

Environmental taxes: recent developments in tools for integration

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Preface

In a recent Communication the European Commission recognises that environmental taxes support environmental and economic aims. This indicates a shared responsibility for environmental taxes, which develop from instruments for environmental protection to instruments for sustainable development and a fair fiscal system. In 'Bringing our needs and responsibilities together – Integrating environmental issues with economic policy', the Commission wrote: *'A coordinated approach within the Community to implementing the polluter pays principle – whether by taxation or other market-based instruments – will help to address issues which are commonly grouped under the heading of 'competitiveness', even if (...) this is a misnomer, since macroeconomic competitiveness should be enhanced by moves towards better integration of environmental concerns.'* This statement reflects progress in thinking about the role of environmental considerations in sector policies, and the recognition of the potential synthesis of environmental and economic goals.

This is the second time the European Environment Agency reports on developments in the use and impact of environmental taxes. The first report (*Environmental Taxes – Implementation and Environmental Effectiveness, 1996*) noted a continuous increase in the use of environmental taxes at the level of the EEA member countries. The current report reconfirms this progress. The use of taxes is widening and more tax bases are being used. The majority of EU Member States now apply taxes in the context of an ecological tax reform, and will apply CO₂ taxes by 2001. Environmental taxes are increasingly used to maximise incentive effects by for example the development of charge-and-reward schemes. A more sophisticated design and implementation of environmental taxes is also perceptible in longer lead-in periods and wider consultation with affected groups. Evidence of environmental effectiveness is growing but proper evaluation studies are still limited in number.

But, in general, tax rates in the Member States are insufficient for full internalisation of external costs, for giving the correct signals to the market, and for establishing a

more efficient and equitable fiscal system. That allowed me to say, when presenting the results to the Environment Ministers in Paris, July 15th, 2000, that insufficient eco-taxation means unfair fiscality and impedes progress in sustainability in the market economy.

Environmental taxes are absent at the EU level. Annex 2 of the Commission report on the operation of the own resources system 'Financing the European Union (October 1998) marks the proposed CO₂/energy tax as a serious candidate for a genuine EU resource, given however that a Council agreement could be reached on adoption of the tax. It is my strong belief that, adhering to the 'user pays principle', this tax is needed at Community level in order to establish a fair and efficient price of energy in the Internal Market, and also, why not, to replenish some Community funds to finance programmes on renewable energy, energy saving, reforestation, to counteract existing unsustainable trends.

It is the EEA's task to provide 'timely and targeted information'. A report on environmental taxes is one form of doing this but updates are necessarily infrequent. The Agency, in consultation with the Commission joined the OECD in developing a database on market-based instruments. This database will be frequently renewed and will substantially extend the Agency's capacity to provide and update information on such instruments.

The EEA produced this report on the basis of contributions by Kai Schlegelmilch and his team from the Wuppertal Institut (Germany) and Frans Oosterhuis (Institute for Environmental Studies, Amsterdam). Stephan Speck (REC, Budapest provided valuable data and texts for the sections on countries in Central and Eastern Europe. Hans Vos, skilfully supported by David Gee and Teresa Ribeiro, managed the project. This team was critically followed by an Advisory Group consisting of Frank Convery (EEA Scientific Committee, University College Dublin), Alberto Majocchi (University of Pavia), Mikael Skou Andersen (Århus University) and Nils Axel Braathen (OECD), who provided very valuable

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guidance. Many useful comments from National Focal Points and others were received on draft texts.

I would like to thank all who contributed to the production of this report.

Domingo Jiménez-Beltrán

Executive Director

Summary

1. Recent developments in the use of green taxes

Member States are making increasing use of environmental taxes. The share of environmental taxes in total tax revenue is slowly growing, and evidence of the environmental effectiveness of green taxes is increasing. More data is needed for such evaluations, for which an 'in-built' evaluation framework can be a major tool. Despite progress made in Member States, in the past decade almost no progress has been made at EU level with adoption of environmental taxes. The adoption of the Eurovignette Directive, taking effect in July 2000, is an exception. The requirement of unanimity voting on fiscal matters is a major obstacle, and the idea of an 'Eco-Schengen' is gaining attention.

1.1. Increase in the use of environmental taxes

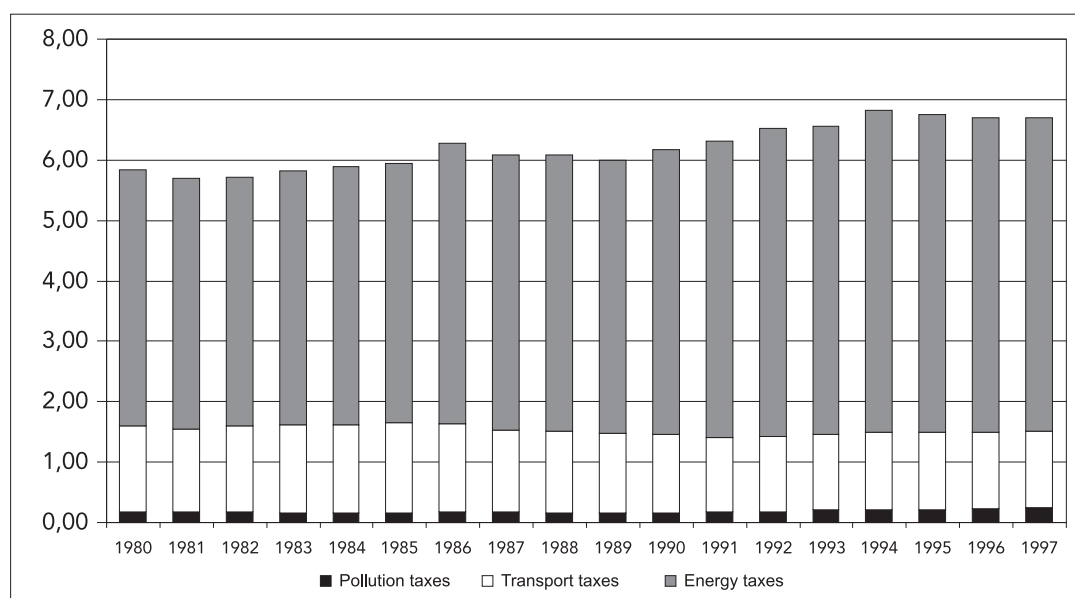
At the end of the 1990s the use of environmental taxes in Europe accelerated. Many countries have now introduced taxes on environmentally harmful products and activities, or have expanded and refined existing tax schemes with a view to improved environmental effectiveness. By 2001, most EU Member States (eight) will apply carbon taxes, up from only four in 1996. Nine Member States now apply taxes on waste

disposal, up from just two in the early 1990s. The number of product tax schemes is also increasing on products such as batteries, packaging and car tyres. Environmental taxes can provide multiple benefits such as economic incentives to reduce pollution and resource use, and revenues that can be used for fiscal reforms (e.g. lower labour taxes and social contributions) and for stimulating investment in the environment.

Environmental taxes are tools for integrating environmental requirements into sector policies. The share of environmental taxes (defined as taxes with a potentially positive environmental impact, hence comprising energy taxes, transport taxes and taxes on pollution and resources) in **total revenue** from taxes and social contributions in the EU is rising slowly though steadily (see Fig. 1). This share was 5.84 % in 1980, 6.17 % in 1990 and 6.71 % in 1997. Taxes directly on pollution and resources are modest if measured by their share in total environmental tax revenue, but this share is rising substantially. There is a 50 % increase in the share of pollution tax revenue in the period 1990-1997, against a 10 % increase for energy taxes and a small decrease for transport taxes. The share of all environmental taxes in total tax revenue grew by about 9 %.

Revenues from environmental taxes as % of total taxes and social contributions, EU15, 1980-1997

Figure 1



Source: Eurostat, 2000

1.2. New areas for environmental taxation are emerging

As much as 95 % of **environmental tax revenue** in Europe comes from the energy and transport sector. Less than 5 % of **environmental tax revenue** comes from taxes on other items such as on emissions, chemical substances, products, waste and natural resources. However, the number of these environmental taxes is increasing and new tax bases are being explored. Examples of such tax bases include agricultural inputs (fertilisers and pesticides), chemicals such as solvents, PVC and phthalates, raw materials, (ground)water, land, aviation and tourism. This broadening of the environmental tax base reflects a widening of the 'polluter pays' principle to the more comprehensive 'user pays' principle, where users pay for ecological services and thus contribute to reductions in material inputs and improvements in eco-efficiency. Examples include taxes on abstraction of (ground)water in France, Germany and the Netherlands, and the tax on aggregates in Denmark.

1.3. Dynamic developments in large EU countries

The larger EU Member States (notably France, Germany, Italy and the United Kingdom) are now joining the ranks of other countries exploring and exploiting the potential of environmental taxation. Germany and Italy have introduced CO₂ taxes in the framework of ecological tax reform, and France and the UK will do so by 2001. As the emphasis is on taxing energy products, with a view to reducing CO₂ emissions under the Kyoto protocol, an increase in minimum energy tax rates is taking place in most EU Member States. This is happening despite the failure of attempts to implement the Monti Proposal (CEC, 1997) with its extension of obligatory minimum tax rates to all energy products (except renewable energy products) and its increase in minimum tax levels in three bi-annual steps. In addition, the planned gradual increase in tax rates over several years to increase predictability for liable parties, can be found for instance in the German and Italian fuel tax systems and in the UK's landfill tax.

1.4. Almost no progress at EU level

Despite various attempts in the 1990s to introduce a common CO₂/energy tax and after subsequent attempts to apply EU-wide minimum excise tax rates to all energy

products, the need for unanimity in the Council on fiscal measures has hitherto frustrated such a harmonised approach. Recently, the Commission has proposed to introduce a kerosene tax on aviation (European Commission, 2000a). The Eurovignette Directive, which haulers must obtain to use the motorways of seven Member States (the three Benelux countries, Germany, Denmark, Sweden and Austria) that do not levy motorway tolls, takes effect from 1 July 2000. With EU enlargement, however, the unanimity requirement can be expected to become an even more serious obstacle to fiscal harmonisation. Meanwhile, the idea of energy tax harmonisation in a few EU countries only ('Eco-Schengen') is gaining attention.

1.5. Accession countries play a valuable role

Many countries in central and eastern Europe have several years' experience with elaborate systems of environmental taxes. Slovenia operates a CO₂ tax since 1997. Most of these taxes, as well as many new taxes under consideration, are mainly designed to raise revenue for environmental investments, but in some schemes the incentive function dominates (e.g. reduced VAT rates for environmentally preferable products). Some of the existing taxes are under reform, with a view to improved effectiveness and efficiency, and to future EU membership. The accession countries' experiences and plans with environmental taxation could be a valuable source of information and ideas for the present EU, and vice versa. For example, in the forestry sector in these countries, many taxes are applied, such as on wood production and on changing forestry land to other uses. The Czech Republic operates a tax for alternative use of forested land, which is levied on wood production. The tax is differentiated as to the type of forest, and is higher for 'protected' forests than for 'economic' forests.

2. Effectiveness of environmental taxes

2.1. Evidence of effectiveness is increasing

Most ex-post evaluations have been made in northern European Member States (notably in Scandinavia, Finland and the Netherlands). The evidence indicates that many environmental taxes do have a positive influence on the environment. Water pollution taxes (e.g. in France, Germany, the Netherlands), the Swedish NO_x charge and the tax differentiation on leaded and

unleaded petrol are well-known cases. More recent evaluations have shown that the Danish waste tax, the Danish, Finnish and Swedish CO₂ taxes, the UK fuel duty ‘escalator’ and the Danish tax on sulphur in fuels are producing positive environmental results.

In addition to making environmentally compatible behaviour financially attractive and/or raising revenue for environmental investments, environmental taxes also provide ‘soft signals’ that increase attention, awareness and concern about the environmental issue to which they relate. As these taxes are usually part of a policy package with several other instruments, it is often difficult to disentangle the contribution of each instrument to the overall environmental results. Accurate and sufficient data are also often lacking. The evaluation of policy instrument effectiveness could be facilitated if the introduction of an instrument were accompanied by an ‘in-built’ evaluation framework (as recommended by the OECD, 1997a) in which an evaluation procedure runs alongside the instrument’s design and implementation.

2.2. Combined measures and policy packages may be helpful

In theory environmental taxes can, in a perfect market, achieve any environmental target on their own if designed appropriately and if the tax rate is sufficiently high. In practice, high tax rates are politically not always feasible and an optimal tax design may be too costly. Environmental taxes generally have a lower than environmentally optimal rate and are commonly used in combination with other instruments and measures. These may enhance the effectiveness or reduce unwanted side-effects

of the tax. In particular, possible negative impacts on industry’s competitiveness are usually mitigated by tax-rate reductions or exemptions, or by recycling revenues, in combination with instruments such as voluntary environmental agreements and subsidies that may stimulate industry to achieve the stated environmental objectives. The Danish CO₂ tax system offers a significantly reduced tax rate for firms that agree to energy-conservation measures. The UK plans to create a similar provision in the climate-change levy.

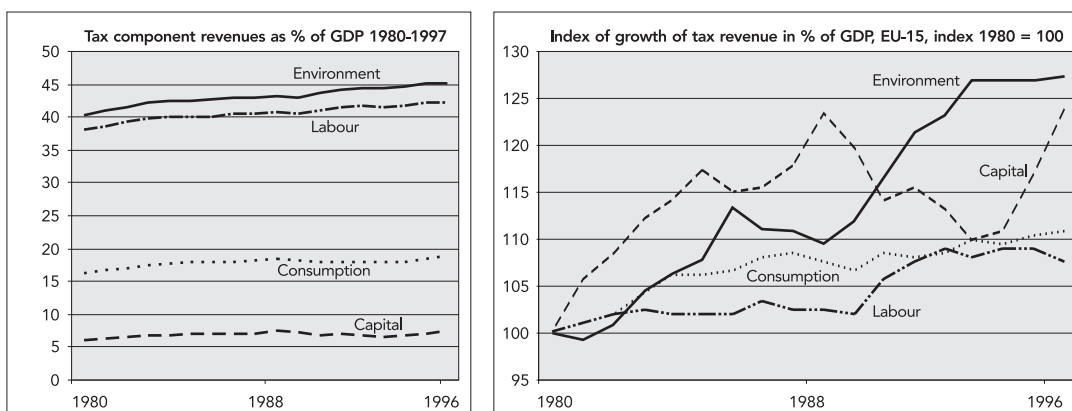
2.3. Ecological tax reforms serve multiple objectives

A majority of Member States (currently Denmark, Finland, France, Germany, Italy, the Netherlands, Sweden and the UK) introduce (or increase) environmental taxes as part of a wider fiscal reform, encompassing measures such as reductions in direct (labour) taxes and/or in social security contributions. Such comprehensive reforms aim at the simultaneous realisation of environmental and other objectives. In particular, shifting the tax burden from labour to environment and resources may contribute to (but not guarantee) an increase in employment alongside environmental improvements (the ‘double dividend’ argument). The shares of taxes raised from labour, capital and consumption remain much larger than the share of environmental taxes.

However, since 1980 and in particular in the 1990s, the share of environmental taxes has indeed been growing faster than the share of taxes on capital, labour and consumption (see Fig. 2). Other objectives to which these ‘Ecological Tax Reforms’ might contribute include innovation and competitiveness. The feasibility of achieving these multiple

Revenues of tax components, 1980-1997

Figure 2



Source: Eurostat, 2000

objectives appears to depend on various factors, including the initial market situation, existing tax distortions, and the design and details of the tax reform.

3. Taxes and the integration of environment into sector policies

Quantification of environmental externalities, and the realisation of 'fair and efficient pricing' via relevant taxes, are two of the EEA's criteria for monitoring progress towards the integration of environmental policies into sectoral policies and strategies. Although most environmental tax revenue comes from energy and transport taxes, progress with the internalisation of external costs is variable across Member States but generally is not great. Preliminary attempts to assess the extent of integration have been made for the 'Cardiff' sectors: transport, energy and agriculture (EEA, 1999a).

3.1. Energy

About 75 % of environmental tax revenue comes from taxes on energy products. Such taxes generally consist of fiscally motivated excise duties and – in an increasing number of Member States – environmental taxes, which are sometimes based on carbon content. Energy taxes include taxes on the final use of energy by agriculture, industry, services, transport and households, as well as on energy used for electricity generation. These taxes improve the incentive to save energy and to develop more energy-efficient technology. However, at current rates, and with economically motivated exemptions for energy-intensive industry, the short-term impact of energy taxes on energy use is usually limited. They have a more pronounced short-term impact on substitution between energy types, as tax rates are often differentiated according to carbon or sulphur content. Tax differentiation schemes with proven short-term effectiveness include those for unleaded petrol and low-sulphur fuels.

The recent substantial increases in the world oil prices seem to have an impact on the use of oil. Petrol consumption in the first half of 2000 in Germany dropped by 4.4 % against the same period in 1999.

3.2. Transport

Almost 20 % of environmental tax revenues in the EU are related to transport (excluding transport fuels). They include, among others, car registration taxes and annual car

taxes. Although these taxes may influence car *ownership*, there is hardly any evidence that they lead to a lower aggregate level of car *use*. Their main (short-term) environmental impact is possibly through tax-rate differentiation by, for example, emission characteristics (as in Austria and Germany) or by weight (influencing energy use, as applied in many countries).

The environmental externalities of transport are estimated at about 5.5 % of EU GDP (INFRAS/IWW, 2000). If the costs of accidents, which are not normally considered as environmental effects, are included, the costs are 7.8 % of GDP, or EUR 530 billion. Only a small proportion is captured by relevant transport taxes. Taxes on air transport are almost non-existent in Europe. However, several studies clearly show that international agreements do not prevent aviation taxation, provided the taxes are based not on the energy used but on the calculated emissions of the aircraft. Recently, the European Commission expressed its intention to introduce such a tax at EU level (European Commission, 2000a).

3.3. Agriculture

There is no similar quantification of *negative* environmental externalities for agriculture as there is for transport and energy, though a preliminary estimation indicates considerable costs due to pesticides and fertiliser use, and biodiversity loss (EEA, 1999a). Apart from some pesticides and fertiliser taxes there are few examples of taxes being used to internalise these costs. Similarly, the *positive environmental externalities* from agriculture, such as carbon sequestration and maintenance of biodiversity justify their internalisation via appropriate subsidies such as the agro-environment measures of the CAP.

4. Barriers to the introduction of environmental taxes can be overcome

Despite the strong theoretical arguments in favour of environmental taxes and the available evidence of their effectiveness, reluctance to expand their application is still widespread. Concern about possible negative effects on income, competitiveness, employment, inflation, and/or income distribution is often a major reason for this restraint.

Experience shows that a careful design, introduction and implementation of environmental taxes can overcome such barriers. Complementary measures such as tax-rate reductions for tax payers that agree to improve their environmental behaviour may reduce or neutralise possible unwanted side effects and thus ease opposition to the taxes. Such measures could include the use of environmental taxes and their revenue as part of policy packages and ecological tax reforms, including reductions in taxes on labour and social contributions, and a clear presentation of the tax as an opportunity for firms and households to save money by changing their behaviour in an environmentally compatible direction.

Also, tax harmonisation at EU level may lower barriers to implementation since it may limit differences in competitiveness of individual Member States. However, the requirement of unanimity voting on fiscal measures at EU level is a barrier to such harmonisation. Concerns about equity can be addressed by tax design, such as exemptions on initial consumption of energy, water etc., progressive tax rates on increasing consumption, or by complementary measures such as energy-efficiency incentives. Modification of EU state-aid rules, for instance to facilitate tax exemptions for firms that take action beyond what is required by environmental law, could also help to remove barriers.

1. The case for environmental taxes

Environmental taxes have been in use in the EEA member countries for some time. Many of the candidate EEA member countries in central and eastern Europe also have considerable experience with environmental taxes. In many countries plans for extending tax bases and increasing tax rates exist, and increasingly environmental taxes are used in the context of an ecological tax reform (sometimes also referred to as 'greening the budget'), creating a shift of the tax burden from labour to the environment and natural resources.

Environmental taxation exists in many forms, and there are various reasons for their application, which are listed and discussed in this chapter.

1.1. Integrating economic and environmental-protection requirements

In 1997, the Amsterdam European Council amended the EC Treaty that came into force in May 1999. With respect to sustainable development, the revised Treaty of the European Community contains essential improvements: Article 2 describing the goals of the EC was changed so that the social and economic goals were given an environmental dimension with the objective of sustainable development:

'The Community shall have as its task, by establishing a common market and an economic and monetary union and by implementing common policies or activities (...) to promote throughout the Community a harmonious, balanced and sustainable development of economic activities, a high level of employment and of social protection, equality between men and women, sustainable and non-inflationary growth, a high degree of competitiveness and convergence of economic performance, a high level of protection and improvement of the quality of the environment, the raising of the standard of living and quality of life, and economic and social cohesion and solidarity among Member States.'

Article 2 states that the common market, the economic and monetary union, and the

other common policies are means to realise sustainable development. Thus, the Treaty gives an important reason for the development of economic instruments as tools for meeting environmental and other sustainability goals simultaneously.

The interconnection of these dimensions is further emphasised by the integration principle in Article 6: *'Environmental protection requirements must be integrated into the definition and implementation of the Community policies (...) in particular with a view to promoting sustainable development.'*

As the Union is primarily an economic association so far, the integration principle applies also and above all to the economic dimension of Community policies. After the Cardiff European Council in 1998, it was a major achievement of the Austrian, German and Finnish EU Presidencies to take concrete steps towards directing the EU on track to sustainable development as a main objective of the Union. As integration primarily implies taking into account environmental requirements in the policies of economic sectors, originally the Transport, Energy and Agriculture Councils, and later also the Development, Internal Market, Industry, General Affairs, ECOFIN and Fisheries Councils were invited to design appropriate strategies.

Environmental taxes may play an important role in such strategies. The Commission working document 'From Cardiff to Helsinki and beyond' (European Commission, 1999d) lists as a main action to be undertaken in this process 'increased use of environmental taxes and charges'. For the energy sector this document formulates as a main action: 'Internalising external costs/environmental benefits and adoption by the Council of the energy products tax'. In transport, 'fair and efficient pricing based on the polluter pays principle including fair taxation of fuels across all modes of transport and a shift towards variable taxation on cars in order to increase people's awareness of the costs of their travel' is listed as a main action, and in agriculture 'the suitability of applying environmental taxes to agricultural input' is to be investigated.

