Reducing Subsidies*, OECD, Paris.
- OECD (1999a), *Implementing Domestic Tradable Permits for Environmental Protection*, OECD, Paris.
- OECD (1999b), *Consumption Tax Trends*, OECD, Paris.
- OECD (1999c), *The Price of Water: Trends in OECD Countries*, OECD, Paris.
- OECD, (1999d), *Environmental Performance Review: Hungary*, OECD, Paris.
- Swedish Environmental Protection Agency (1997), *Environmental Taxes in Sweden*, Stockholm.
- Wallis, P. (1999), "Transferable Fishing Quotas: Experience in OECD Countries", in OECD (1999a), *Domestic Tradable Permits for Environmental Management*, OECD, Paris.