Next to its institutional goals (such as Economic and Monetary Union and EU enlargement), the Union is preoccupied with two social and economic challenges: global economic competition and a high unemployment rate. The European answers to these problems are to increase the competitiveness of European industry and to create more employment opportunities. The question that arises from the integration principle is whether the Union's environmental goals are compatible with competitiveness and job creation. The evidence collected in this publication suggests that they can be compatible, since environmental taxes often achieve or contribute to environmental effectiveness while considering, and sometimes even increasing industry's competitiveness.

With regard to fiscal policy, the integration of environmental aspects into it and vice versa is the objective. A concrete test case is the pending proposal for more harmonised EU-wide minimum tax rates on all energy products.

1.2. Bringing 'externalities' into prices; the 'polluters pays principle'

Environmental damage leads to costs that have to be covered by society. For example, costs for health care and the repair of buildings due to pollution have to be paid

from public and private budgets. If these costs are not covered by the polluter (polluter pays principle), they are 'externalised': the bill has to be paid by someone other than the polluter. For example, pollution from coal-fired power stations contributes to acid rain that damages soil, vegetation, water and buildings belonging to people and countries that do not directly benefit from the power station. And because the prices paid by the power producers and consumers do not include these 'external' costs, they give incorrect market signals, encouraging power production beyond the level of optimal economic efficiency for the economy as a whole. The main economic reason for using taxes in environmental policy is to bring the costs of pollution and other 'externalities' into the prices of the goods and services produced by economic activity.

When externalities are not sufficiently included in prices, they create distortions in the market by encouraging activities that are costly to society as a whole, even if the private benefits, such as car driving, are substantial. Estimating the economic value of externalities of economic sectors is not easy and is restricted to that part of the total that is quantifiable; it is usually an indicator of the lower boundary of costs that are not controversial. Only for transport and energy are estimates available, still facing several

Box 1.1. External costs imposed by the transport and energy sectors

In INFRAS/WWW (2000), the external costs associated with accidents, noise, air pollution, anthropogenic climate change, nature and landscape, urban effects and upstream (indirect) effects have been quantified for the transport sector, including road, rail, inland shipping and aviation. Costs due to congestion are not included. The assessment was done for the EU15, plus Norway and Switzerland (EU17). Total external costs amounted to about EUR 530 billion (in 1995), or 7.8 % of GDP, in the EU17. Excluding accident costs, which are not normally considered as environmental effects, environmental external costs amount to EUR 375 billion, or 5.5 % of GDP. The road sector is responsible for over 90 % of these costs. Cars cause over four times as much costs as the train per passenger kilometre. Also trucks cause over four times as much costs as freight transport by train. The study also contains a trend forecast to 2010, resulting in a 42 % increase in the costs, against projected GDP growth of 39 %.

Fair and efficient pricing implies internalisation of external costs in market prices. An EEA analysis (EEA, 1999b) shows that most Member States currently internalise less than 50 % of the external costs and infrastructure costs from transport through relevant transport taxes. Denmark, the Netherlands and Sweden have high cost recovery rates of above 40 %, while Belgium and Portugal are much lower at slightly less than 15 %. Cost recovery rates are generally higher for rail (39 %) than for road (30 %), although Denmark, Finland, Ireland and Sweden are exceptions to this trend. Public sector policies to encourage rail use, such as by subsidising infrastructure, can explain such differences.

Estimates of external costs are notorious for their wide margins of uncertainty. Thus, other studies have concluded that the degrees of internalisation of external costs from transport are substantially higher than the figures mentioned above (e.g. Roy, 1998).

The ExternE project (European Commission, 1995/1999) estimates the external costs of energy systems (fossil fuel, coal, hydro etc) to be 1-2 % of GDP on average, with fossil fuels being the main contributor to those costs that could be estimated. Much of this external cost is not internalised into market prices, which therefore gives a competitive disadvantage to renewable energy sources. EU policy is to internalise the external costs of energy into market prices. Initial estimates of the externalities of agriculture, both negative and positive, illustrate the range and complexity of these estimates (EEA, 2000).

uncertainties. Estimates of the environmental external costs of transport appear to be large and rising. The environmental externalities of transport are estimated at about 5.5 % of GDP. If the costs of accidents, which are not normally considered as environmental effects, are included, the costs are even 7.8 % of GDP, or EUR 530 billion (see Box 1.1.). In a recent EEA report (EEA, 1999a) the external costs of EU agriculture are roughly estimated at EUR 13.7 billion per year.

The 'ideal' environmental tax includes these external costs in prices (the 'internalisation of externalities') so that both social and private costs are brought closer together¹. The more that prices allow the markets (e.g. transport services, electricity) to work with full costing, the more efficiently they help to internalise these costs. This internalisation of external costs will lead to a re-allocation of resources in the economy according to 'fair and efficient' prices, by redistributing the costs. Thus, environmental taxes help in improving societal welfare.

Internalisation exists in many cases. In a number of countries, for example, a wastewater charge is levied and the revenue used for collection and treatment. If the charge were directly related to the amount of wastewater discharged, and if the charge rate were equal to the additional economic *and* environmental (damage) costs of an extra unit of wastewater, then full internalisation would be secured. But the additional damage costs are seldom known, and often a close relation between the charge rate and the discharged amount is lacking.

The policy basis for internalisation of external costs is found in the 'polluter pays' principle, adopted by the EU in 1974 and reconfirmed in the Rio Declaration on Environment and Development in 1992 (see Box 1.2.). Concerning the sustainable use of natural resources, the Environment Council of December 1, 1991, in preparing Rio 1992, formulated what can be considered as the 'resource user pays' principle (Box 1.2.).

Box 1.2. Policy principles on internalisation of external costs

The 'Polluter pays' principle

'National authorities should endeavour to promote the internalisation of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.' (Rio Declaration, 1992)

The 'Resource user pays' principle

'In order to reach the necessary reallocation of economic resources to achieve sustainable development, full social and environmental costs should be integrated into economic activities so that environmental externalities are internalized. This means that environmental costs and others related to the exploitation of natural resources in a sustainable way and borne by the supplier country should be reflected in economic activities. Economic and fiscal instruments could be among the measures to achieve this.' (Community Platform for UNCED, 1992)

The precautionary principle

Article 174 of the EC Treaty says that Community Policy on the environment '...shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should be rectified at source, and that the polluter should pay.'

1.3. Incentives for pollution abatement at minimum cost

An environmental tax provides an incentive to avoid costs by using, or generating, less of the product or substance being taxed. For example, if sulphur emissions are taxed, producers have an incentive to reduce the emissions, such as by filtering or using materials and processes that create less sulphur pollution. The tax will raise prices for the consumer, creating an incentive to use less of the taxed product. Environmental taxes may be targeted directly at consumers, such as the tax differentials for leaded/unleaded petrol, or at producers, such as carbon taxes. But in all cases they affect both consumers and producers by changing relative prices, which may induce alternative behaviour. This is called the incentive effect of environmental taxes.

However, because price is only one factor that determines behaviour, the success of an

¹ Economists call this a 'Pigovian' tax, after Pigou (1920). According to economic theory, the tax rate should equal the *marginal* environmental costs, or the environmental costs caused by an *additional* unit of economic activity (car kilometre driven, kWh of electricity produced, etc.) at the optimum point. As reliable information on the size of external costs is usually lacking, the tax rate can also be set at a level that provides a sufficient incentive to achieve the pollution reduction desired by the authorities (cf. Baumol and Oates, 1988).

environmental tax in achieving behavioural change depends on the particular market for the substance being taxed. For example, if the use of domestic energy cannot easily be reduced because of a lack of information and money for energy-efficiency measures, then raising the price of domestic energy with a tax may not induce much, if any, of the desired behavioural change. Still it can nevertheless be the impetus for a general awareness and subsequently information exchange on the problem and potential solutions.

Similarly, if the use of cars cannot easily be reduced because of the absence of competitive, safe and reliable alternatives, like public transport or cycling, then raising the price of petrol with an environmental tax may not lead to reduced car use. Inability to respond to a price change (called 'inelastic demand') means that taxes have to be raised to give an incentive effect (and this can then reduce economic welfare by over-taxing some groups), or that additional measures are needed. For example, tax differentials between leaded and unleaded petrol in Europe have been successful because they were accompanied by consumer-awareness campaigns about brain damage to children from lead in petrol, and by regulations – and occasionally tax incentives – on catalytic converters that work only with unleaded petrol. However, disentangling the tax effects from the other elements in a policy package is very difficult (see Chapter 4).

In reducing pollution, taxes can be a more cost-effective tool than regulations. This is because taxes on pollution provide an incentive to apply all available low-cost pollution-abatement options, whereas polluters facing high abatement costs may prefer to pay the tax instead of investing in abatement equipment.

1.4. Dynamic incentives towards pollution-abatement technology

Tax payments will provide a continuous incentive to seek new ways to reduce pollution, unlike regulations that provide no such incentive once the regulatory standard has been met, leaving any remaining pollution for free. This dynamic incentive of taxes is one of the ways in which environmental taxes help to minimise pollution-control costs and to encourage innovation – and thus to develop environmental policy further in a dynamic

way. There are basically two ways in which the dynamic efficiency of taxes can become manifest in the productive sector: technological and managerial innovation in individual firms, and the exit and entry of firms, which can create an improved environmental performance of the sector as a whole.

There is little empirical evidence on the magnitude of dynamic efficiency in terms of environmental and economic effects. OECD (1997a) reviews some evaluation studies but evidence on dynamic efficiency is scarce. One such case concerns the Dutch water pollution tax that eventually induced liable firms to develop and establish technologies for improving the quality of their wastewater before it was discharged.

An increase of the prices of fossil-fuel energy, or water, or waste through environmental taxes can encourage new ways of meeting our needs. Such innovation can lead to new technologies, processes and products. For example, the US tax on CFCs helped to encourage the development of substitute chemicals that were then exported (cf. Cook, 1996). Similarly, the Swedish tax differentiation on diesel oil helped to encourage the introduction of new, less polluting fuels (cf. Swedish EPA, 1997). Environmental taxes can therefore help to move our economies towards a more 'eco-efficient' use of energy and resources by raising the price of nature (Weizsäcker 1996 p. 143).

Sustainable development seems to require large increases in 'eco-efficiency' (e.g. by a factor of 10 – see Carnoules Declarations, 1994-1995). Such large-scale structural changes in production and consumption can be encouraged by environmental taxes, especially if their price signals are gradual and predictable over the long planning periods required by industry. Given the uncertainty about the effects of many of our chemicals and other products on humans and the environment, any increase in eco-efficiency that environmental taxes encourage also helps to implement the 'precautionary principle', i.e. the reduction of exposure to substances before there is conclusive evidence of serious harm.

Innovations that are encouraged by taxes can also help to improve competitiveness. The OECD considers these dynamic efficiency gains to be one of the main advantages of environmental taxes (OECD 1996 p.12).

1.5. Raising revenue

Given that producers and consumers will probably not entirely cease the activities that are being taxed, the taxes and charges will raise revenues. These can be used in several ways:

1. To feed the general government budget;
2. To reduce other taxes, for instance on labour or capital, simultaneously, so that budget neutrality is achieved ('ecological tax reform'; see Chapter 2);
3. To provide funding for particular purposes ('earmarking')
 - a) related to the tax base (e.g. to finance a collective environmental service, or to compensate those who pay the tax through 'recycling' of revenues, or to reduce tax rates for specific environmentally friendly activities);
 - b) for other specific purposes (e.g. environmental subsidy schemes).

Nowadays, many governments aim at reducing or stabilising the total tax burden, so that option 1 is quite exceptional. Option 2 is more popular, especially because it holds the promise of reducing tax distortions (see below). Option 3 is often chosen for reasons of political feasibility and acceptance, and increasingly for creating an environmental incentive additional to the tax incentive, for increased environmental effectiveness. An example is the Dutch 'charge and reward' policy, explained in Chapter 3.

1.6. The 'double dividend' argument

Establishing market prices for external environmental effects through taxes and charges is advocated because it should improve the functioning of the market. As the European Commission puts it in a recent Communication (European Commission, 2000b) '... macroeconomic competitiveness should be enhanced by moves towards better integration of environmental concerns.'

A tax strategy that introduces externalities into market prices may have additional benefits. Taxes on 'goods' such as income, employment and investment are raised in order to create the necessary means enabling

the government to do its work. Such taxes are burdening the economy, since they distort the functioning of the market. A US study shows that each dollar raised in taxes costs about 20-30 cents in lost economic output (Ballard, Shoven and Whalley, 1985). In an 'ecological tax reform' (ETR), taxes on 'bads' such as polluting activities and products create revenues that could partly² replace the revenue raised by the taxes on 'goods', thereby shifting the tax burden from the 'goods' to the 'bads'. An ETR could both reduce pollution and decrease the distortion effects of the tax structure as a whole. This is the so-called 'double dividend', wherein the second dividend is usually interpreted as an increase in employment through the reduction of direct taxes (income tax, social contributions) as well as taxes indirectly affecting income, such as VAT.

This 'double dividend' is not automatically secured in practice. Economic analyses (e.g. Heady et al., 2000) reveal that an increase in employment only will occur under special conditions concerning the labour market, the existing tax structure, and international economic relations in the markets for products and capital. Referring to Heady et al. (2000), four prominent conditions for the existing of any double-dividend effect can be listed:

- The environmental tax can be passed on to factors for which the demand is not very sensitive to price changes
- The tax can be passed on to non-workers
- Labour and energy are easier substituted for each other in economic processes than energy and capital
- Real wages are not very sensitive to the level of employment

Bosquet (2000) states: 'For the double dividend to arise, the tax system must be inefficient in a way that fully compensates for what otherwise would be the relative inefficiency of green taxes as a means of raising revenue.' Although environmental taxes do not create distortion in theory, second-best applications in practice are bound to create certain inefficiencies. The balance of such inefficiencies and the theoretical and practical inefficiencies of other forms of taxation are decisive for any positive effects on employment to appear.

2 EUROSTAT data show that environmentally related taxes have a share of about 7 % in the total revenue of taxes and social contributions in the EU, in 1997 (see Chapter 3), which is about one percent more than in 1980. In the hypothetical case of a doubling of these taxes, taxes on 'goods' can only be reduced by 7.5 %, in case of revenue-neutrality.

This should be assessed on a case-by-case basis.

In a recent study for the European Commission, Heady et al. (2000) present a review of model calculations of the impact of a switch of taxes from labour to energy or carbon. They conclude that almost all models show a positive impact on employment, but they differ in the size of the impact. In an empirical analysis, the 1992 European Commission proposal for the CO₂/energy tax (a tax rising to \$ 10 in seven years) is found to create in the EU one to a few hundreds of thousands of new jobs, and to result in a reduction of carbon emissions of 1 to 2 % of the 1990 amounts.

Because of the uncertainty of the 'second dividend', it is generally accepted that ETR should concentrate on its 'first dividend' of welfare improvements associated with a cleaner environment. Incidences of market improvements resulting in less unemployment can then be considered as an 'extra dividend'.

1.7. Changing the distribution of income and welfare

Regarding the implementation of indirect taxes, to which environmental taxes belong, it is important to raise the question of the justice of income and welfare distribution. The impact on income distribution is generally hard to determine, as people with similar incomes tend to have widely different spending patterns. The distributional impact will also depend on the way in which the revenues are used. From the point of view of welfare distribution, the initial distribution of externalities must also be analysed, i.e. who is most heavily affected, who 'pays' more than the average population in terms of external damages as well as who causes them, so that economic welfare can be maximised when designing environmental taxes. As with car transport, it often appears that the poor, or least-advantaged, 'pay' most of the external costs. This could be demonstrated in Berlin where low-income groups are particularly affected by emissions of all kinds and would benefit more than others from a reduction in emissions (Luhmann *et al.*, 1998).

1.8. Exploiting multiple environmental gains

Environmental problems are interrelated. Often a single pollutant will contribute to several different environmental problems.

Reducing this pollutant is therefore likely to alleviate several problems, although the exact effects will be hard to predict with certainty. An environmental tax on one item can thus have beneficial effects on a number of environmental problems. This should be taken into account when the rate of the tax is being set, and when cost effectiveness is being evaluated. More specifically, synergy could be exploited between the introduction of an EU-wide higher taxation on energy products and other directives 'in the pipeline' to reduce particles, ground ozone and other toxic emissions.

1.9. Broadening the range of instruments and mutual reinforcement

A broadening of the range of policy instruments, which was identified as a 5th EAP objective and which would indicate a move towards integration, has taken place since 1992, and there is now evidence of a greater use of taxes, environmental agreements and information to supplement legislative measures at Member State level. In the case of economic instruments, more environmental taxes and other economic instruments are in use, especially in the energy and transport sectors (cf. Chapter 2).

While broadening the range of instruments appears to be useful, the right mix of instruments remains crucial to their effectiveness. According to the EEA report

Box 1.3. Synergy between environmental taxes and voluntary commitments: some examples

In Denmark, an environmental agreement was reached in 1991 on the collection of used nickel-cadmium batteries. Under the agreement, manufacturers committed themselves to achieve the collection of 75 % of scrapped batteries. However, only 35 % of the spent nickel-cadmium batteries had been collected in 1995. Against this background, a tax on these batteries was introduced in April 1996 to make achievement of the target more reliable (Danish Ministry of Finance 1995, p. 23f).

A tax on PVC and phthalates was introduced in Denmark in 2000. This is also the consequence of a failure of an environmental agreement to reduce the use of these substances that create pollution in the production phase.

In Belgium, a number of (planned) environmental taxes on products fulfil a comparable complementary role. Firms only have to pay these taxes if they fail to meet certain targets concerning recycling, etc. The practice is that very little is paid, because most liable actors have implemented recycling schemes.

on environmental agreements, 'environmental agreements appear to be of most use as complements to other policy measures, such as regulations and fiscal instruments' (EEA 1997, p.9). Environmental taxes can be used both as

'carrots' and as 'sticks'. Voluntary agreements and commitments can often be achieved more easily if the alternative is the introduction of a levy, or if there is a reward in the form of a tax exemption (cf. also Box 1.3.).

2. Types of environmental tax

The subject of this assessment is 'environmental taxes'. In this chapter, the meaning of this term is elaborated. In the previous report (EEA 1996), the issue of a 'definition' of the term 'environmental taxes' was addressed. A statement given in OECD (1995, p.7), which also dealt with environmental taxes, applies. Defining the scope of the work is inevitably imprecise. Similar measures in different countries may be variously defined as taxes, charges, levies, fees or duties, and it is not the intention to enter into semantic discussions of the borderline between these concepts.' The present report uses the terms 'taxes' and 'charges' according to the OECD/Eurostat definitions (see OECD, 1997b) where 'tax' refers to 'unrequited' payments (the revenues going to the general budget or being earmarked for some purpose unrelated to the tax base) and 'charge' to 'requited' payments (the revenues being recycled or used for purposes related to the charge base). However, for ease of reading, the term 'taxes' is used to cover both taxes and charges, unless explicitly stated otherwise.

Environmental taxes and charges can be classified in several ways. Options are to distinguish them according to:

- Main objective: cost-covering charges, incentive charges, (fiscal) environmental taxes
- Main field of operation: energy taxes, transport taxes, pollution taxes and taxes on natural resources (other than energy)
- Point of application: pollution taxes, product taxes, taxes on capital goods, taxes on activities
- Tax base: fuel taxes, wastewater taxes, emissions taxes, taxes on packaging, etc.

2.1. Objectives

Regulating and treating emissions in land or water costs money. In accordance with the 'polluter pays principle', it was considered appropriate that the cost of regulation and treatment should be paid by those being regulated (polluter pays principle). Hence, the first category of environmental taxes, still important today, is that of **cost-covering**

charges, whereby those making use of the environment contribute to or cover the cost of monitoring or controlling that use. The effectiveness of cost-covering charges stems from both the revenue use (financing the supply and management facilities) and their impact on the price, thus expressing the scarcity of natural resources and sinks. Cost-covering charges can be of two types:

- *User charges*, where the charge is paid for a specific environmental service provided to the charge payer. Example: treating wastewater or disposing of waste.
- *Earmarked charges*, where the revenue from the charge is spent on related environmental purposes but not in the form of a specific service to the payer. Example: revenues to finance recycling services, e.g. of used batteries.

The main shortcoming associated with the concept of 'cost-covering charges' is implied in the 'cost' concept regularly applied. Normally only part of the total cost is really covered by polluters, i.e. the cost of services that usually only prevent or mitigate part of the environmental damage. Consequently, the true 'environmental' cost, the monetary equivalent of the damages not mitigated, is *not* covered by 'cost-covering charges'. Applying a concept of covering total cost would result in a financial surplus. This kind of 'rent-skimming' is therefore not charging but taxation (it is unrequited), and justifiable as it can be considered as an internalisation of negative externalities.

An environmental charge may be levied purely with the intention of changing environmentally damaging behaviour, and without any intention to raise revenues. Such a charge may be termed an **incentive charge**. The level of an incentive charge can be set according to estimates of:

- the cost of the environmental damage (Pigou, 1920);
- what price signal will be sufficient to achieve the environmental objectives (Baumol and Oates, 1988).

Although the intention may not be to raise revenues, revenues are likely because the use

of the taxed product or the activity will normally not be reduced to zero. Revenues are then often used to further encourage behavioural change through grants or tax incentives. One example is the Swedish charge on NO_x , the revenues of which are refunded to the firms that pay the charge, proportional to their energy output.

Environmental taxes designed mainly to raise revenues for government income are here called **fiscal environmental taxes**. Fiscal rules normally exclude earmarking. The tax system is designed so as to raise sufficient government income, whilst avoiding economic distortion as much as possible. The spending of the tax money is a matter of political debate and consensus, and is usually unrelated to the tax system. A relation is made in specific cases, such as where government subsidies are part of an environmental programme, including environmental taxes. In the design of the tax system increasingly green elements can be found. They consist of a shift in taxes away from income and social contributions towards taxes on the consumption of resources and environmental pollution (Ecological Tax Reform, ETR). ETRs often include energy taxes and several non-energy taxes like taxes on waste, wastewater, pesticides, fertilisers, sulphur, etc. Chapter 3 gives more details and examples.

Clearly, the three types of environmental tax distinguished above are not mutually exclusive: a cost-covering charge may have incentive effects, as may a fiscal environmental tax, or the revenues from a fiscal environmental tax may be partially used for related environmental purposes. The motivation for the taxes may even alter over time.

2.2. Fields of operation

In addition to classifying environmental taxes according to their main function or objective, one can also classify them according to the main field of operation: energy taxes, transport taxes (e.g. taxes on vehicles), and taxes on pollution and non-energy natural resources (e.g. taxes on emissions, non-energy products, raw materials and waste).

This classification is defined from a statistical point of view. Whereas the main objective or purpose of a tax may not always be clear, its

field of operation may be more easily determined.

Eurostat, OECD and IEA defined this classification for statistical purposes. The motive for including energy and transport taxes is that these taxes also have a (potential) environmental impact, either intended or not. Eurostat used it to construct time series for the revenues of environmental taxes (see below). A practical deficiency of this classification is that it excludes charges (required payments) because of poor data availability. Environmental tax revenues are much better recorded, as they are part of federal or national fiscal systems.

2.3. Point of application

A third way of classifying environmental taxes is by the point of application of the tax. Taxes can be levied on pollution, on products, on capital goods, or on activities. Ideally, a tax should be directly imposed on the environmentally damaging object, as its potentially correcting impact is most accurate. Examples include taxes on measured quantities of chemicals in wastewater (BOD, COD) and in air pollution (SO_2 , NO_x). This is not always possible, however, as an effective tax is often complex and difficult to implement and enforce. Then a tax is imposed on the pollution-creating product or activity, as a proxy of the pollution itself. Sometimes the proxy may be precise, as is the case with CO_2 from the combustion of various types of fuel), but more often it is rather imprecise, so that the tax is a compromise between environmental effectiveness and practical applicability.

The choice of the point of application of a tax is a major decision in tax design.

2.4. Tax bases

Classification of taxes according to the tax base is an extension of the classification by fields of application. In its database of taxes and charges, the OECD is to a large extent using this classification, distinguishing among such bases as petrol, diesel, coals, coke (and other energy carriers), sales and registration or annual use taxes on motor vehicles, and products such as artificial fertilisers and ozone-depleting chemicals.

In the description of the use of environmental taxes in EU Member States (Chapter 3), a combination of classification according to fields of application and tax bases is followed.

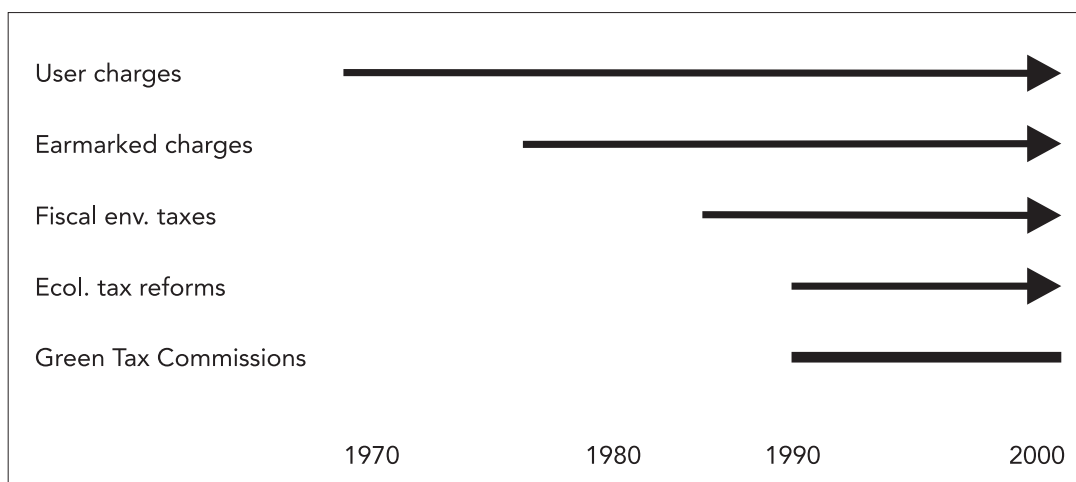
2.5. Development in types of taxes and charges

Figure 2.1. gives a broad picture of the evolution of environmental taxes in the last three decades, as well as of the existence of Green tax commissions. Cost covering and earmarked charges dominated in the early years of environmental policy. In recent years the emphasis has shifted to fiscal

environmental taxes and ecological tax reforms, while the other types continue to play their (often still expanding) role. Green tax commissions have played (and still play) a supportive role in many countries. In general, the instrument of environmental taxation has evolved from a financing device in the 1970s to an integral tool of environmental policy. This does not imply that environmental taxation is a major tool among the other tools of environmental policy. It is still rather marginal in most of its applications (as Chapters 3 and 4 will argue), and often functions as an add-on to other policy measures.

General chronological evolution of environmental taxes; Green tax commissions

Figure 2.1.



Source: Eurostat, 2000

3. Use of environmental taxes in Europe

3.1. Introduction

During the 1970s and 1980s the environmental discussion centred on the subject of pollution. Problems of industrial emissions and waste were of increasing public concern. Governments reacted with regulations focused mainly on the 'end-of-pipe' in order to regulate this undesired industrial output with standards and technology. To raise revenue for abatement, research and development of new technical devices, cost-covering charges were introduced (e.g. the wastewater charges in the Netherlands and France).

In the 1990s the focus shifted in light of the debate around the Earth Summit in Rio de Janeiro. Resource use, production and consumption patterns in the industrial

countries became a matter of concern with regard to the developing economies of the Third World and their compatibility with the world's carrying capacity. Now, discussions emerged for a general shift of industrialised economies towards sustainability. The Delors 'White Paper on Growth, Competitiveness and Employment' published by the European Commission (1993) was a milestone in a widespread discussion of market-based instruments – not only among environmentalists, but across all sectors of society.

In some countries the use of economic instruments has spread widely, particularly in Scandinavia, Finland and the Netherlands, but also to some extent in other European countries such as the UK, France, Italy, Austria, Germany and Belgium. They are

Box 3.1. Details of ecological tax/budget reform commissions

Country	Year of introduction	1. Environmental taxes	2. Recycling revenues	3. Damaging subsidies	4. Within context of broader tax reform
Austria	1998	+	+	+	+
Belgium	1993	+	+	-	-
Denmark	1993	+	+	-	+
Finland	1999	+	?	?	+
Ireland	1996/97	+	+	-	?
Netherlands	2000/1995*	+	+	-	+
Norway	1994/1990*	+	+	+	+
Sweden	1995/1988*	+	+	-	+

+ = considered

- = not considered

? = unknown or unclear

* = earlier commission existed in this year

Comments:

- Austria: Though environmental taxes were examined as part of a major tax reform, no implementation of either results of the Commission took place due to forthcoming elections. The report was published at the end of 1998 (<http://www.bmf.gv.at>).
- Belgium: The main tasks of the "Follow-up Commission on Environmental Taxes" are to evaluate the existing taxes, to propose adaptations and possible new taxes, and to advise on changes in the law.
- Denmark: Commission facilitated the implementation of an ecological tax reform; strong political commitment.
- Ireland: An inter-ministerial committee published a report with several deliberations mid-1999.
- Netherlands: Commission helped to accelerate implementation and acceptance of environmental taxes in the 1990s. A new Commission was installed in 2000.
- Norway: Commission made concrete proposals for environmental tax reform, taking into account employment issues. The Commission released a report on its work in 1997.
- Sweden: Commission did some macroeconomic modelling and came up with concrete proposals.

Source (updated): Schlegelmilch 1998

also in use in the transitional economies in eastern Europe, as well as in the more advanced industrialised economies in Asia. In the 1990s the command-and-control approach established in the early phase of environmental regulation was gradually evolving into a mixed-policy approach including the use of market-based policy instruments. In economies in transition, such as Poland, Hungary and Estonia, environmental charges and taxes were seen as a promising mechanism to integrate economic and environmental policies (OECD 1994a, Schlegelmilch 1999).

The OECD's (1989) first comprehensive survey of the use of environmental economic instruments in member countries included taxes and charges, subsidies, deposit-refund systems, emissions trading and financial enforcement incentives. That report identified about 150 instruments in use in 1987, or 100 if subsidies, purely administrative charges and liability are excluded. Later surveys (OECD, 1994c; OECD, 1999b) showed a considerable increase in the use of such instruments and notably of taxes and charges.

By 2000, eight countries have had official task forces or commissions to explore opportunities for market-based instruments in environmental policy, and/or for a more general ecological tax reform. The commissions varied in their make-up: some were inter-ministerial, some included a broad societal representation. In their concluding reports, these commissions usually came up

with more or less detailed proposals, which were frequently brought into the political debate, sometimes resulting in new initiatives or further reforms. Box 3.1. provides some details.

This chapter presents recent developments in environmental taxes and charges and deals with such aspects as rising tax revenue, spreading taxes over countries and the emergence of new tax bases. The chapter describes developments at EU level and provides an overview of the use of taxes by country. Finally, developments in some specific areas are described.

3.2. General trends

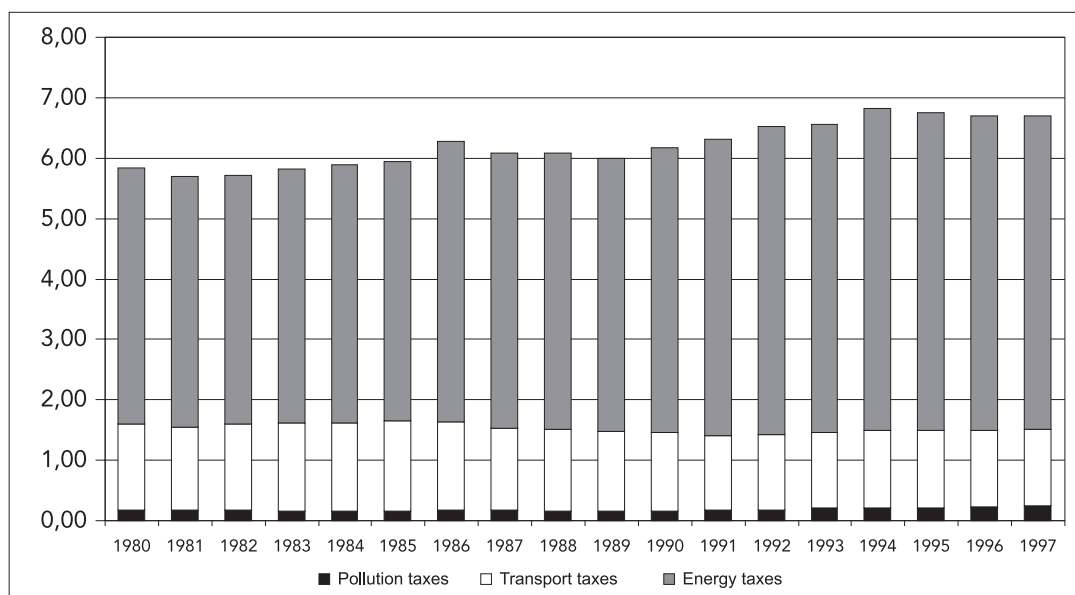
3.2.1. Environmental tax revenue trends

Although it is difficult to get hard evidence on the functioning of environmental taxes, for one indicator information is more readily available. Eurostat is collecting information on the revenues of environmental taxes and provides data series up to 1997 (Eurostat, 2000; EEA, 2000). The time series includes energy taxes, transport taxes and taxes on pollution (including taxes on natural resources other than energy) but excludes charges, due to lack of data. Figure 3.1. shows the environmental tax revenue as a percentage of total revenue of taxes and social contributions.

The share of environmental taxes in total tax revenues in the EU15 is still relatively small. It was 5.8 % in 1980 and increased to 6.8 % in 1994, mainly due to higher energy taxes.

Revenues from environmental taxes as % of total taxes and social contributions, EU15, 1980-1997

Figure 3.1.



Source: Eurostat, 2000

Since then, it has remained more or less stable: in 1997, it was 6.7 % (Eurostat, 2000). Among EU Member States, the share in 1997 ranged from 5.3 % in Austria and Germany to 9.7 % in Portugal. Taken as a percentage of GDP, it ranged from 2.1 % in Spain to 4.9 % in Denmark (see Figure 3.2.).

Energy is the main tax base from which environmental tax revenues are drawn: it accounts for more than 75 % of these revenues in the EU15. Transport accounts for almost 20 % and taxes on pollution and resources for less than 5 %. Among the energy-based taxes, motor vehicle fuels

Table 3.1. Trend in types of environmental tax as share of total tax revenue, 1990-1997

EU15	1990	1997	% change
Energy taxes	4.708	5.184	10
Transport taxes	1.293	1.264	- 2
Pollution taxes	0.163	0.246	51
Total taxes	6.174	6.706	9

Figure 3.2. Structures of revenues from environmental taxes as % of total revenues from taxes and social contributions in EU Member States, 1997

Source: Eurostat, 2000

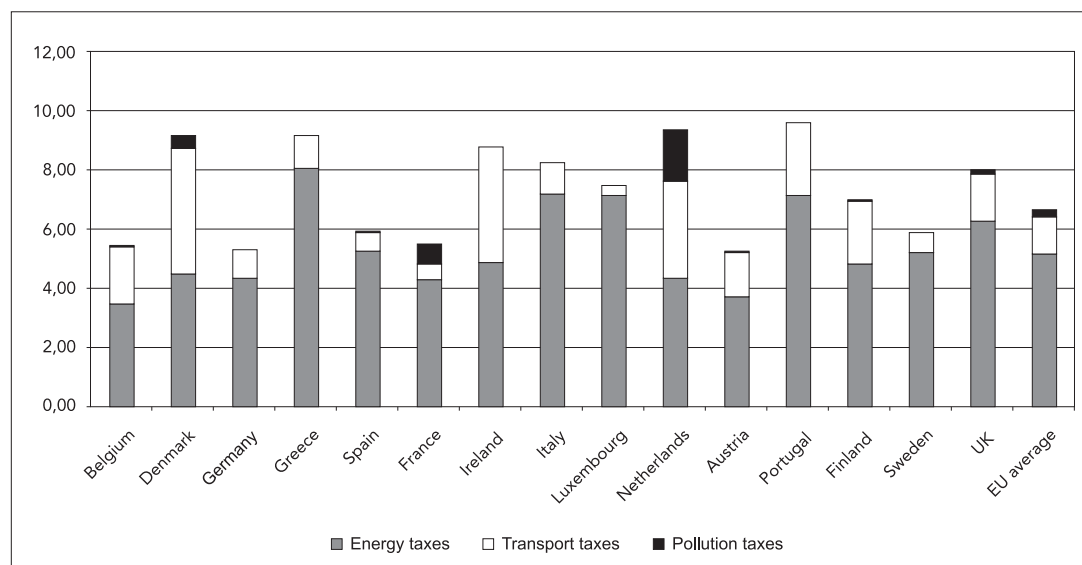
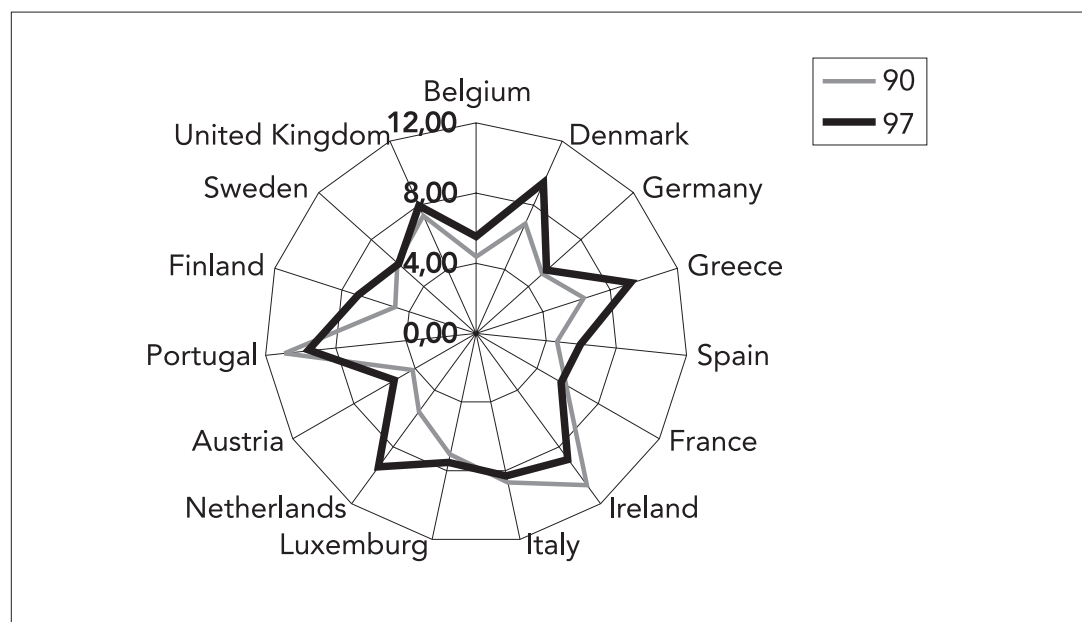


Figure 3.3. Revenue of environmental taxes as percentage of total taxes, 1990 and 1997

Source of data: Eurostat, 2000



generate by far the largest part of revenues (OECD, 1999a).

Importantly, the classification of environmental taxes, as reflected in Eurostat revenue figures, is not uniform among EU countries. For example, revenue figures for Denmark, France and the Netherlands include water pollution and waste collection taxes, as they are part of the tax system, making the share of pollution and resource taxes in total environmental tax revenue non-negligible. Such charges are not included in the figures for other countries.

Although pollution taxes (including resources) are marginal, their growth in terms of the share in total tax revenue is significant and much larger than the growth of energy taxes (up 10 %) and transport taxes (down 2 %).

In most EU Member States the share of environmental taxes increased in 1990-97 (Fig. 3.3). It remained stable in Sweden and Germany, grew strongly in Denmark, Finland, Greece and the Netherlands, but decreased in Ireland and Portugal.

Figure 3.4. shows that the growth in revenue from environmental taxes for the EU as a whole (expressed as a percentage of EU GDP) has been larger than the growth in revenue from taxes on labour, in the period 1980 to 1997. In terms of indices (1980 = 100), environmental tax revenue grew by 28 % whereas labour tax revenue rose by 7 %. This indicates a relative shift away from

labour taxation to environment-related taxation. The shift is most pronounced from 1990 on at the time of the first ecological tax reform initiatives (notably in Sweden). Labour tax revenue however continues to rise as a percentage of GDP.

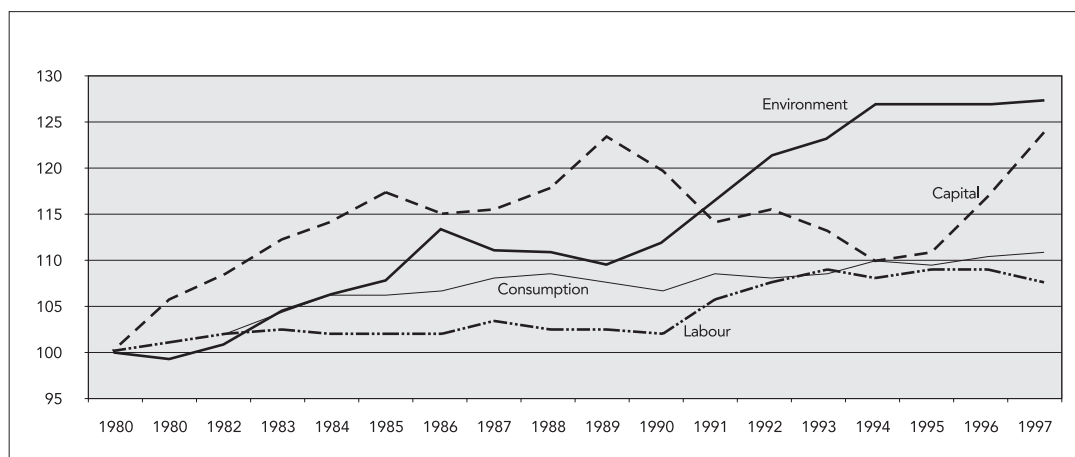
The relevance of the revenue as an indicator of the impact of environmental taxes is limited, however. A revenue increase may result from different developments. The number of taxes and/or the rates of individual tax schemes may have increased. If a revenue increase runs in parallel to the extension of the taxes, the behavioural impact of taxes may have been insignificant. An increase may also indicate that pollution, products or activities on which the taxes are imposed have grown. Some taxes may have been successful in changing behaviour resulting in smaller revenue, but other tax bases may have outgrown these reductions.

The only conclusion one can draw is that, given the increase in the share of environmental taxes, as of GDP, there is a tendency to present a larger part of the environmental bill to economic sectors in an attempt to make progress with internalisation of external effects and to encourage economic subjects to take more environment-friendly directions.

The remainder of this chapter and the next chapter provide more information on what actually happened to environmental taxes and ecological tax reform in the past couple of years.

Index of growth of tax revenue as % of GDP, EU15, index 1980=100

Figure 3.4.



Source of data: Eurostat, 2000

Table 3.2. Development in environmental tax bases in EU Member States, 1996-2000, indicating year of introduction of CO₂ taxes

Tax on:	A	B	DK	FI	FR	GE	GR	ICL	IRL	IT	L	NL	NO	P	SP	SW	UK
Energy																	
CO ₂ *			1992	1990	2001	1999				1999		1992	1991			1991	2001
Transport																	
Diff annual car tax																	
S in car fuel																	
Water effluents																	
Waste-end																	
Dangerous waste																	
Tyres																	
Disposable razors																	
Beverage containers																	
Disposable cameras																	
Raw materials																	
Packaging																	
Bags																	
Disposable tableware																	
Pesticides																	
CFCs																	
Batteries																	
Light bulbs																	
PVC/phtalates																	
Lubrication oil																	
Fertilisers																	
Paper, board																	
PE																	
Solvents																	
Aviation noise																	
NO _x																	
SO ₂																	
Minerals (P, N)																	
		in 1996			new in 2000												

3.2.2. Emerging tax bases

Although the emphasis in environmental taxation is still on energy and transport, the interest in other tax bases is increasing. Table 3.2. shows new tax bases in 2000 compared with 1996, as well as an extension of existing tax bases to other countries in that period.

New tax bases include annual car taxes differentiated according to environmental characteristics (Germany), waste-end taxes (in Austria, Finland, France, Greece, Italy, Norway, Sweden and the UK: already existing in Denmark and the Netherlands in 1996), packaging (in Italy; taxes on various types of packaging already existed in 1996), PVC/phtalates (Denmark), and solvents

(Denmark and Norway). More details can be found in the country-by-country description of the use of taxes in the next section.

3.2.3. Value-added tax

Not only do 'pure' environmental taxes indicate awareness and willingness to act on environmental issues, they also reflect the general taxation and the degree to which environmental aspects are dealt with in an integrated manner. An obvious tax that can be compared among countries is value-added tax (VAT). Table 3.3. shows the standard VAT rate for the EU15 and some other European countries, as well as the reduced rates, to the extent that these reduced rates can be regarded as environmental incentives³. VAT exemptions

3 Reduced VAT rates for public transport are applied in most countries and therefore not mentioned in the table.

and reduced rates that may have an environmentally *adverse* impact (e.g. reductions for certain fuels, usually maintained for social reasons) are not included.

In the period 2000 to 2002, Member States have the possibility to experiment with a reduced VAT rate on several labour-intensive services⁴. Although this arrangement is primarily intended to support services in the lower section of the labour market, it may have a positive environmental influence in some cases, since the arrangement may include such services as bicycle repair shops

and housing maintenance services. The Netherlands introduced this arrangement in early 2000.

3.3. Main features of environmental taxes in Europe

The following is a short overview of the environmental tax situation in the EU and each EU Member State, as well as in Iceland, Norway, Switzerland and the accession countries (except Malta). Two boxes highlight the situation in the four largest EU Member States and in the accession countries.

VAT rates in European countries (latest available information)

Table 3.3.

Country	Standard rate (%)	Reduced rate (%)	Environmentally relevant items to which reduced rate applies
Austria	20		
Belgium	21	0	certain recovered materials and by-products
Bulgaria	20		
Cyprus	8		
Czech Republic	22	5	several environmentally preferable and/or energy-saving products
Denmark	25		
Finland	22		
France	19.6	2.1	treatment of waste and wastewater
Germany	16		
Greece	18		
Hungary	25	12	car equipment with environmental relevance (e.g. catalytic converters), waste water treatment equipment, certain fuels
Iceland	24.5		
Ireland	21		
Italy	20	10 0	urban waste, purification stations, renewable energy scrap metals
Latvia	18		
Lithuania	18		
Luxembourg	15	3	treatment of waste and wastewater
Malta	15		
Netherlands	17.5	6	bicycle repairs, house maintenance
Norway	23		
Poland	22	0	certain products and services related to environmental protection
Portugal	17	5	solar power and alternative energy sources
Romania	22		
Slovakia	23	6	low-solvent paint, low-sulphur heating oil, renewable fuels, measuring equipment for heat and water consumption, wastewater and waste-disposal treatment services
Slovenia	19	8	waste treatment
Spain	16		
Sweden	25		
Switzerland	7.5	0	reusable containers; certain second-hand goods
Turkey	15	8	natural gas
United Kingdom	17.5	5 0	certain energy-saving materials treatment of waste and wastewater

Sources: OECD (1999a); EC (1999b); REC (1999); EC (1997); National Ministries of Finance

4 Directive 1999/85/EC, amending the 6th VAT Directive

3.3.1 Environmental taxation at EU level

No environmental taxation is yet in force at EU level. However, compulsory minimum tax rates on mineral oils have existed since 1993. Recently, the Commission has proposed to introduce a kerosene tax on aviation (European Commission, 2000a).

Several attempts have been made to introduce a CO₂/energy tax as well as to broaden the concept of minimum excise rates to all energy products and to increase rates gradually. In the early 1990s a discussion arose on the introduction of a CO₂/energy tax at EU level (European Commission, 1992a). It was considered an appropriate and effective means of combating the greenhouse effect, by spurring towards eco-efficiency the innovation and production patterns in business in particular, but also the consumption patterns of society in general.

Prior to the Earth Summit in Rio de Janeiro in 1992, the European Commission came up with a concrete proposal for its introduction (European Commission, 1992a). However, no consensus could be reached in the respective ECOFIN Council (consisting of Ministers of Finance and of Economic Affairs), though introduction was eventually made dependent on its launch in other OECD countries (such as Japan and the US). Furthermore, energy-intensive industries were foreseen to be exempt.

Since progress was too slow for several countries, they introduced such a tax unilaterally (in addition to ordinary mineral oil taxes), e.g. Finland (1990), Sweden (1991), Norway (1991), Denmark (1992), and the Netherlands (1992). Germany and Italy introduced such taxes in 1999 and France and the UK will implement them by 2001. By then, the majority of EU Member States will operate some form of a CO₂ tax or CO₂/energy tax.

The CO₂/energy tax was just one of several instruments proposed. Others included financial support for energy efficiency and renewables (through programmes such as SAVE, ALTENER, JOULE and THERMIE) as well as EU-wide energy-efficiency standards for appliances. The need to broaden the range of instruments (to include fiscal instruments) but also the need to integrate environmental concerns into other policies was emphasised in the Fifth Environmental Action Programme (5EAP, European

Community 1993). After three years of discussion without any real progress, the Commission came up with a more flexible proposal (European Commission 1995), in which it allowed for flexible national time-plans with regard to the exact date of introduction and the rates for the tax. However, by 2000 at the latest the tax would have to be implemented by all Member States. Again, this proposal faced opposition due to the fact that, in the end, the introduction of such a tax would be obligatory.

The most recent attempt by the European Commission to advance the debate and the introduction of energy taxation was the proposal to broaden existing minimum excise rates and legislation on mineral oils to all energy products (apart from renewables), and to increase these minimum excise rates in three steps in 1998, 2000 and 2002 (European Commission 1997a). The Council has not yet adopted this proposal. In its proposal the Commission points out that minimum excise rates were often not even adjusted to inflation as would be required to keep up the incentive.

This 1997 initiative by the Commission not only was supported by ECOSOC, where members agreed in principle, but also by the European Parliament which supported the introduction of such energy taxation across all country representatives. Furthermore, the Parliament launched a debate on 'Greening the Budget of the EU' in 1996. Within this joint initiative of the Committees for the Environment and for Fiscal Affairs, the Commissioners of major Directorates General of the European Commission were asked to show that the way they spent and intended to spend their resources would be in line with sustainable development and thus with the Maastricht and the Amsterdam Treaties. Agricultural policy and structural funds were at the core of discussion since both account for about 80 % of the EU budget.

On 17 July 1998, the European Parliament (EP) adopted the 'Olsson report', making clear that it wanted EU-wide taxes on energy. The Commission was then asked to elaborate on a possible third higher VAT rate on energy. The resolution also calls for a change in how member states vote for measures on energy tax, in other words to change the unanimity voting at least into qualified-majority voting. The EP amended the

minimum tax rate proposal in 1999 by proposing to start with the tariffs originally meant for 2000 and to index the tariffs for the following years on the basis of the inflation rate, plus 2 percentage points.

The Netherlands and others made a strong point in the Environment Council in June 1998 that the then-agreed target ('burden') sharing for greenhouse gas emissions would only be acceptable to them if an energy tax is introduced by the year 2002.

On 25 May 1999, Spain blocked a Council decision on the Commission's minimum tax proposal by its veto. Given the apparent lack of unanimity, the Dutch Finance Minister has suggested to introduce harmonised minimum energy taxes in a number of EU Member States only. The European Parliament's Environment Committee supports this idea of a 'Eco-tax Schengen', as a possible application of 'enhanced cooperation'.

In the second draft of the new guidelines on state aids for environmental protection, an extension of the possibility for energy tax exemptions for energy-intensive industry to 2010 is proposed. However, firms would only be eligible for exemptions if they signed up to voluntary agreements to improve energy efficiency.

In other areas, harmonised EU environmental taxes have reached only the drawing-table stage. In recent years, studies have included possible EU-wide taxes on solvents (volatile organic compounds – European Commission, 1996), aviation (Bleijenberg *et al.*, 1998; see also Section 3.4), nitrogen from agriculture (Zejts, 1999), pesticides (EIM/Haskoning, 1999) and cadmium in fertilisers (Oosterhuis *et al.*, 2000).

The Eurovignette took effect from 1 July 2000: an instrument for fair and efficient pricing in transport which haulers must obtain to use the motorways of seven Member States (the three Benelux countries, Germany, Denmark, Sweden and Austria) that do not levy motorway tolls.

Despite the problems of finding common positions in the EU that lead to the

introduction of environmental taxes at EU level, the European Commission continues to advocate such instruments as important tools of sustainable development policy. In a recent communication (European Commission, 2000b), the Commission states: 'Making better use of environmental taxes and charges than is now the case would contribute to economic efficiency and broaden the tax base. This would help Member States continue fiscal consolidation while improving the quality and sustainability of public finances, in line with the Lisbon European Council conclusions. At the same time, markets to which these instruments are applied should be made more competitive and more responsive to price signals.'

3.3.2. *Environmental taxes in central and eastern Europe*

The economic transition process in the countries of central and eastern Europe (CEE) has created a unique context for the implementation taxes for the environment. Since 1990, economic reforms and restructuring have helped reduce the role of pollution intensive industry in the economy and investments have been made to tackle existing environmental liabilities and introduce modern technologies. Many countries of the region, led primarily by those most advanced in economic transition, have adjusted existing instruments and introduced new ones with the objective of supporting and promoting environmental improvements.

A notable aspect of the use of economic instruments for environmental policy in CEE has been the focus on raising and earmarking revenues from pollution charges for priority expenditures within the environmental field. For this reason, CEE experience differs from the experience with environmental taxes in most OECD countries members, where the majority of environmental taxes generally represent central budget revenues with no explicit link environmental spending priorities. Earmarked revenues from environmental charges in CEE represent the main revenue source for state/municipal environmental funds that exist, in one form or another, in most countries in the region⁵. Revenues from pollution charges, however,

5 On a regional level, pollution charges have raised some 1.9 billion USD for national environmental funds in the period 1993-1997 alone. It includes the national funds of: Bulgaria, Czech Republic, Estonia, Hungary, Poland, and Slovakia. This figure excludes funds operating at the municipal level, which also receive revenues from pollution charges in some countries (calculation based on OECD, 1999a).

Table 3.4. Motor fuel taxes in CEE compared with EU minimum excise tax rates

Source: REC, 2000.

Comparative motor fuel tax rates in CEE (in % terms of EU minimum excise tax rates, (Directive 92/82/EEC))			
CEE	Leaded petrol	Unleaded Petrol	Diesel
Estonia	46 %	54 %	39 %
Latvia	52 %	53 %	58 %
Romania	67 %	77 %	61 %
Poland	70 %	76 %	74 %
Slovakia	not on market	73 %	83 %
Croatia	79 %	78 %	89 %
Czech Republic	89 %	105 %	103 %
Slovenia	108 %	108 %	129 %
Hungary	not on market	112 %	146 %
EU min	100 %	100 %	100 %

represent only a portion of total revenues from environmental taxes in CEE. While these play the dominant role in terms of pollution management and in financing environmental funds, CEE countries also levy more 'traditional' energy taxes, primarily on mineral oils, which are similar in structure and function to trends in EU Members and generate significant revenues for the central budgets.

The dominant forms of environmental levies implemented in CEE are: *energy taxes, product charges/taxes (including vehicle taxes), pollution charges on air and water effluents (generally earmarked for comprehensive environmental funds), and natural resource mining taxes.*

Vehicle related product taxes are in place in all countries. Table ...provides an overview of the motor fuel tax rates in some countries, compared with the minimum excise tax rate according to EU Directive 92/82/EEC).

Additional product charges exist on a country by country basis: product charges on environmentally damaging goods in Hungary and Latvia; packaging in Hungary, Latvia and Estonia and charges on ozone depleting substances in Latvia, Czech Republic and Slovakia. Comprehensive pollution charge systems (effluent charges in air and water sector) are in place in Poland, Czech Republic, Estonia, Latvia, Lithuania, and Slovakia. These systems are generally based on a payment for pollution (per unit) based on a permit for (medium and) large point source polluters. SO₂ and NO_x are the primary pollutants, though the list extends to over 160 chargeable pollutants in some countries. Graduated non-compliance fines are used in these countries as additional incentives. Croatia and Romania have a water effluent charge system, the former

quite developed, but no corresponding air charge. Hungary and Bulgaria rely on non-compliance fines alone to enforce regulations in the air and water sector. No effluent charges are in place in Bosnia-Herzegovina, Albania, Macedonia or Yugoslavia.

A number of changes have been made over the past few years (1997-2000) with the goal of improving effectiveness of existing charges, many of which have been driven by the EU Accession Process. Simplification of pollution charge systems; adjustment of the structure and level of taxes, particularly energy taxes; and the introduction of new instruments have been on the agenda throughout the region. Parallel to discussions within the ministries of environment to determine appropriate economic instruments for environmental goals, is an on-going dialogue between ministries over the use of revenues from environmental taxes and charges. Lack of consensus on this issue alone has often been an impediment to changes and introductions of environmental taxes, and successful coordination will become more important in the future.

Annex V presents an overview of taxes and charges in place in 11 countries in central and eastern Europe.

3.3.3. Country overview

The country presentation focuses on recent developments and elements that are specific to each country and not (yet) common throughout the EU. More details are presented in Annex I. No attempt has been made for an exhaustive listing of all taxes and charges, as several databases are available to that end⁶.

Austria

Taxes on	% of total tax revenue (1997)	Special features
Energy	3.7	No reduced rates of mineral-oil tax for industry, but a ceiling for total payments (0.35 percent of the net value-added)
Transport	1.5	Higher taxes for cars without catalytic converter and for fuel-inefficient cars
Pollution and resources	0.02	High levies exist on waste disposal (earmarked for containment and redevelopment of contaminated sites)

Recently, Austria has started to use environmental taxes more intensively. Recently, taxes were introduced on waste brought to landfills and on batteries. In 1998, a tax commission was set up to explore several issues, of which environmental taxes was one. The final report provided two options for further increased use of environmental taxes. As discussions stand, there is general support for the proposed options so that implementation appears likely in 2000 or 2001.

Belgium

Taxes on	% of total tax revenue (1997)	Special features
Energy	3.5	Higher excise tax rate for high-sulphur heavy fuel oil
Transport	1.9	
Pollution and resources	0.03	Eco-taxes can be levied on drink packaging, disposable cameras, batteries, industrial packaging, pesticides and paper and cardboard (applicability mostly dependent on the non-attainment of certain collection or recycling targets) Taxes exist at regional level on water effluents, excess manure, gravel extraction, water abstraction, and waste

In 1993, the Law on the completion of the federal state structure created the possibility to levy environmental taxes on a number of products. Since then, only a few of these taxes have been implemented, but the possibility to do so has been an incentive for industry to achieve the criteria for exemption.

The new government, in force since mid-1999, has announced the introduction of a CO₂/energy tax and plans to use environmental taxes more intensively.

Bulgaria

Taxes on	Special features
Energy	Excise taxes on mineral oils among lowest in Europe; well below EU minimum level; Excise tax on non-motor fuel oils is earmarked for environmental fund yielding 24 mil EUR in 1999
Transport	Annual vehicle tax differentiated according to engine capacity
Pollution and resources	Non-compliance fines only in case of air and water effluents; Mined natural resources are taxed

Recently, legislation has been enacted in Bulgaria that provides for emission charges (on emissions within admissible levels) in addition to the existing non-compliance fees (for emissions exceeding admissible levels).

Cyprus

Taxes on	Special features
Energy	Diesel oil excise tax rate currently well below EU minimum rate
Transport	
Pollution and resources	

With a view to EU membership, the Cyprus government has published an Action Plan for the Protection of the Environment; the use of fiscal instruments is one of the items being discussed.

6 An overview of the use of environmental taxes in the EU, Norway and Switzerland can be found in a database established by the European Commission, available through the Internet (<http://europa.eu.int/comm/environment/enveco/database.htm>). An OECD database on environmentally related taxes (developed in cooperation with the European Commission) can be found on <http://www.oecd.org/env/policies/taxes/index.htm>. An overview of environmental taxes and other economic instruments in the accession countries in Central and Eastern Europe can be found on the REC website (<http://www.rec.org/REC/Programs/SofialInitiatives/Ecolnstruments/EI.shtml>).

Czech Republic

Taxes on	Special features
Energy	Excise tax on unleaded fuel set above EU minimum rates; Bio-gas and bio-diesel subject to discounted VAT rate of 5 %;
Transport	Public transport, combined transport, and electric vehicles exempt from annual vehicle tax; Airport landing tax differentiated according to noise levels
Pollution and resources	SO ₂ (27 EUR/t) and NO _x charges (22 EUR/ton) and other air emission charges generated 30 million in revenues earmarked for environmental fund in 1999; Water effluent charges and water extraction charges in place Tax on ozone depleting substances (5416 EUR/ton); Charges on conversion of agricultural and forest land are partially earmarked for environmental fund (60 %); Mining is taxed per km ²

The Czech Republic has a comprehensive system of environmental charges. The charge revenues accrue mainly to the State Environmental Fund. The principles of the charge system are reported to be compatible with EU membership. The idea of an ‘eco-tax reform’ is being considered.

Box 3.2. Environmental taxes in the accession countries

Many EU candidate countries in central and eastern Europe (CEECs) have in place well-established systems of environmental charges (details in Annex I). Some of these date back to the pre-1989 centrally planned system, although several changes have taken place since. Typical features of CEEC environmental charges are:

- a high degree of detail (e.g. the Polish air pollution charge covers 62 different pollutants, though a reduction to 10 has been proposed);
- earmarking of revenues for ‘Environmental Funds’, which are financing investments in pollution abatement;
- substantially higher rates (‘non-compliance fees’) for emissions exceeding permitted levels than for those below emission limits.

Systems differ between CEECs: Hungary, for example, does not apply emission charges, but has a number of product charges.

In 1995, the ‘Sofia Initiative on Economic Instruments’ was launched, aimed at an improved application of economic instruments in the environmental policy of CEECs (cf. REC, 1999).

The presence of a framework for environmental charges in CEECs, and their experience with them, might be a favourable factor for implementing cost-effective environmental policies and ecological tax reforms. In doing so, the accession countries could put their economies on a sustainable track and reduce the costs of complying with the environmental ‘acquis’.

Denmark

Taxes on	% of total tax revenue (1997)	Special features
Energy	4.5	Energy taxes in Denmark are among the highest in the world; In the case of industry, the energy taxes are largely refunded (space heating excepted) sulphur tax on energy products since 1996. CO ₂ tax was introduced in 1992 and revised in 1996, with reduced rates for firms according to energy intensity of process and if voluntarily agreeing to invest in energy saving
Transport	4.3	Car registration tax is highest in Europe, Annual car tax is related to fuel efficiency
Pollution and resources	0.69	Taxes exist on carrier bags, chlorinated solvents, CFCs and other ozone-depleting substances, certain retail containers, disposable tableware, electric bulbs, pesticides, NiCd batteries, drinking water, waste, raw materials, PVC/phthalates

For more than a decade, Denmark has been applying a broad spectrum of environmental taxes. Evaluation studies have shown the effectiveness of many of them, especially in the area of energy. A tax on PVC products and products containing phthalates was introduced in 2000, following the failure of an environmental agreement. New taxes on certain chemicals (other ozone-depleting chemicals, MTBE in gasoline) are being considered. Denmark also is preparing a tax on aluminium cans in case the ban on such cans has to be lifted. Together with the Netherlands, Denmark is the only other country in the EU where less than 50 % of environmental tax revenue comes from energy.

Estonia

Taxes on	Special features
Energy	Excise taxes on mineral oils below EU minimum level
Transport	Sales tax differentiated by age and engine capacity of vehicle
Pollution and resources	SO ₂ (2.9 EUR/t) and NO ₂ (6.7 EUR/t) charges are lowest in region but reported to influence large source polluters; Water effluent charges and water extraction charges in place; Packaging excise tax introduced in 1997 linked to policy target of 60 % packaging collection; Mined natural resources are taxed

In Estonia, charges on air and water pollution and waste are applied. The revenues are used to finance environmental projects.

Finland

Taxes on	% of total tax revenue (1997)	Special features
Energy	4.7	CO ₂ tax since 1990
Transport	2.2	
Pollution and resources	0.07	Taxes exist on non-refillable soft-drink and alcoholic beverage bottles and on waste delivered to municipal landfills

Finland was the first country in Europe to introduce a CO₂ tax (in 1990). The tax has been frequently changed since then. Increases in the tax rates are currently being considered.

France

Taxes on	% of total tax revenue (1997)	Special features
Energy	4.3	CO ₂ energy tax to be introduced in 2001
Transport	0.5	
Pollution and resources	0.32	Several pollution taxes now grouped in 'TGAP'; tax on fertilisers planned

In 1998, the 'general tax on polluting activities (TGAP)' was created, which comprises several smaller environmental taxes that are now easier to administer under a uniform scheme. TGAP also marks the start of ecological tax reform in France since any tax increase will be balanced by a decrease in other taxes (e.g. on labour). The tax base is to be broadened and tax rates are to be increased.

Box 3.3. Dynamic developments in the four largest EU Member States

Within the EU, relatively small (northern) Member States used to be ahead in applying environmental taxation. However, for the past few years the four largest Member States – France, Germany, Italy and the UK (together accounting for almost 70 % of the EU population) – are rapidly catching up. To some extent, this may be explained by the political changes that have taken place in these countries (for example, Germany, France and Italy got Ministers of Environment belonging to the Green Party). In addition, the need for effective and efficient instruments to achieve environmental policy objectives (such as the Kyoto targets) has raised interest in environmental taxes.

All four countries introduced ecological tax reforms (ETR) that consist of increasing environmental taxes and reducing taxes on labour or social contributions.

France introduced the general tax on polluting activities (TGAP) that is an extending basket of environmental taxes, including a tax on carbon (of EURO 39 per ton) to be applied to large energy consumers, as of 2001. TGAP revenue is the basis for a decrease of taxes on labour and social contributions and will gradually extend in three stages through 1999–2001.

Germany is gradually introducing an ETR for the period 1999 to 2003. Electricity, gas and fuels are taxed, and social contributions are reduced. Exemptions of increased mineral-oil taxes are being created for efficient CHG plants and for gas-fired power plants with high energy efficiency.

Italy introduced CO₂ taxes, to be phased in over the period 1999-2004. More than half of the revenues will be used to reduce employment taxes.

In the UK, revenues from the landfill tax, introduced in 1996, are recycled to lower the costs of labour. The revenue of the climate-change levy, to be introduced by 2001 on industry, is destined for reducing national insurance contributions.

Concern about the impact of environmental taxes on international competitiveness creates some resistance and leads to mitigation measures, especially for energy-intensive industry. The introduction of CO₂ taxes in these four countries makes that such taxes are becoming common in most of the EU, which in itself is reducing the negative effects on competitiveness for those industries whose main competitors are confronted with similar taxes.

Germany

Taxes on	% of total tax revenue (1997)	Special features
Energy	4.4	Major program of increases in existing fuel taxes and introduction of an electricity tax started in 1999
Transport	1.0	Motor-vehicle tax differentiated by emission characteristics
Pollution and resources	0.00	Regional (groundwater, wastewater and waste) and local (packaging) taxes withdrawn (despite effectiveness of the latter) after legal challenges

In April 1999 Germany implemented the first step of an Ecological Tax Reform.

Reductions in taxes on labour are to be financed by increases in excises on mineral oils and gas as well as by the introduction of an electricity tax. Exemptions and reductions are foreseen for energy intensive industry, cogeneration and rail transport.

Greece

Taxes on	% of total tax revenue (1997)	Special features
Energy	8.1	
Transport	1.1	Reduced vehicle registration tax rate for low-emission vehicles
Pollution and resources	0.00	Tax on waste disposal

Use of environmental taxes in Greece is practically limited to the 'classic' types of mineral-oil and vehicle taxes. Revenue from a tax on waste disposal is used for financing purposes.

Hungary

Taxes on	Special features
Energy	Unleaded and diesel fuel excise taxes are among highest of CEE region and above EU minimum rates; no unleaded available on market 3 % of motor fuel excise is earmarked for environmental expenditures
Transport	Vehicle taxes differentiated according to age and catalytic converters
Pollution and resources	Taxes in place for batteries, packaging materials, tires, and ozone depleting substances Mined natural resources taxed at 2-15 % of sales price

Hungary has a number of environmentally motivated product charges in place. Charge rates are generally too low to reduce consumption of these products, but there are some effective built-in incentives.

Iceland

Taxes on	Special features
Energy	
Transport	
Pollution and resources	Charge exists on toxic substances in waste; revenues used for toxic-waste management

In contrast with other Nordic countries, Iceland does not (yet) apply any energy taxes, apart from mineral-oil excise taxes.

Ireland

Taxes on	% of total tax revenue (1997)	Special features
Energy	4.9	Greenhouse gas taxation proposed
Transport	3.9	Higher vehicle registration taxes for larger cars; taxes studied to discourage vehicle use in urban areas
Pollution and resources	0.06	Environmental taxes on plastic carrier bags approved, taxes on waste studied Wastewater is partly charged according to BOD.

In 1999, the Irish government presented a number of options for increased use of environmental taxes. These are being discussed.

Italy

Taxes on	% of total tax revenue (1997)	Special features
Energy	7.2	Italy is the first Mediterranean EU Member State with a comprehensive energy/CO ₂ taxation scheme
Transport	1.1	
Pollution and resources	0.00	Taxes exist on SO ₂ and NO _x emissions and landfilling of waste

Starting in 1999 the Italian government is annually raising excise taxes on gasoline, diesel, coal, and mineral oils for the next five years as part of a plan to reduce greenhouse gas emissions.

Latvia

Taxes on	Special features
Energy	Excise taxes on mineral oils below EU minimum level; Excise taxes on non-motor fuel oils are earmarked for environmental expenditures
Transport	
Pollution and resources	SO ₂ (16 EUR/t) and NO _x (16 EUR/t) are revenue leaders of pollutant charge system covering 160 pollutants; Earmarked charges exist on batteries, packaging, ozone depleting substances, and light bulbs Mined natural resources are taxed

Since 1995, Latvia has implemented an extensive system of environmental taxes and charges. The revenues flow into the state, regional and local environmental funds.

Lithuania

Taxes on	Special features
Energy	Excise taxes on motor fuels below EU minimum level; no unleaded available on market; Electricity is taxed at 1 %
Transport	Vehicle taxes differentiated according to age of vehicle
Pollution and resources	SO ₂ (48 EUR/t) and NO _x (90 EUR/t) are earmarked for municipal environmental funds; Water effluent charges on BOD (100 EUR/t), suspended solids (20 EUR/t), P (346 EUR/t) and, N (100 EUR/t); Mined resources are taxed

Since 1991, Lithuania has applied charges to air pollution and a tax on natural resources. The revenues go partly to the state budget and partly to municipal environmental funds.

Luxembourg

Taxes on	% of total tax revenue (1997)	Special features
Energy	7.2	Taxes on petrol are lowest of all EU Member States Electricity tax and tax incentives for bio fuels, LPG and natural gas are proposed
Transport	0.3	Vehicle-tax differentiation based on fuel consumption is proposed
Pollution and resources	0.00	

In August 1999, the Luxembourg government announced a study on the feasibility of an ecological tax reform. In May 2000, a national strategy for the reduction of greenhouse gas emissions was presented, containing concrete proposals. An electricity tax is announced for 2001.

The Netherlands

Taxes on	% of total tax revenue (1997)	Special features
Energy	4.4	Increasing role for regulatory energy tax, as tax brackets are extended; reductions or exemptions for internationally competing sectors
Transport	3.3	Reduced car tax for fuel-efficient cars gradually implemented
Pollution and resources	1.76	Taxes exist on wastewater, groundwater and landfilled waste, and on aviation noise and manure Tax on aggregates under discussion

The Netherlands has applied environmental taxes since the 1970s and started greening the fiscal system in 1996 when the regulatory energy tax for small-scale users was introduced and other, labour and income related taxes were reduced. Environmental taxes have been gradually extended since then. The Dutch approach is 'to charge and reward' and contains a large number of fiscal encouragements for environmentally friendly behaviour. A more systematic ecological tax reform ('greening the fiscal system') began recently (first phase in 1999, second phase in 2000). The third phase will be an integral component of the major

overhaul of the Dutch fiscal system, to be implemented by 2001. The increase of environmental tax revenue will be compensated by a reduction in income taxes.

The second Green Tax Commission was installed in 2000 and is to come up with further proposals, after a thorough screening of the suitability and feasibility of a broad area of potential fiscal components. Together with Denmark, the Netherlands is the only other country in the EU where less than 50 % of the environmental tax revenue comes from energy.

Norway

Taxes on	Special features
Energy	CO ₂ taxation recently expanded SO ₂ tax exists on fuels; doubling of rate announced
Transport	Aircraft emission tax on international flights introduced in 1999, but soon repealed because of incompatibility with international agreements (see Section 3.4.1)
Pollution and resources	Taxes exist on pesticides, beverage containers, lubricant oils, solvents and waste disposal

After recent changes in the CO₂ taxation system, the Norwegian government has announced that it will continue to expand existing environment taxes and to impose new ones.

Poland

Taxes on	Special features
Energy	Excise taxes on motor fuels below EU minimum level
Transport	Vehicle taxes differentiated according to age and engine capacity
Pollution and resources	Highest SO ₂ (80 EUR/t) and NO ₂ (80 EUR/t) charges in the CEE region and higher than some EU Member States; generated 175 million USD for environmental funds in 1996 Industrial waste disposal charge Water effluent charges (BOD5, COD, suspended solids) and water extraction charges Mined natural resources taxed at percentage of sales price

Poland has a comprehensive system of air pollution charges, with relatively high charge rates. Revenues are an important source of financing investments in pollution control, through environmental funds at different administrative levels.

Portugal

Taxes on	% of total tax revenue (1997)	Special features
Energy	7.2	Reduced tax rate for low-sulphur heavy fuel oil
Transport	2.5	Various taxes on registration and use of (transport) vehicles
Pollution and resources	0.00	

'Traditional' excise taxes on petroleum products are the main type of environmental tax in Portugal. Up to four different taxes are imposed on vehicles for transport of goods: one-off registration tax, annual municipal vehicle tax, circulation tax and truck tax.

Romania

Taxes on	Special features
Energy	Excise taxes on motor fuels below EU minimum level;
Transport	Tax reductions for less-polluting vehicles exist
Pollution and resources	Water effluent charges are earmarked for water fund

Although the use of environmental taxes in Romania is limited, several proposals have been made for their expansion.

Slovakia

Taxes on	Special features
Energy	Excise taxes on motor fuels below EU minimum level;
Transport	Commercial vehicles taxed according to engine size; 50 % reductions for gas powered vehicles and vehicles with catalytic converters were cancelled in 1997
Pollution and resources	SO ₂ (23 EUR/t) and NO _x charges (18 EUR/ton) and other air emission charges generated 7 million in revenues earmarked for environmental fund in 1999; charge rates phased-in over several years; Product charge on ozone depleting substances Water extraction, agricultural and forest land conversion, and mining charges in place

Slovakia has an extensive system of environmental charges, which is currently under revision in light of its envisaged EU membership.

Slovenia

Taxes on	Special features
Energy	Excise taxes on mineral oils above EU Minimum rates; Additional CO ₂ Tax on mineral oils is based on carbon content of liquid fuels; charge was introduced in 1997 and phased-in; currently 14 EUR/t CO ₂ ; generated 78 mln. EUR for general budget in 1999
Transport	
Pollution and resources	Water effluent charges on COD, P, N and heavy metals were increased in 1998

In 1997, Slovenia introduced the first CO₂ tax in the CEE region. The tax is applied to all liquid fuels based on their carbon content, and it is planned to be extended for coal used for electricity production in 2004. Introduced at a rate of 2.2 SIT/l petrol, 2.6 SIT/l diesel, and 3.1 SIT/l heavy fuel oil; the rates were tripled (based on pre-announced scheme) in 1998. Tax authorities collect the tax along with energy excise taxes, which has minimised costs and improved efficiency of administration. The current tax rate is equivalent to about 14 EUR/ton CO₂ and the tax raised 77.9 mln EUR in 1999 representing an additional 30 % of the revenue generated by excise taxes which are in accordance with EU minimum (REC, 1999).

Spain

Taxes on	% of total tax revenue (1997)	Special features
Energy	5.3	
Transport	0.6	
Pollution and resources	0.06	Tax on acidifying emissions exists in Galicia; tax on environmentally damaging installations on Balearic islands; eco-tax on tourism planned on Balearic islands

Spain is opposed to the introduction of common minimum energy taxes in the EU (cf. Section 3.3.1), because of fears that higher energy taxes would be harmful to industry and spur inflation. Initiatives for environmental taxes are mainly taken at regional level.

Sweden

Taxes on	% of total tax revenue (1997)	Special features
Energy	5.2	Comprehensive system of energy and CO ₂ taxes in place since 1991; reduced tax rates for low-sulphur fuels
Transport	0.7	Tax on air pollution from domestic air traffic abandoned when joining EU Vehicle taxes differentiated according to emission characteristics Car-scrapping charge in place since 1975
Pollution and resources	0.01	Taxes and charges exist on NO _x emissions, fertilisers, pesticides, gravel, batteries and landfilling

Sweden was the first country to implement a tax shift from income taxes to taxes on energy and pollution. In addition, Sweden applies a relatively large number of other environmental taxes and charges, many of which have been quite effective in reducing pollution, waste and resource use.

Switzerland

Taxes on	Special features
Energy	Tax on light fuel oil with sulphur content above 0.1 %
Transport	Zurich airport applies emission charges Pollution-related kilometre tax on heavy-goods vehicles
Pollution and resources	Charge on organic solvents in place since 1 January 2000 Tax on landfilling and export of waste to be introduced in 2001

In order to introduce a multi-step tax reform, the Swiss Environmental Protection Law was recently adapted to allow market-based instruments. Additional revenues have to be recycled into the economy.

Turkey

Taxes on	Special features
Energy	
Transport	Charge exists on noise and air pollution from aircraft
Pollution and resources	

With the exception of taxes on energy and motor vehicles, environmental taxes are not yet being used in Turkey.

United Kingdom

Taxes on	% of total tax revenue (1997)	Special features
Energy	2.3	Industrial energy tax ('climate change levy') to be introduced in 2001; fuel duty escalator rate to be decided annually Reduced excise tax exists on low-sulphur diesel
Transport	1.6	Reduced Vehicle Excise Duty on fuel-efficient cars
Pollution and resources	0.13	Landfill tax in place since 1996 and increased gradually Tax on aggregates discussed

In 1999, the UK government presented a package of environmental tax reforms. The main element in the package is a CO₂ tax on the use of energy by industry to be introduced in 2001. A discount is available for firms achieving certain efficiency standards, and exemptions will apply to new forms of renewable energy and to combined heat and power plants of good quality.

3.4. Environmental taxation in specific areas

3.4.1. Taxing aviation

Feasibility of an EU-wide aviation tax

According to the IPCC (1999), aircraft emissions released amount to about 40 % of total emissions at high altitudes. Due to special circumstances in the upper atmosphere the global warming contribution ('radiative forcing') by aircraft is two to four times larger than the same amount of emissions of the same substances in the troposphere.

Nevertheless, aircraft emissions (from trans-boundary transport) are not explicitly regulated under the climate protection multilateral regime (Framework Convention on Climate Change – FCCC). The only multilateral convention that in principle controls air transport activities, including their environmental effects, is the UN Convention on International Civil Aviation, for which the International Civil Aviation Organisation (ICAO) is the responsible body.

Already in the late 1970s ICAO identified environmental protection as a major challenge to be addressed, and responded by establishing its Committee on Aviation Environmental Protection (CAEP). In 1998 the CAEP was requested to work on possible options regarding emission-related levies (charges or taxes) with a focus on an en-route levy or a fuel levy to address global emissions.

At EU level, mineral-oil products used as fuel for commercial air transport are exempt from the obligatory excise duties imposed by Council Directive 92/81/EEC of October 1992 (European Commission, 1992b). Nevertheless, the directive explicitly allows that the same products 'may be subject to other indirect taxes for specific purposes...'.¹

In November 1996 a new communication (COM(96)549) recommended that excise duties on mineral oil should be extended to aviation kerosene as soon as the international legal situation allowed the Community to levy a tax on all carriers including those from third countries. This approach is reflected in the Commission's proposal for the taxation of energy products (CEC, 1997a)).

Box 3.4. Legal barriers against unilateral implementation of aviation taxes: the cases of Sweden and Norway

The **Swedish** tax on domestic air traffic existed from 1989 until 1997. It consisted of two components. The first was calculated on the basis of average fuel consumption per domestic flight differentiated according to engine type. The second was based on standardised data on hydrocarbon and NO_x emissions according to type of aircraft on an average flight. The first component aimed at reducing emissions of CO₂. The tax basis chosen was kerosene, although kerosene is exempt from taxation under international legal provisions.

In a lawsuit against the Swedish aviation tax between the airline Braathens Sverige AB and the Riksskatteverket (Swedish Tax Agency) the European Court of Justice (case C-346/97) made the factual statement that 'there is a direct and inseverable link between fuel consumption and the polluting substances (...) which are emitted in the course of such consumption'. It concludes 'that the tax at issue, as regards both the part calculated by reference to the emissions of hydrocarbons and nitric oxide and the part determined by reference to fuel consumption, which relates to carbon dioxide emissions, must be regarded as levied on consumption of the fuel itself ...'.

As emission of VOC and NO_x also depends on other factors (such as speed and aircraft handling), the link between kerosene emissions and such emissions is apparently 'severable'. Environmental taxes on aviation should be legally possible as long as they do not have an inseverable link with the fuel used. Only with respect to CO₂ this barrier is difficult to overcome since kerosene consumption and CO₂ emissions are proportional, hence inseverable.

The **Norwegian** Government proposed in 1999 to levy a tax of NOK 100 per tonne CO₂ in air traffic. The existing tax on aircraft seats was reduced correspondingly. The tax was removed in the same year. This was due to 'uncertainty arising as to whether these taxes are in line with bilateral air-transport agreements on international flights between Norway and several other states (...). The emission tax on fuel for domestic flights will remain in force.' (Press Release No 21/99 from 26.3.1999).

The legal background of this retreat is a clause in the German-Norwegian Air Services Agreement (ASA), under which it is agreed that fuels and lubricants taken on board are not subject to any indirect tax that is normally levied in the host country. Obviously the CO₂ tax is seen, as in the Swedish case, as 'essentially' a fuel tax so that the provision of the ASA holds. Furthermore, it can be suspected that Article 15 of the Chicago Convention may have been of some importance. This Article deals with airport charges that are to be imposed in a non-discriminatory manner and only for recovering the cost of well-defined services supplied to the carriers. Article 15 concludes with the sentence 'No fees, dues or other charges shall be imposed by any contracting State in respect solely of the right of transit over or entry into or exit from its territory of any aircraft of a contracting State or persons or property thereon.' A unilaterally introduced CO₂ tax could be interpreted as 'essentially a charge for the right of entry'.

In December 1999, the European Commission presented its strategy on air transport and the environment (European Commission, 1999e). It states that the European Community may introduce its own system of charges if no agreement can be achieved by 2001 at the ICAO level on a global system of aviation taxation. **'En-route' charges**, which take into account the distance flown and the aircraft's emissions per kilometre, are singled out as the most promising technique.

The economic and legal barriers to such a unilateral EU approach have been elaborated on behalf of the European Commission (Resource Analysis *et al.*, 1999).

A major legal obstacle to the use of **kerosene taxes** is the existence of many bilateral Air Services Agreements (ASAs), both between EU countries and with other countries. They regularly include exemptions that forbid the taxation of fuel in transit as well as fuel taken on board an aircraft in the territory of the bilateral partner, i.e. at the host country's airport. Therefore, an approach using energy as a tax basis will likely fail to become a feasible solution. Moreover, given that CO₂ content is a much too simple approach for the complexities of atmospheric interferences induced by aircraft, other tax bases have to be considered. In principle, there are two tax base options:

- environmental effects of aviation, or
- aviation itself.

Bleijenberg *et al.* (1998) suggest implementing a 'European environmental aviation charge'. For such a charge essentially three different bases are taken into consideration: (1) (calculated) emissions on a flight in European airspace; (2) volume of kerosene taken on board at European airports; (3) (movements of) passengers and freight. The most important criteria are 'environmental effects' and legal feasibility. Applying the tax basis 'calculated emissions' should lead to a feasible solution with high environmental effectiveness.

The Commission will further prepare a 'European Charge' in coordination with CAEP and will try to reach decisions by 2001.

3.4.2. Taxes on (hazardous) chemicals

Chemicals are both essential and potentially dangerous for living organisms. Their properties differ widely, and according to

Paracelsus: dose matters. These characteristics require a sufficiently flexible approach. Approaching the entirety of different chemicals by using unified measures according to a classification along certain joint features of groups of chemicals appears thus appropriate. Such initiatives are especially intended to help domestic industry to switch as early as possible to sustainable paths in the development or use of (potentially hazardous) chemicals. Examples are mentioned below.

Ozone-depleting substances

In the follow-up to the Montreal Protocol on Ozone Depleting (ODS) and its amendments, the US decided to commit to phase out substances that destroy stratospheric ozone. One measure used to implement this commitment has been the 'ozone-depleting chemicals tax'. It was increased in 1992 when the US planned to accelerate their phase-out.

Secondly, the commitment to a phase-out requires a policy supplying industry with domestic markets that anticipate demand structures that the world market will follow. This increases the chances that domestic industry will play a leading role in the world market after the phase-out. Thirdly, the ozone-layer protection regime supplied a uniform basis (known as ODP: ozone depleting potential) for all the different ozone-depleting chemicals that could be used as the tax base (cf. Hoerner 1998, p.1225 and Cook 1996, Ch 5).

Taxes or charges on ozone-depleting substances are being used in Europe as well, namely in the Czech Republic, Denmark, Hungary, Poland and Sweden.

Chlorinated solvents

In Denmark, a tax has been introduced on the three most common chlorinated solvents (tetrachloroethylene; trichloroethylene; dichloromethane). The tax rate is DKK 2 per kg net weight, or about 25 % of the current price. The background for this tax initiative was the above-mentioned phase-out of substances harmful to the ozone layer. The solvents mentioned are able to replace many of the ozone-depleting substances used so far, but there are environmentally more preferable options available for many applications – the solvents mentioned are not 'essential' in use. The aim of the tax on chlorinated solvents is therefore to prevent industry from switching to an unsustainable product pattern.

Volatile organic compounds

VOCs (volatile organic compounds) are important contributors to tropospheric ozone formation on the regional level. Besides fuel- and transport-related VOC emissions, there are many (non-chlorinated) solvents that make up the remainder of VOC emissions. Chemicals used as solvents are produced by a small number of firms (refineries; chemical as well as fermentation industries), but are used by a huge amount of end-users. Solvents are, technically speaking, emitted from 'non-point' sources, as their end products are mainly paint, cosmetics, ink and glues. These characteristics call for addressing this problem with economic instruments, not through a regulatory approach.

Statistics are problematic. The border between household and company use is vague. Only 'building' and 'civil engineering' can be treated separately. Figures about solvent use are as vague as their classification – according to experts' judgement, margins of uncertainty in figures for total Europe (CEECs included) typically range between plus 100 % and minus 50 %. Nevertheless VOC emissions are a priority issue in EC environmental policy. And it is broadly felt that after having addressed the fuel- and transport-related emissions the residual issue of solvent emissions has to be tackled.

In 1999, a Directive (1999/13/EC) was adopted on the use of organic solvents relying on a 'best available techniques' approach and 'solvent management plans' by companies. Closed cycles for the application of solvents, drastically reducing or stopping emissions, are now available. However, this Directive only covers solvent use exceeding certain thresholds. Small-scale solvent use might be addressed using economic instruments, especially product taxes. To date, Switzerland is the only European country that has implemented a VOC charge aimed at encouraging alternative techniques such as closed cycles.

Other chemicals

The Danish Government introduced taxes on PVC and on phthalates on July 1, 2000. The background to this was a failed environmental agreement with industry that did not meet targets (Hansen, 1999; OECD, 1999b). A tax on MBTE (lead replacement in octane-98 gasoline) was proposed in 2000.

*3.4.3. Taxes on chemicals used in agriculture**Pesticides*

Pesticide taxes are already implemented in five European states: Belgium (not in agriculture), Denmark, Finland, Norway, and Sweden. Interest in pesticide taxes is growing due to increasing concern about the side effects of its use in agriculture and horticulture; the subject is under discussion in the Netherlands and France, as well as in some CEE countries. The UK recently decided, after studies and discussions with target groups, not to introduce such a tax, but to rely on environmental agreements instead.

As with ozone-depleting chemicals, taxing 'pesticides', including disinfectants, fungicides, herbicides, insecticides and growth regulators, requires a common 'denominator' agreed upon. In pesticide taxes currently implemented, three different concepts are followed:

- The quantitative active ingredient (Sweden) or
- The standardised area dose (Norway) or
- The retail price (Denmark).

It is widely felt that there should be a more general approach that more adequately takes into account the different hazards, both to human health and the environment, acknowledging the rules for taxation in the internal market. Therefore the European Commission is conducting preparatory work to determine whether the establishment of an EU-wide framework for environmental taxes on pesticides is desirable (EIM/Haskoning 1999).

Fertilisers

Nitrogen emissions mainly from agriculture cause significant environmental problems. The European Union adopted a Nitrate Directive in 1991 (91/676/EEC). Member States adopted regulations and codes of 'good agricultural practice'. But in effect, the already significant environmental problems are still increasing. Economic instruments like taxes are little used and even had to be abandoned by some countries when joining the EU (Austria and Finland; Sweden, however, maintained its fertiliser tax).

Nitrogen emissions from agricultural activities stem mainly from two sources: (1) from fertiliser, i.e. an industrial product that can be efficiently taxed at the production stage; (2) from manure, which causes environmental

problems only in areas with high livestock intensities. A pure nitrogen tax on industrial fertilisers therefore is unsuited to address the problem as a whole. This regional differentiation of the problem of nitrogen surplus leads to the conclusion that 'decisions on the implementation of economic instruments to regulate nitrogen control are most likely to be made by individual countries, rather than at EU level.' (Zeijs 1999, IX)

Nitrogen is not the only environmental problem associated with fertiliser use. Other issues include soil contamination with heavy metals, especially cadmium. The Swedish tax on fertilisers is levied both on nitrogen and on cadmium. Recently, a study was made for the European Commission on the environmental and economic impacts of an EU-wide environmental charge on cadmium in fertilisers (Oosterhuis *et al.*, 2000). The study concludes that such a charge could efficiently reduce cadmium loads to farmland in the EU, without major impacts on EU industry and agriculture, but with potentially significant consequences for the EU's current phosphate suppliers (mainly countries in Africa and the Middle East).

3.4.4. Waste taxes

Taxes on waste are applied increasingly in the EU, with a view to reducing the amounts of waste being landfilled (and incinerated) and to stimulate re-use, recycling, and diverting waste from landfills to incineration plants, as is the explicit objective of the UK landfill tax. Such taxes have to be distinguished from the charges paid by households and firms for the public service of waste collection and removal. Waste taxes are usually levied from the owner of a landfill (or incineration plant) at a rate per tonne of waste. By applying a higher rate to landfilled waste than to incineration, waste can be diverted from the former to the latter treatment method.

It is obvious, however, that waste taxes will only contribute to re-use and recycling if the taxpayer 'translates' the tax into waste-collection charges that are based on weight or quantity. If households and firms offering waste for final disposal pay a flat rate, as is still common practice, they do not have a financial incentive to reduce waste. Some municipalities (e.g. in Denmark, Germany and the Netherlands) apply weight-based collection charges that provide an incentive to reduce the amount of waste offered.

3.4.5. Water taxes

Several EU and accession countries apply charges or taxes on the abstraction of fresh water (cf. OECD 1999b). Rates are often higher for groundwater than for surface water. Nevertheless, many water users in Europe (households, industry as well as agriculture) do not yet pay the full (internal and external) cost of this precious commodity, although there is some progress towards full cost recovery (cf. OECD 1999d). The principle of full-cost charging is a contentious issue in the decision-making over the European Commission's draft Water Framework Directive.

3.4.6. Land taxes

More than a century ago, Henry George (1839-1897) proposed the Land Value Tax as an instrument to alleviate poverty, create economic growth and promote equity. Recently, his ideas have gained renewed interest. A Land Value Tax (levied on the value of the land alone, without the buildings and other improvements made by the land owner) would provide an incentive to develop idle land and discourage speculation. From an environmental viewpoint, such a tax could be judged positively if the increase in development of urban land reduces the pressure on 'green' space. The idea of a Land Value Tax is put forward in the final report of the German Parliamentary Enquete Commission on Protection of Man and the Environment.

An interesting example of a land tax functioning in practice can be found in the Czech Republic and in Slovakia. These countries impose charges on the conversion of agricultural and forest land to other purposes (cf. REC, 1999).

3.4.7. Tourism

Many municipal authorities in regions attractive to tourists levy tourist taxes to finance the additional costs of tourist facilities. Such taxes are normally not specifically environmental, though in at least one case such an environmental tax has been proposed. The regional government of the Balearic Islands in Spain plans to impose an eco-tax on tourists, to feed an environmental regeneration fund. The tax rate would range from EUR 0.25 to EUR 2 and would affect all visitors to hotels, apartments and camping sites. The tax and fund should protect the environment and improve the quality of tourism on the islands.

4. Environmental effectiveness

4.1. Introduction

In its 1996 report on the implementation and environmental effectiveness of environmental taxes, the European Environment Agency reviewed evaluation studies of 16 environmental taxes. The conclusion at that time was that ‘within the limitations of the studies, it appears that these taxes have been environmentally effective (achieving their environmental objectives) and they seem to have achieved such objectives at reasonable costs.’

A number of European countries have created environmental tax commissions for the development and partly also for the evaluation of their environmental taxes (see also Chapter 3, and Schlegelmilch 1998a). Conclusions and recommendations are usually connected to the national debate; however, the OECD (1997b, p.25) in referring to the work of these commissions highlights a set of their conclusions of general interest:

- Environmental taxes are an effective and efficient instrument for environmental protection.
- A tax shift where green taxes are increased, and labour taxes or other distorting taxes are reduced, will improve economic performance through improvements in the environment and some reductions in other economic distortions.
- These improvements are not likely to come at a cost of significant employment losses, overall. On the contrary, total employment *might* increase somewhat.
- Such a tax shift would on its own make only a marginal contribution to solving the unemployment problem in many OECD member countries.
- High international mobility of factors of production can generate adjustment costs if small, open economies introduce policies that differ significantly from what other countries pursue. More ambitious environmental policies would therefore be stimulated by increased international co-operation.’

Box 4.1. An “in-built” evaluation framework

In 1997, the OECD assessed available evidence of the environmental effectiveness of economic instruments, including taxes. Little systematic information appeared to be available. To help improve evaluation methodology and practice, it formulated a framework for “Evaluating Economic Instruments for Environmental Policy” (OECD 1997a). A main feature of this framework is its “in-built” approach. As the study concluded that the sooner the decision is taken to evaluate, the better it is, the “in-built” scheme suggests that the evaluation procedure is streamlined alongside the policy process. It facilitates the adequate collection and comparison of “before” and “after” data, and it simplifies keeping track of any changes that occur in the structure of the instrument under evaluation or in relevant conditions of its functioning.

Stage	Policy process	LINK	Stage	Evaluation procedure
1	Identifying and defining the environmental problem			
2	Discussing the need for policy intervention and setting objectives			
3	Designing and assessing effective and efficient options (instruments or mixes)	→ ←	1	Description of the instruments and of the institutional context; definition of relevant influential factors
4	Selecting, discussing and adapting instrument (mix) chosen	→	2	Definition of evaluation criteria
			3	Construction of evaluation model and definition of data to be gathered
5	Introduction of instrument (mix), implementation of control and enforcement	→	4	Continuous collection of data and reassessment of influential factors, and ex post evaluation
			5	Possible adaptation of the evaluation model, criteria and data
6	Possible modification of instrument (mix) after evaluation	←	6	Conclusions, recommendations and feed-back into the policy process

Source: OECD, 1997a. p.112

Notwithstanding the evidence found, the OECD concluded in 1999 that: 'Evaluating the performance of economic instruments is a complex task and few reliable and systematic assessments have been made. (...) The overall conclusion (...) on environmental effectiveness of economic instruments is positive. However, evidence is limited, assessments are made on scant data, and in-depth evaluations are scarce. (...) Many statements apply to – sometimes remote – proxies for environmental effectiveness, rather than effectiveness itself (OECD 1999b, p.90-99). In an attempt to remedy the main difficulty of lack of relevant data for evaluation, the OECD already had proposed in 1997 to introduce so-called 'in-built' valuation frameworks in which the evaluation procedure runs alongside the (political) environmental tax development process (see Box 4.1).

This chapter brings together recent evidence on the environmental impact of environmental taxes and charges, focusing on the period since 1996.

4.2. Evaluating effectiveness

Evaluating the functioning of environmental taxes is linked to the reasons for their implementation (Chapter 1). Environmental taxes are supposed to improve integration of environmental-protection requirements, to internalise external effects, to promote eco-efficiency, to provide incentives for pollution abatement at minimum cost (static efficiency), to encourage innovation (dynamic efficiency), to raise revenue for financing environmental activities or, if taxes are unrequited, to finance reductions in other (distortionary) taxes ('double dividend'). Finally, environmental taxes are intended to broaden the range of policy instruments and to reinforce other environmental policy instruments.

Not all environmental taxes necessarily have to serve all of these functions. In Chapter 2, environmental taxes have been subdivided into three categories, each of which has specific purposes:

- **Cost-covering charges** (sub-categories: user charges and earmarked charges) make those using environmental services contribute to or cover the cost of monitoring or of controlling that use (e.g. treating wastewater or disposing of waste). Although, according to economic theory,

every price change will have some impact on behaviour, the main subject of evaluation for this type of charge is the functioning of the programmes for which the charge provides financing.

- **Incentive charges**, to be levied with the intention of changing environmentally damaging behaviour, and with no intention to raise revenue. Revenues can be returned to the payers on an environment-neutral basis. This 'textbook' environmental tax is intended to serve a number of the above-mentioned functions and should be evaluated against these functions as defined in specific cases. Enhancing of environmental effectiveness and promotion of static and dynamic efficiency are key purposes.
- **Fiscal environmental taxes**, which are primarily designed to raise revenue for government income. Although their secondary function increasingly is to facilitate 'ecological' tax reform, fiscal-economic evaluation criteria have to be acknowledged. These include stability of revenue, income distribution effects, competitiveness and economic growth.

All categories of environmental taxes are used for reinforcing existing policy measures. It is this condition that creates a general, methodological evaluation problem. Taxes are added to a policy package that already exerts its impact on the environmental question at hand. Isolating the specific tax impact demands a lot of information, which normally goes beyond what is available. Most available evaluation studies circumvent this 'disentangling effect' and come up with second-best estimates (OECD, 1997a, 1999b).

In some cases taxes work in tandem with positive financial incentives such as subsidies or advantageous fiscal provisions. Such combinations are viewed as particularly strong incentives. Examples include systems where a certain product or process is taxed, whilst the cleaner alternative face a reduced tax rate, is tax-exempt or even subsidised. The Danish CO₂ tax has a provision that allows firms a substantial reduction in the high tax rate if they agree with the authorities on an energy efficiency improvement programme. In the Netherlands, a list of most energy-conserving equipment has been adopted, for which firms can get a free tax depreciation allowance, normally leading to a 100 % write-off in the first year. The new UK climate-change levy, to be introduced in 2001, is accompanied by

both provisions, a nod to the success of the Dutch and Danish systems.

Next to the 'hard' effects of an environmental tax, which are linked to its primary objectives, there are a number of 'soft' effects that deserve more attention when evaluating market-based instruments. An example of soft effects is the 'capacity-building' effects of the German wastewater charge (Kraemer 1995). This charge improved administrative competence by:

- Providing financial resources for increasing the number and capability of staff engaged in determining and issuing water pollution permits, and in monitoring and modelling activities;
- Creating the need for better information and monitoring of effluent discharges; better monitoring strengthened the position of environmental authorities vis-à-vis polluters;
- Introducing into the relationship between authorities and polluters the objective elements of control and enforcement associated with fiscal legislation;
- Providing polluters with an incentive to review their discharges, and to consider technological options (awareness effect);
- Giving more attention and recognition to issues of municipal sewage treatment;
- Signalling legislators' determination to ensure more effective compliance with existing pollution control requirements.

That taxes are subject to a public debate makes not only their financial aspect, but also their environmental motive, better known to a broader public. Taxes and charges can then have an impact that goes beyond their economic function: raising public awareness of the environmental issues at stake. A purely economic approach to evaluating environmental taxes that ignores the 'soft' effects would fall short of the broad spectrum of their functions.

4.3. Evidence on environmental effectiveness

This section presents an overview of available evidence of environmental effectiveness, interpreted as the extent to which the taxes contribute to environmental improvement.

The descriptions of effectiveness of taxes are grouped under their field of operation: taxes on energy, taxes on transport and taxes on pollution and resources. More detailed

information by country is presented in Annex I.

4.3.1. Energy

Taxes on motor fuel

Taxes on motor fuel have been applied all around Europe for a long time. Typically, these belong to the category 'fiscal environmental taxes', although they have potential incentive side effects. They increase the (marginal and average) cost of driving. The long-term price elasticity (the percentage decrease in demand associated with a 1 % increase in price) for the consumption of petrol is estimated at about -0.65 to -1.0 (Goodwin, 1992; NEI, 1991; Sterner, 1990 (survey study); RCEP, 1994 (survey study); Kågeson, 1993). The price elasticity for diesel is lower, at about -0.6 (NEI, 1991). The long-term price elasticity for the number of kilometres driven is estimated at between about -0.1 and -0.4 (Van Wee, 1995; Kleijn and Klooster, 1990). It is thus likely that the consumption of motor fuel and the number of kilometres driven would have been higher in the absence of motor fuel excise duties. It is noteworthy that, despite increases in excise tax rates, the real (weighted average) price of motor fuel for road traffic in the EU was actually *lower* in 1999 than it was in 1980 (Eurostat data). Where disposable income has been on the rise, the actual burden of fuel costs has constantly decreased.

A simple cross-sectional analysis between EU Member States does not show a clear inverse relationship between the level of fuel excise taxes and car use. For example, the UK has the highest excise taxes on unleaded petrol and diesel of all EU countries (USD 0.67 per litre as of 1/1/1998 – OECD 1999a), but also the highest share of cars in land-based passenger transport (87.7 % in 1997, European Commission, 2000c), whereas both figures are at the lower end of the range for Greece. Nevertheless, evidence suggests that fuel consumption by the road-transport sector in the UK has fallen as a result of the 'fuel duty escalator'. For example, average fuel efficiency of articulated lorries over 33 tonnes increased by 13 % between 1993 (when the fuel duty escalator was introduced) and 1998 (cf. UK DETR, 1999).

Many European countries apply a tax differentiation between leaded and unleaded petrol, and it is compulsory for EU Member

States. This differentiation can be regarded as a pure incentive element within a primarily fiscal tax. It is generally reported to have been very successful in stimulating the market penetration of unleaded petrol (cf. OECD, 1997a, p. 50). The Swedish Environmental Protection Agency states in its 1997 report that 'without a doubt the main reason for the rapid changeover to unleaded petrol was the introduction of differential taxation.' (Swedish Environmental Protection Agency, 1997.) In some European countries leaded petrol has already vanished from the market. The technical necessity of using unleaded petrol in cars with catalytic converters has contributed to its increase in market share.

Some countries also have **lower excise tax rates for** other relatively 'clean' motor fuels, like **low-sulphur diesel**. In the UK, this differentiation led to a 43 % market share for 'ultra low sulphur diesel' (ULSD) by February 1999. An increase in the duty differential in 1999 was expected to turn almost the whole diesel market to ULSD by the end of 1999 (UK Government, 1999). In Sweden, the 'cleanest' diesel oil, with the lowest tax rate, reached a market share of 85 % in 1995. A differentiation of petrol taxes according to environmental class also led to a quick substitution (Swedish EPA, 1997).

Other energy products

Taxes on energy products other than motor fuel are becoming increasingly important in Europe (cf. Annex III). They often form part of an 'Ecological tax reform'. Thus their main function is fiscal, but they also have important incentive functions.

Energy use is not very price-sensitive in the short term. However, the long-term price elasticity is much greater. The most probable value of this elasticity is estimated at about -0.7 (European Commission, 1997b, p. 58). Therefore, energy taxes can be expected to provide incentives to save energy and thus to help reduce the environmental impacts of energy use. Tax rates are usually related to energy and/or carbon content. Specific types of energy, such as **renewables**, are often exempt for environmental reasons. Several countries apply reduced tax rates to **low-sulphur** fuels. Thus, in addition to energy saving, most energy tax systems stimulate substitution of energy carriers in favour of environmentally less harmful ones.

CO₂ and SO₂ taxes

CO₂ taxes were introduced in seven EEA member countries in the 1990s (Denmark, Finland, Germany, Italy, the Netherlands, Norway and Sweden). Two more countries will introduce such a tax by 2001 (France, the UK), and more countries plan to do so (Belgium, Luxemburg). Slovenia introduced a CO₂ tax in 1997 and is gradually increasing the tax rate. A couple of evaluation studies have been done, in particular in the Nordic countries and in the Netherlands. A survey of Nordic evaluation studies includes about 70 evaluation studies of which about 20 are *ex post* assessments.

In **Denmark**, the system of energy taxes has evolved to an extensive package of energy, CO₂ and sulphur taxes, affecting a wide range of energy sources and energy users. In combination with other policy instruments and structural changes, the Danish energy/CO₂ taxes have probably contributed to the fact that since 1986, energy consumption has remained fairly constant and emissions have decreased, whereas real GDP has grown by more than 50 % (cf. Enevoldsen, 1998; Danish EPA, 2000). It has been assessed that the energy policy package introduced in 1995 will reduce CO₂ emissions by 3.8 % by 2005, of which 2 % will be realised as an impact of the taxes (Danish Government, 1999a).

The Danish tax on the sulphur content of energy products, introduced in 1996, has had a rapid impact. The average sulphur content of fuel oil and coal (and thus SO₂ emissions) decreased significantly in the same year. In addition, the tax had a positive impact on the development of sulphur purification plants and technology (Danish Ministry of Taxation 1998, p.31).

In **Sweden**, the introduction of the CO₂ tax in 1991 was estimated to have led to a reduction in carbon dioxide emissions of 5 million tonnes by 1994, representing 9 % of total Swedish CO₂ emissions (Swedish EPA, 1997). However, following a reduction in this tax rate in 1992, CO₂ emissions were found to have increased by a quarter by 1994, according to a survey of 27 industrial firms by Carlsson & Hammar (1996). In 1995 the tax rates were doubled for industry, and further increases are proposed for 2001.

The Swedish tax on sulphur (in coal, peat and oil products) is estimated to be responsible for 30 % of the total reduction in

sulphur emissions from 1989 to 1995. This represents 19 000 tons of SO₂, i.e. 20 % of total emissions in 1995 (Swedish EPA, 1997).

A Finnish study showed that the CO₂ tax in **Finland** is among the highest in Europe. The tax was introduced in 1990. Without the impact of energy taxation, emissions would have been 4 million tonnes, i.e. a good 7 % higher than the 57 million tonnes recorded in 1998 (PMOPS, 2000).

An evaluation of the **Dutch** general fuel tax showed that in 1994 CO₂ emissions would have been 1.7 million tons higher than in the actual situation. The 'regulatory energy tax', introduced in 1996, has not yet produced measurable environmental impacts. However, it has made energy conservation investments more attractive for firms, leading to shorter payback times and an increase in the amount of profitable energy-saving options by about 5 %. It has also stimulated the use of renewable energy.

4.3.2. Transport

Purchase or registration of a new motor vehicle

Many European countries levy taxes on the purchase or registration of a new motor vehicle. These taxes, although primarily intended as fiscal, might contribute to a lower rate of car ownership and possibly also car use, and thus have environmental incentive effects. An illustration of the impact on car ownership can be seen in Denmark (with car registration taxes of up to 180 % of the producer's price): car ownership in Denmark is 34 per 100 inhabitants, whereas in Germany (with negligible car registration taxes) it is 50 per 100 (calculated after European Commission, 2000c).

However, since car ownership is relatively price inelastic, drastic changes in car costs are needed to have a significant effect (Van Wee, 1995). One side effect is that the Danish fleet is relatively old. As new cars are cleaner and more economic because of technological developments, the fleet becomes relatively more polluting. However, car production also has an environmental impact (consumption of energy, etc.). Life-cycle analyses show an unclear environmental effect: while the effect on CO₂ emissions and energy consumption of a younger car fleet is lower or about equal, other emissions like NO_x and VOCs are higher. Overall, the environmental impact of

purchase/registration taxes is rated as 'moderate positive' (European Commission 1997b, p.34).

In some countries, purchase or registration taxes are lower for 'cleaner' cars (an incentive element in these 'fiscal' taxes). In Sweden, for instance, the sales tax on the most-polluting (class 3) cars was increased by SEK 2 000 in 1993, whereas it was lowered by SEK 4 000 for the least-polluting (class 1) cars. In the period 1993-1996, the share of newly registered cars in class 1 or 2 increased from 16 to 75 %. Given that the tax differentiation amounted to only a few percent of the purchase price, it seems likely that the impact should be attributed mainly to 'soft effects', such as better consumer information and awareness (cf. Swedish EPA, 1997).

Vehicle scrapping charge

Also in Sweden, a vehicle scrapping charge is due upon registration of a car. This can be regarded as an incentive charge. A (higher) premium is refunded when the vehicle is delivered to an authorised scrap enterprise. It is concluded that this system (in operation since 1975) has achieved its original purpose: to prevent scrap cars from being abandoned. However, it has not accelerated the rate at which old cars are scrapped (Swedish EPA, 1997). In other countries, such as the Netherlands, a 'disposal fee' is due upon the purchase of a car. This is more of a cost-covering charge, from which authorised vehicle scrapping is financed.

Annual motor vehicle taxes

Annual motor vehicle taxes are levied throughout Europe, again with a mainly fiscal purpose. As with registration and sales taxes, they might discourage car ownership and use, but the impact is probably small. The price elasticity for car ownership as well as for the number of kilometres driven are both estimated at about -0.1 (European Commission, 1997b, p.36).

Common tax bases are weight and engine capacity, favouring cars with relatively low fuel consumption. Diesel cars, which are relatively polluting but energy-efficient, are usually taxed at a higher rate than petrol cars. However, excise taxes on diesel are lower (see above). The net environmental impact depends on the annual distance driven.

A number of countries (including Denmark, Germany and Italy) have differentiated rates

of annual motor vehicle tax according to emission characteristics and/or energy use. This can be expected to have a positive environmental impact, but it should not be overestimated. Firstly, cars that are more economic have lower variable costs, which in effect leads people to drive more kilometres. Secondly, the expected price elasticity is low: the comfort of a more powerful car will be valued more highly than extra costs (European Commission, 1997b). Lower or zero rates are sometimes applied to cars with electric engines (e.g. in Austria, Ireland and the Netherlands). However, such cars are still exceptional in Europe and their environmental merit is not undisputed.

In some countries old cars are taxed at a reduced rate or given an exemption, for collection reasons mainly. The environmental impact of favouring old cars is ambiguous (see above).

4.3.3. Pollution and resources

Air pollution

Taxes on air pollution are usually levied as product taxes, e.g. on the carbon or sulphur content of fuels (see above). An important exception is the Swedish charge on nitrogen oxides, which has been levied since 1992 on (measured) NO_x emissions from large plants. This is a pure incentive charge. Revenues are refunded to the taxpayers in proportion to their share in net energy output. The impact of this charge has exceeded expectations. It is estimated that NO_x emissions in 1995 would have been 10 000 tonnes greater without the charge. This equals 25 % of all NO_x emissions from combustion for energy generation in Sweden (Swedish EPA, 1997, p. 36). Over the period 1992-1999 the amount of nitrogen oxide per MWh produced has decreased from 0.41 to 0.26 kg (Swedish EPA, 1999). The air pollution charges in France and in several CEE countries are mostly cost-covering charges. As far as their revenues are used for environmental investments, they are effective.

Water pollution

Charges on water pollution are usually levied to finance collective treatment plants; thus, they are primarily cost-covering charges. However, in some countries (notably, the Netherlands and the Flanders region in Belgium) levies on industrial discharges to surface water are high enough to have an incentive effect, i.e. to stimulate industries to reduce these emissions (cf. Leek *et al.*, 1996). In Germany, the early announcement of the

charge induced industries and municipalities to increase their efforts in wastewater treatment. The structure of the charge, with the option of a rate reduction for individual discharges that meet specific pollution targets, and of offsetting investment costs against the charge, may have contributed to a reduction in the wastewater discharge level. Evidence of this is hard to get, since data are lacking and because of the close relation of the charge system with the direct regulatory measures (OECD, 1997a).

Pesticides and fertilisers

Taxes on pesticides are levied in a few European countries, usually as incentive charges. The 'overall' price elasticity of demand for pesticides is assessed between -0.2 and -0.5. 'Overall' price elasticity of demand for herbicides, fungicides and insecticides is higher (EIM 1999). However, it remains unclear to what extent they are based on ex post evaluations. 'At present, there is little experience available in the Member States of the European Union which is useful for evaluating the economic and environmental effects of an EU wide levy on pesticides' (EIM 1999, p.21).

In Denmark, where a pesticide tax was introduced in 1995, pesticide use fell by 10-13 % from 1995/96 to 1997, but it is not certain that this can be attributed entirely to the tax (Danish Government 1999c, p.9). According to Statistics Denmark, from 1994 to 1998 the reduction was 6 %, when measured in application frequency of standard doses (Andersen, 2000). In Sweden, the main effects of the pesticide tax were attributed to the amplification of 'soft' effects of the charge by financing research and training in best practice (Swedish Environmental Protection Agency, 1997, p.69).

The experience with taxes on fertilisers (introduced in most cases to finance agricultural policy measures, i.e. as cost-covering charges) suggests that they contribute moderately to reductions in the use of these products. In Austria, the levy on fertilisers (abolished in 1994 at the accession to the EU) led to price increases that were estimated to have reduced nitrogen demand by about 2.5 % (Hofreither & Sinabell 1998). In Finland, where fertilisers were taxed until 1995 (abolished due to EU accession), reductions in fertiliser use were probably more related to other factors (such as compulsory set-aside and falling output prices) than to the tax (Zeijts, 1999).

Swedish fertiliser taxes (still existing) are estimated to reduce the total nitrogen dosage by about 10 % and the cadmium content in (phosphate) fertiliser to an unknown extent (Swedish EPA, 1997, p. 62).

Other products

The effectiveness of taxes on batteries (intended to be both cost-covering and incentive charges) is not clear. In Denmark, the tax on NiCd batteries is reported to have reduced their use (Danish Government 1999b). The Swedish experience shows that charges on batteries (including car batteries) seem to be most effective if the revenues are used to stimulate the collection of spent batteries.

Taxes (mostly incentive charges) on specific chemical substances, such as the Danish taxes on (chlorinated) solvents and CFCs, are usually part of a wider policy package to reduce or phase out the use of these substances. It is therefore hard to attribute observed reductions to the tax alone.

Evidence of the effectiveness of environmental taxes on specific (waste-generating) consumer products and packaging is mixed. These taxes are usually intended as incentive charges. In Estonia, the excise tax on packaging has stimulated the re-introduction of deposit-refund systems and in Hungary the announcement of such a tax led to recycling initiatives (REC 1999). On the other hand, the Danish taxes on certain retail containers and on disposable tableware did not show clear results in terms of substitution by re-usable alternatives. As the Belgian example shows, this kind of tax may also play a role as a 'stick' to persuade industry to attain certain re-use or recycling targets.

Waste

Taxes on waste disposal are applied in 10 EEA member countries, up from three in 1996. The Danish and UK systems (among the three in place in 1996, the third being the Dutch tax) have been evaluated and appear to be especially effective in diverting waste streams from landfill to incineration. An assessment of the Danish tax system (Andersen, 1998) led to the conclusion that the waste tax had a significant impact on reductions in taxable waste, particularly construction and demolition waste and the heavier fractions of households and other waste. The UK landfill tax had an impact on diverting waste streams from landfill but it was deemed insufficient; a Government

Committee report concluded that a further increase of the tax rate to £30 would be needed if the tax should achieve its objective (UK DETR, 1999). The report recommended raising the rate for active waste to £20 per tonne over a five-year period and preparing for further increases thereafter. The 2000 standard rate of the UK landfill tax is 11 GBP per tonne for non-inert wastes and 2 GBP for inert wastes. The rate for non-inert waste is to rise by 1 GBP each year until at least 2004.

The Dutch tax on (ground) **water** (introduced in 1995 as part of a tax reform with environmental incentive intentions) was expected to reduce groundwater use by between 1.3 and 51.0 %, depending on the type of user. In 1997, a first evaluation showed that water savings by industry were developing in line with expectations, whereas small-scale (tax exempt) groundwater extractions by households and agriculture were increasing (Vermeend and Van der Vaart, 1998).

4.4. Conclusions

Assessing the effectiveness of environmental taxes is by no means a simple task. Firstly, it is not always clear how effectiveness should be defined and measured, because environmental taxes have to fulfil several functions simultaneously. Secondly, environmental taxes are almost always one element in a package of policy measures, which makes it difficult to isolate the impact of the tax. And thirdly, lack of relevant data is frequently a bottleneck.

Having said this, the available evidence seems to suggest that many of the existing environmental taxes in Europe do provide incentives to economise on the tax base, and thus contribute to the reduction of environmentally harmful emissions, products and activities. Tax schemes for which positive effectiveness has been shown include those on fuels and other energy products (especially when differentiated by environmental quality, such as lead and sulphur content), and emission taxes (such as the Swedish NO_x charge, the German and Dutch water pollution charges, and the Danish and UK waste-disposal taxes). Most product taxes such as on batteries, pesticides and packaging are normally so much part of a policy package that the singled-out impact of the tax itself cannot properly be assessed.

Apart from the incentive function, the effectiveness of environmental taxes can be assessed in terms of their functioning as a source of revenue, either for the general budget or earmarked for specific environmental purposes. This type of effectiveness has not been discussed in the present chapter, but in previous chapters we have seen that revenues from environmental taxes are gradually increasing. As a source of financing for environmental investments, environmental taxes are particularly important in several central and eastern European countries.

An assessment of effectiveness is incomplete if side and soft effects – positive or negative – are neglected. As the Danish example shows, intelligent planning of an eco-tax system not

only can avoid negative impacts on economic development by supporting environmental policy, but can also contribute to increasing competitiveness on emerging markets for renewable energies and eco-efficient goods and services. The open debate with the Danish stakeholders, the appointment of an eco-tax commission, as well as the timely evaluation of the system seem to have contributed to the success of Danish eco-taxation (Togebly, 1998; Schlegelmilch, 1998a). Experiences in other countries confirm the importance of consultation and participation of stakeholders for the effectiveness of environmental tax systems.

Table 4.1. presents a summary of effectiveness results.

Table 4.1. Some environmental taxes in Europe and their effectiveness

Tax on	Applied in	Evidence of effectiveness
Motor fuels	All European countries	Some impact reported on vehicle fuel consumption (e.g. in case of UK Fuel Duty Escalator) Main short-term impact is substitution in response to tax differentiation (e.g. lower rates for unleaded petrol, in many countries, and low-sulphur fuels, e.g. in Denmark and Sweden)
Other energy use (including carbon and sulphur taxes)	Many European countries	Clear energy-efficiency improvements and fuel substitution observed in countries with highest tax rates (e.g. Denmark, Finland, Sweden) CO ₂ taxes reviewed positively in Scandinavia and Finland Rate differentiation (e.g. by sulphur content) leads to substitution processes
Motor vehicle registration or sale	Most European countries	Some evidence of downward impact of high fees on car ownership; registration tax differentiated by environmental classification in Sweden, but financial impact marginal, and environmental impact mainly "soft"
Motor vehicle ownership/use (annual taxes)	Most European countries	Mostly differentiated according to weight or cylinder content; recently differentiated according to emissions in Germany; no evidence of effects
Motor vehicle use (road pricing, tolls etc.)	Several European countries	Usually applied as a cost-covering charge; evidence on effectiveness as an environmental policy instrument is lacking
Industrial emissions to air and water (measured)	Several European countries	Clear incentive effect in a limited number of cases (e.g. Swedish NO _x charge; Dutch water pollution tax); elsewhere main effectiveness through recycling of revenues to environmental investments (e.g. France, several accession countries)
Agricultural inputs (fertilisers, pesticides)	BE, DK, NO, SE AT, FI	Limited direct impact on use; "soft signals" (awareness raising) possibly more important (e.g. when revenues used for financing training programme – Sweden)
"One-way" packaging and other disposables	BE, DK, EE, FI, HU, LV, NO, PL	Positive impact on re-introduction of deposit-refund systems observed in Estonia; impact not clear elsewhere
Chemical substances (e.g. solvents, CFCs)	BE, CH, CZ, DK, HU, IS, SK	Contribution to reduction in CFC use reported in Denmark
Batteries and accumulators	BE, DK, HU, LV, SE	Mainly instrumental in stimulating collection of spent batteries
Car tyres	DK, HU, LV, NL	Revenues used for financing treatment of spent tyres
Water abstraction	Several European countries	Decrease in industrial groundwater use observed in the Netherlands after introduction of tax
Waste (apart from cost-covering charges)	A, DK, EE, FI, IT, NL, NO, SE, GB	Effective in several cases (e.g. Danish waste tax and UK landfill tax) on recycling, waste reduction, and shift from landfilling to incineration, reuse and recycling

5. Implementation: barriers and solutions

5.1. Barriers and solutions to wider use of environmental taxes

In general the role of environmental taxes is still limited. One indication is the relatively small amount of revenue. According to Eurostat statistics, only 6-7 % of total tax revenue (excluding environmental charges) has an environmental touch, and over 90 % of environment-related taxes appear to be energy and transport taxes which were not primarily designed for environmental reasons (Eurostat, 2000). There are several barriers to the introduction or further extension of environmental – particularly energy – taxes.

A major concern is the uncertainty of the environmental effectiveness of taxes which typically work indirectly (through the market) and which have no direct, compulsory, impact on the 'target group'. Contrary to 'command-and-control' measures, the taxed firm or individual is left with the choice between 'pollute and pay' or 'protect and save'. Chapter 4 showed that evidence on the effectiveness of environmental taxes is limited. Assessing effectiveness is a complicated job, because of methodological problems such as disentangling the impact of the tax from the effects from other measures in place, and due to lack of adequate data. Even if the environmental effectiveness of a tax cannot be assessed, or if an assessment shows that the effectiveness is limited, the principle of internalising external effects can still be seen as justified (even in a situation of demand surplus created price increases). Although correct in itself, in the eyes of the taxed subjects, however, it remains an academic argument, unless a clear connection is created between the tax, its role in the policy package, and the related policy objectives⁷. Such is the case in many national climate change programmes where quantitative GHG emission reductions have been formulated in the wake of signing the Kyoto Protocol (cf. UK Round Table, 2000).

In literature a number of other barriers for using environmental taxes can be found (e.g. OECD, 1996, 1997b, 1999c; Kasa, 1999, European Commission 1997c). These barriers reflect economic, social, fiscal and political conditions.

5.1.1. Economic barriers

Economic barriers include:

- The financial cost of taxes, in many cases on top of the necessary outlays for other environmental measures, potentially jeopardising a firm's vitality;
- The perceived impacts on (international) *competitiveness*, and consequently on employment, particularly in some sectors/regions;
- Perceptions that the taxes have to be *high* to work;
- The impact of taxes on inflation, as they increase prices in general.

Although firms liable to pay the tax often cite competitiveness and the financial cost of environmental taxes as a major impediment, there is hardly any evidence on the macro-economic level that supports such a statement. At sector level however, this issue should be studied with great care when preparing new taxes or tax modifications. Well-organised sectors are known to be able to ward off new taxes with lobby actions bringing (perceived) barriers to the attention of the competent authorities (see Box 5.2.). Studies of the impact of new taxes may result in special provisions in the proposed tax system that relieve much of the burden, and all of it in specific cases. In the Dutch tax on disposal and incineration of waste, firms that de-ink waste paper can get a refund of the tax on the de-inking residue waste. The tax would otherwise render the price of recycled paper higher than the price of virgin paper (Vermeend & Van der Vaart, 1998). The Netherlands also allows an exemption from the groundwater tax for water used to rinse recyclable bottles.

⁷ One could say that the pure 'Pigouvian tax', which is related to the environmental damage itself is less appealing for the general public than the 'Baumol & Oates' type tax, which is related to efforts to reducing the damage (see Chapter 2.1).

Most national CO₂ tax systems have ample provisions protecting national (large-scale) energy users. Large-scale energy users whose share of energy in production costs is significant, are either fully exempt from the tax for one or more energy products, or pay a reduced rate. Some systems (e.g. the Dutch) have reduced rates over certain thresholds. Furthermore in some cases the revenue from the tax is partly or fully recycled to the taxpayer (as in the case of the Swedish NO_x tax), which also helps to reduce the financial burden. Exemptions are the core of Belgian eco-taxes, since they are used as a 'stick' to meet certain waste collection or recycling objectives. Since the exemptions can apply to a sector as well as to individual firms, the eco-tax system even gives a firm the possibility of gaining a competitive edge if it qualifies for the exemption, while others do not.

The share of environmental tax revenue in total tax revenue indicates that the effect of environmental taxes on inflation will be small.

5.1.2. Social barriers

The (perceived) impact on income distribution is the main social barrier: low-income groups may be worse off than high-income groups, especially in the case of product taxes. This effect may be even stronger if the revenue is used to reduce (progressive) income taxes. Water metering is difficult to introduce for this reason (UK Round Table, 2000) and the adopted climate change levy in the UK will not affect households.

Careful design of new taxes or tax modifications can reduce or remove such equity problems. Many existing schemes already contain such social provisions. The Dutch CO₂ tax has a tax-free lower bracket for electricity and natural gas at about the minimum level required for a household. Dutch households in the lowest income bracket are exempt from municipal environmental taxes (such as the waste collection tax, the sewage tax) and from the water-pollution tax. Recycling the revenue from a tax through generic fiscal measures makes it possible to create fiscal provisions that balance the tax payments by the lower-income groups.

5.1.3. Fiscal barriers

Fiscal considerations creating barriers to environmental taxes include:

- The general striving towards reducing the tax burden;
- The perceived conflict between changing behaviour (i.e. through less tax) and maintaining revenues;
- The view generally held that the revenue from environmental taxes should be added to the public purse and not be earmarked for environmental purposes;
- The administrative costs of a tax, which may be high in comparison with the revenue.

Environmental taxes are different from other taxes such as taxes on labour and capital: their purpose is not solely to provide money for public tasks, but also to internalise external effects and to reduce environmental damage. The macro-economic impact of environmental taxes could even be positive, if they result in reducing environmental damage and thus improving national welfare. If other taxes, such as on labour, are reduced at the same time, the positive welfare effect could even be greater, since taxes on labour and other economic factors create a market distortion, which is not inherent in environmental taxes. As Chapter 1 argued, this double dividend is not automatically secured, and should not be seen as the major purpose of environmental taxes. However, a report for the Commission (Heady *et al.*, 2000) states that almost all economic modelling points towards positive welfare and employment effects from a shift in taxation from labour to the environment.

As far as environmental taxes are fiscal taxes (not charges), their objective is necessarily twofold: to create public money and to abate environmental damage. There is unavoidably a cross purpose here, in that the environmental objective of the tax entails eroding the tax base. The erosion effect may be greater if more environmental taxes are introduced or if existing taxes are increased. However, the price elasticity of environmental taxes (the effect of the price increase on the use of the taxed item) is restricted in many cases, and the share of environmental taxes in total tax revenue is small. Moreover, environmental taxes are just one element in a dynamic fiscal network in which all sorts of taxes and tax revenue change constantly. The extra labour-tax revenues resulting from larger-than-expected economic growth and lower-than-expected unemployment can easily outweigh the total revenue from environmental taxes.

5.1.4. Political barriers

Environmental taxes and some tax design elements come up against political barriers both at EU level and in the Member States as a result of EU legislation. The Commission (1997c) published a Communication to clarify the position of taxes and charges in the single market. Major constraints include existing rules for indirect taxation (such as energy taxes), avoidance of discrimination against products from other Member States and respecting state aid rules. Taxes must be notified and intended environmental effects well proven.

At EU level, fiscal matters require unanimity voting. It has therefore not yet been possible to introduce an EU-wide CO₂/energy tax, nor to extend and increase minimum tax levels for energy products. This is not a completely fixed stance, however. In the framework of the ICG, the Portuguese Presidency proposed to consider introducing majority voting for environmental tax issues, and the Dutch Minister of Finance suggested in 1999 to form a smaller group of Member States willing to better harmonise energy taxes, if no breakthrough at EU level could be achieved.

State-aid guidelines put restrictions on the spending of tax revenue and on the extent to which exemptions can be granted. These guidelines are under revision, which may result in more room for Member States to design taxes in an optimal way. It could facilitate tax exemptions for firms that take action beyond what is required by environmental law.

5.1.5. Careful planning

Proper design of environmental taxes is a major and necessary condition for overcoming barriers to their introduction – but it is not sufficient. Another decisive condition is careful and transparent planning of the new tax, encompassing study, information, consultation and readiness to bring about modifications if needed. Early announcement of the tax details, including the tax rates, flexibility during preparation while firmly sticking to what has been announced, and gradual implementation help the taxpayers to find in a timely manner the best strategy to adapt to the new instrument. As Vermeend and Van der Vaart (architects of the Dutch model of greening the fiscal system) put it ‘The process is pragmatic and incremental. What can be done effectively is done at the time it

can be done.’ (Vermeend & Van der Vaart, 1998, p. 8). And the Dutch experience shows that the right mix of design and planning leads to a fair acceptance of the taxes in place. The preparation of the climate change levy in the UK, to be introduced by 2001, has also been considered a success (Box 5.3.).

The importance of proper planning, information and consultation can also be illustrated by the Danish example where the eco-tax system did not create a negative impact on economic development, but on the contrary contributed to increasing competitiveness on emerging markets for renewable energies and eco-efficient goods and services. The open debate within Danish society, the appointment of an eco-tax commission, as well as the timely evaluation of the system seem to have contributed to the success of the Danish eco-taxation (Togeby, 1998; Schlegelmilch 1998b).

As competitiveness of national industries, equity and single-market issues are considered to be important barriers to the introduction of environmental taxes, the European Commission has put forward several initiatives. For two such cases, the barriers are addressed in the following section:

1. Barriers to the harmonised implementation of minimum energy tax rates to be levied on all environmentally harmful energy products; and
2. Barriers to the unilateral introduction of energy taxes above the minimum rates, as well as to the unilateral introduction of environmental levies generally if these are to be implemented in a competitive environment, given the restrictions of EU and WTO legislation, and given other barriers.

5.2. Barriers and solutions to EU-wide minimum energy taxes

Although various forms of energy tax, particularly the ordinary mineral-oil tax, have been applied in all EU countries for decades, and although they have contributed to increasing energy efficiency and thereby reducing costs, an EU-wide harmonisation and increase in minimum energy taxes faces opposition.

Major objections put forward and voiced in public are as follows:

- Negative impacts on competitiveness and thus employment due to the tax and hence price increases for several energy products. This holds particularly true for transport costs in the case of accession countries and the peripheral regions in the EU since they are located on the border of the EU and therefore face higher transport costs anyway.
- Impact on prices and thus inflation could endanger compliance with the Maastricht criteria for European Monetary Union (EMU).
- Uncertain effects on the environment if some countries have to increase taxes more than others.

Provisions in the Commission's 1997 proposal offer options which would substantially reduce these concerns: provisions for transitional periods, exemptions and reductions in tax rates under certain circumstances for energy-intensive industries.

The core of the resistance is in the extent to which existing energy taxes must be introduced or increased before or by 2002, in order to comply with the Commission's proposal. Annex III compares the current (2000 or most recent) tax rates with the minimum rates for 1998. It appears that only Denmark's taxes were all beyond the proposed 14 minimum tax levels. None of Luxemburg's taxes reached that level by 1998. Sweden was behind with one tax (on natural gas as a motor fuel), and Italy and the Netherlands with two taxes. Apart from Denmark, all Member States would have to introduce a tax on natural gas used as a motor fuel if the proposal is adopted. The performance of the reported tax rates (most of them for 2000) against the minimum rates for 2000 is almost the same as for 1998.

5.3. Barriers and solutions to environmental taxes in EU Member States

To help Member States decide on the legality and feasibility of unilaterally introduced taxes, the European Commission has addressed the use of these levies in a special Communication (Box 5.1.).

In general the reaction to the Communication has been positive, and there have been less complaints to the European Commission on environmental taxes since its adoption. The role of the Communication in

Box 5.1. Communication on environmental taxes and charges in the single market (COM(97) 9)

The Communication (European Commission 1997c) was adopted in April 1997. It explains the legal framework applicable to Member States, and clarifies both the possibilities and constraints for Member States to act in this field. The document mainly deals with product taxation, as this is the area most sensitive to internal market aspects.

It is explained that the effects of the European legislation, among other things, are that:

- If a levy has a clearly positive environmental effect, it may be judged in a more positive way in terms of its effect on other policy areas.
- Levies may not be used to discriminate against products from other Member States.
- Levies should be in accordance with Secondary legislation on indirect taxation, e.g. in the field of energy taxation, where detailed rules exist.
- Exemptions from paying the levy, and the way revenues from environmental levies are used, should fulfil rules in the field of state aid.

As environmental taxation is a rapidly evolving area, the Commission closely follows the evolution of the use of environmental taxes and charges in Member States and their impact on the single market and on environmental policy. As a follow-up to the Communication, the Commission is now having an evaluation carried out on the economic and environmental effects of their impact, which should be finalised by the end of 2000. The results of this work will be used to draw policy conclusions on the further use of environmental levies on Community and Member State levels.

this improved situation is difficult to estimate, but it is likely that it has helped Member States and regional authorities adopt environment taxes and charges that are in compliance with the Treaty.

The Communication is intended to present guidelines for the use of environmental taxes and charges in the single market. The main concern is that they should be compatible with European legislation as well as with the Community's obligations to third parties, e.g. in the context of the WTO. In particular, the Commission is aware of possible conflicts of national and even regional environmental tax legislation with competition, the single market and taxation policies. But these are only or at least mainly to be envisaged if the levies are imposed on (tradable) products. It is probably only in this case that they can be equivalent to customs duties, which are abolished in intra-Community trade and which are under the exclusive mandate of the Commission in extra-Community trade. This assertion holds true, for example, if the levies are imposed only on imported goods. Areas of conflict are especially the provisions given under the following Articles of the EU

Treaty (according to the Amsterdam Treaty): Art. 23 to 25 (customs union), Art. 28 to 30 (quantitative restrictions and similar measures), Art. 87/88 (state aid), Art. 90 (non-discrimination in indirect taxation) and Art. 174 (objectives of environmental policy). Furthermore, secondary legislation, especially on indirect taxation, has to be considered.

The scope of this Communication does not cover the minimum taxation of energy products, which is under EU competence. But the proposed Directive on minimum taxation of energy products is a framework directive, explicitly allowing for national implementation of higher tax rates in a unilateral manner. With respect to non-energy taxes, which are dealt with in the Communication, no common approach has been developed to date. Consequently, according to the principle of subsidiarity, this arena has been left open to initiatives of the Member States.

5.4. Barriers to unilateral introduction

A general restriction that is commonly perceived in pursuing environmental tax policy is not to distort competition, especially not to hurt the competitiveness of national industries that produce or use the taxed goods or services (see Box 5.2. for an example). A national tax policy led by this concern is by no means incompatible with EU rules. Practical difficulties, the real barriers of unilateral tax provisions in Member States, mainly stem from the inevitable conflict between the tendency of any national legislation in cases of doubt to

favour the national industry, and the role of the Commission to be the warden of undistorted, free trade between Member States. In practice, cases are judged on the basis of case-specific circumstances and the balancing of the environmental objectives allegedly pursued.

Practical barriers to the unilateral introduction of environmental levies also stem from the fact that products themselves, if consumed by 'immobile' end-users, are only in rare cases the ultimate reason for environmental degradation. In general, the following holds true: a) a product is not always only a consumption good but may also be used as a factor in production; b) the user is not 'immobile', at least with respect to the purchase of the product and to where he eventually physically consumes or processes the product, and c) environmental concerns about products are really not only product-related but in many cases process-related, i.e. the prior stages of production, the 'history' of a product, matters (or, in case of waste issues: the 'future' of the product matters). But the tax base usually chosen, the product, is only a poor substitute for the real intention of the levy. This constraint is inevitable for practical reasons.

The difficulties (either perceived or real) come from two sides: 1) Producers might tend to avoid using goods included in the tax base by considering to move to locations where this is not the case; 2) Difficulties are experienced with the regulating agencies (Commission; EU Court) to convince them that a specific tax application (e.g. indirect taxation of an environmentally damaging activity) is really the best available 'substitute' to address indirectly what cannot be taxed directly. This is because the 'state of the art' of indirect taxation through product levies does not allow the inclusion of environmental effects at all stages of production of a final product, that is, the 'process history' of the product. Thus one might have to tax a product when the intention is to tax the underlying process.

5.5. Solutions

Systematic remedies for this dilemma are envisaged in only two forms (besides the programme of harmonisation of the environmental tax system):

(a) *Border tax adjustments*: by means of border tax adjustments (BTAs), taxes on

Box 5.2. The case of CO₂ taxes in Norway

In Norway three attempts have been made in the past decade to subject mainland heavy and emission-intensive industries (mainly metals industries and power plants) to CO₂ taxes. The first attempt was made in 1990-1992 and followed the decision to stabilise emissions at the 1989 level. A tax was introduced but heavy industry was exempt. The second attempt followed the 1994-1996 Green Tax Commission's proposals, but was watered down. And in 1998 the third attempt to impose a CO₂ tax on these industries was effectively blocked.

Even though these industries are deemed less important for Norway's economy than the offshore petroleum exploitation and labour-intensive industries, which are under the tax regime, they remain exempt from the tax due to considerable political influence, reflecting well-established employer and employee organisations.

Source: Kasa, 1999

traded goods are levied in the country of destination. Such adjustments are common in all kinds of excise and VAT systems, but they can also be used in the area of environmental taxes. In the United States, for example, the 'Superfund' tax and the 'Ozone Depleting Chemicals' tax are levied on imported products containing, or produced with, the taxable chemicals, whereas the tax is refunded when the products are exported (see Hoerner, 1998);

(b) *An internationally non-distorting system of indirect taxes*, which accumulates the tax burden over all production stages according to the individual 'process history' of the product being taxed, as has been realised in the field of turnover taxes with VAT. This is an academic proposal designed in detail by Keil (1997), called the 'all-phase eco tax' on energy consumption. It is to be imposed on goods and services in relation to the energy consumed during manufacturing and distribution, i.e. the 'process history'. With respect to economic effects, this system would not interfere with the transboundary flow of goods and services, whereas the introduction of a national eco/energy tax would act as an import subsidy and at the same time

raise the cost of exports, which prohibits its introduction. The inclusion of what is designated here as indirect energy consumption would also increase competitiveness of countries with high existing energy taxes.

Box 5.3. The climate change levy in the UK is considered a success story

The UK climate change levy will be in force by April 2001. Preparation began in 1998 when Lord Marshall reported to the Chancellor of the Exchequer that a mixed policy of economic instruments, regulations and voluntary instruments was necessary to help reduce CO₂ emissions. The UK Round Table on Sustainable Development reported that the following factors were decisive in the successful preparation of the levy:

- A clear environmental objective to which the government was publicly committed;
- The signalling of a possible tax as a spur to an improved voluntary agreement;
- An iterative negotiation;
- A balanced mix of economic instruments, voluntary agreements and regulation;
- An element of hypothecation to help the tax payers to reduce their energy consumption and therefore reduce their liability to tax;
- A compensation reduction in other taxes (National insurance contributions);
- A way forward that could be supported publicly by most stakeholders.

Source: UK Round Table, 2000

Annex I: Details of environmental taxes by country

Austria

Austria has started to use environmental taxes more intensively. In 1998, a tax commission was set up to explore several issues, of which environmental taxes was one. The final report provided several options for further increased use of environmental taxes.

Energy

Taxes applied

Since June 1996 an energy tax has been levied on electricity and natural gas. The revenue of the energy tax is 5.1 billion ATS (1999). Reimbursements for the energy-intensive industry amount to 2.5 billion ATS (1999). For energy-intensive industry, a ceiling of 0.35 percent of the net value-added has been introduced. In order to avoid double taxation, oil for electricity production is exempt. As of May 1995 Austria has increased the excise duty on mineral oil by 16 percent on average (ranging from 1.6 % to 24.6 % for specific products). Fuels subject to mineral oil tax do not fall under the ceiling of the Energy Tax Reimbursement Act. Contrary to other member states with high tax rates on energy, there are no reduced tax rates for fuels used in the industry sector. The energy tax on electricity was doubled in June 2000 and amounts to 0.2 ATS/kWh.

Transport

Taxes applied

The motor vehicle tax was increased in June 2000. The tax rate is 0.605 Euro for each kW exceeding 34 kW. A surtax of 20 percent is levied for cars without catalytic converters (not complying with 1987 emissions standards). In 1992 a car registration tax was introduced. The tax is levied on new passenger cars. The tax base is the net price of the car and the rate depends on the standard fuel consumption of the vehicle, thus giving an incentive to buy fuel-efficient cars. In May 1996 the maximum charge was increased from 14 to 16 percent. As of 1997 Austria has introduced user charges on motorways ('vignette'). The user charges are levied on all vehicles up to 12 t gross laden weights.

Pollution and resources

Taxes applied

Charges are also used for the protection of the soil. In 1986 a charge on fertilisers was introduced. This charge was abolished with the accession of Austria into the European Union due to single market concerns. According to the act on the redevelopment of contaminated sites of 1989, a charge on waste depositing was introduced. The revenue is earmarked for the containment and redevelopment of contaminated sites. The charge was further differentiated in 1997. The charge rate will vary from 100 to 600 ATS per tonne by 2001, depending on the type of waste and the extent to which the landfill meets 'state of the art' environmental standards.

Evaluations

'Hofreither & Sinabell calculated a price elasticity of demand for fertiliser in Austria until 1993 of about -0.2. In earlier studies by Bayer & Puwein (1990, ref. Becker 1992) the nitrogen demand elasticity was found to be -0.29. Becker (1992) considers that the decrease in demand for chemical fertilisers since 1986 has been caused mainly by decreased profitability from fertiliser use, increased production of leguminous crops, better utilisation of manure, less excess use of fertilisers and improved extension service. According to Hofreither & Sinabell, the direct effect of the price increases is a reduction in nitrogen demand of about 2.5 % (4000 tonnes). The proceeds were used partly to subsidise leguminous crops, which delivered an extra reduction of 6000 tonnes of nitrogen (about 6 %) (thus overall more than 8 % in the short term). The estimated change in fertiliser application in the medium term, however, was 18,000 to 20,000 tonnes, which is the result of comparing the 3 year averages before and after the introduction of the levy. The same authors propose that not only 'hard' economic effects have to do with both economic optimisation behaviour and 'softer' psychological factors as well as changing attitudes of farmers to environmental issues' (Zejts 1999, p.52). The differentiation of the waste disposal charge has led to a quick adaptation of landfill sites: in 1996/97 there were 21

landfills in Austria which did not comply with 'state of the art' technology; in 1999 this number had decreased to four (Umweltbundesamt 2000).

Belgium

Energy

Taxes applied

Heavy fuel oil with sulphur content above 1 per cent is taxed at a higher rate than low-sulphur fuel oil. With the revenue of the special charge on energy, established in 1993, a special fund for the financing of social insurance measures was supported. This first step will be enhanced substantially. The new government, in force since mid-1999, has announced the introduction of a CO₂/energy tax and to use environmental taxes more intensively.

Pollution and resources

Taxes applied

The Belgian environmental taxes on pollution are mainly incentive charges for the producers to establish a recycling system. The taxes support environmental agreements in which government and producers have defined targets for the Belgian recycling scheme. Environmental taxes can be levied on drink packaging, batteries, packaging for certain products for industrial use (such as glues, inks, paints, oils, pesticides and solvents), disposable cameras, pesticides and paper. Since the Belgian governance structure has changed and some authority has been delegated from the national government to the regional authorities, the implementation of the eco-taxes has been fraught with difficulties. There is a lot of debate on the conditions on which products can be exempted from the taxes. The partial implementation of these pollution taxes is also due to the achievement of environmental targets, with the tax functioning as a sanctioning instrument, as 'a big stick'. At the regional level, Flanders imposes a tax on the excess production of manure and on gravel extraction. Flanders and Wallonia have a tax on groundwater abstraction. All three regions apply waste and wastewater taxes (OECD, 1999b).

Bulgaria

Apart from energy and transport taxes (which include some pollution related differentiation), fines for exceeding emission limits (Non Compliance Fees) are the main environmental 'taxes' in Bulgaria. Recently, legislation has been enacted that provides

for emission charges (i.e. on emissions within admissible levels) as well. Other proposed environmental taxes include product charges on products that generate harmful waste, and a 'nature' tax, to be paid by hotels, stores, sporting facilities etc., located in protected territories (REC 1999).

Cyprus

With a view to its envisaged EU membership, the Cyprus government has published an Action Plan for the Protection of the Environment, in which the use of fiscal instruments is one of the items being discussed (Cyprus Ministry of Agriculture, Natural Resources and the Environment, 2000). The excise tax on diesel oil in Cyprus is currently well below the EU minimum. The price of diesel oil would have to increase by 150 % in order to be in line with the EU Directive (European Commission, 1992b).

Czech Republic

The Czech Republic has a comprehensive system of environmental charges, both on emissions to air and water and on some products (such as CFCs). There is also a charge on the conversion of agricultural and forest land to other purposes. The charge revenues accrue mainly to the State Environmental Fund. The principles of the charge system are reported to be compatible with EU membership. A number of products are subject to the reduced VAT rate of 5 per cent (the standard rate is 22 %) for reasons of environmental protection or energy conservation. At the Prague airport, an airplane noise pollution tax is levied. Tax rates are differentiated according to four noise categories.

The idea of an 'eco-tax reform' is currently being considered.

Denmark

Denmark applies a broad spectrum of environmental taxes and has been doing this for already more than a decade. An environmental tax committee of the Danish government has evaluated the taxation on trade and industry's energy consumption, the consumption of nickel-cadmium batteries, the consumption of chlorinated solvents and waste water. According to the committee, green taxation for trade and industry has proven to be a useful instrument for environmental policy which

at the same time takes competitiveness of Danish industry into consideration. Another study (Enevoldsen, 1998) has particularly looked at the effects of the CO₂ tax compared with policies in other countries. New taxes on certain ozone depleting chemicals and on the lead-in-gasoline replacing chemical MBTE are in preparation (Skatteministeriet, 2000). A recent proposal by EPA recommends changing the packaging tax system and tax packing according to their environmental impact. Relatively low taxes should apply to paper, cardboard and glass, and much higher ones to aluminium, expanded polystyrene and polyvinyl chloride.

Energy

Taxes applied

The Danish taxation on energy is amongst the highest in the world. The taxes cover the fossil fuels oil, coal and gas, as well as electricity. Energy taxes (in addition to mineral oil taxes) were introduced during the oil crises in the 1970s because Denmark was hit very hard by the oil price shock due to its dependency on foreign resources by 95 percent. They were increased considerably in the mid-1980s which neutralised the decreasing prices of crude oil on the world market and thus kept the price level up and ensured that energy saving investments did not have to be written off. Due to concern for competitiveness, VAT-registered companies could have their energy taxes reimbursed if they were entitled to have the VAT on the energy refunded. The net tax burden of energy taxes therefore fell on households and non-VAT registered companies. In the 1990s energy taxation became part of the Danish policy to combat climate change. In 1992 a CO₂ tax for households was introduced which was extended to industry in 1993. Between 1994 and 1998 Danish environmental taxation became part of the first phase of an ecological tax reform. However, in the first phase between 1993 and 1995 the incentives were such that outsourcing of energy-intensive parts of a company became profitable. This led to several undesired effects such as reduced environmental effects and revenues. Hence, in 1995, the Danish Parliament adopted the Energy Package. With the Energy Package the taxation of industrial energy use was changed. The main changes were a gradual increase in CO₂ taxation, a modification of energy taxation on industry (e.g. the possibility of having the tax on energy for space heating reimbursed

was abolished) and, finally, the introduction of a new tax on SO₂ emissions. Of particular interest is the design of the CO₂ tax on business as it takes into account its competitiveness. The rates differ according to the use of energy (namely the processes) and are even further differentiated depending on whether an environmental agreement has been concluded. Heavy processes (35 such processes are laid down in a list) are not exempt, but benefit from a much reduced rate. Light processes are burdened by a slightly reduced rate. For space heating in business, the same rate applies as to households. If voluntary environmental agreements are concluded, including energy audits with the obligation to invest according to certain criteria, a further reduced rate can be achieved for heavy and partly also for light processes. In such a way, the largest energy saving potentials, which are normally in the heating of buildings, can be exploited without damaging the competitiveness of a company. A further feature of the Danish energy tax package is subsidies for energy investments. Further increases in various tax rates of the energy tax package have been announced, partly depending on neighbouring countries' increases in environmental taxes. The fundamental principle of the tax reform is not to raise income for the government but to recycle tax revenue to the private sector. Trade and industry will benefit from this mechanism by investment incentives for energy-saving measures. Furthermore, the marginal taxation of labour income was reduced by a total of 2 percent of the Danish GDP (this was not only financed by environmental taxation but also through a restructuring of the taxation on capital revenue). Finally, a smaller share of the revenue is earmarked for small and medium-sized enterprises.

Evaluations

The high energy taxes have caused a continued incentive for energy savings and the spread of other, tax free energy. 'The taxes have affected behaviour in the following ways:

- less energy consumption at the end users, through the use of insulation, a reduction in room temperature, more energy efficient equipment, newer, more efficient boilers, etc.
- a change from taxed fuels to tax-free fuels
- a greater spread of CHP

- a greater spread of natural gas' (Danish Ministry of Taxation 1998, p.12)

The energy taxes have been increased in July 1998 which led to an even greater advantage for the alternative fuels which are not levied with the increased taxes. (*ibid.*, p.13). 'The influence of the taxes on the net energy consumption should be seen in light of the fact that the large increase in taxes occurred at the same time as prices fell. The actual consumer prices after the taxes were increased considerably were therefore no higher than they had been previously. The taxes have therefore upheld the incentive to save, rather than creating new incentives' (*ibid.*). Still, this is of major importance since hardly any country used this historic window of opportunity. The net consumption of space heating thereby fell by 10-15 percent from the 1970s to the 1990s. 'There is a coincidence between the on-set of new CO₂ policy measures towards industry (CO₂ taxes, investment subsidies and agreements) and a period of stable reductions in CO₂ emissions' (Enevoldsen 1998, p. 65). 'Measured in real CO₂ emissions – i.e. corrected for growth in production volume – the reductions have been more steep from 1993 to 1997 which forms the period where the new CO₂ policy strategy has been in force. Although there are various external reasons for the reductions – most notably an ongoing conversion in electricity production – there is no doubt that the focused CO₂ policy measures since 1993 have contributed to energy-savings and shifts to cleaner fuels beyond what would have taken place in an autonomous development. The progress has been due to the creation of direct incentives to the reduction of CO₂ emissions by way of the CO₂ taxes, and now also the binding agreements, and through the indirect incentives of ear-marked investments subsidies' (*ibid.*, p. 72). 'Without the higher prices and taxes, consumption would probably have increased as the number and size of residences has increased' (Danish Ministry of Taxation 1998, p. 12). The 'most marked' effect of the taxes is a greater spread of new supply systems such as gas and CHPs. The macro-economic effect of the Danish Energy Package is very modest due to the gradual increase over five years and the full recycling of tax revenue (Danish Ministry of Finance 1995, pp. 17). The Energy Package brings in revenue of approximately DKK 2 billion annually in additional CO₂ tax, SO₂ tax and energy taxes on trade and industry. Similarly, approximately DKK 2

billion is transferred back via investment subsidies, the reduction of labour market contributions, and the reduction of fees, etc. The significance for employment is marginally positive. In Denmark labour-intensive parts of the manufacturing sector and the service sector receive a net profit, whereas business with high energy consumption are additionally taxed, although this will be moderate due to the fact that a number of heavy processes are eligible for reimbursement of taxes. In addition 'there is good reason to believe that the 'secondary' policy instrument of investment subsidies had a significant effect on energy-saving measures' (Enevoldsen 1998, p. 66). 'the kind of innovations stimulated by the Danish CO₂ taxes and supplementary instruments are mostly energy process innovations discovered by the specific enterprises' (*ibid.*, p. 73). 'Process innovations usually come about as the result of the enterprises' own experiments. Here the CO₂ taxes and investment subsidies are (...) effective. The eight Danish heavy energy-consuming enterprises, we interviewed, confirm the picture that many process innovations have taken place in the 90s. In particular, the firms have been kilful in developing heat recovery systems which result in drastic savings in the paper, glass, and stone industries where large combustion furnaces and/or drying kilns are employed in the production' (*ibid.*, p. 71). As industry receives a tax rebate in the form of process list discounts or agreement discounts, the energy package includes elements which can be considered as subsidies. This required the approval of the EU Commission. For the purpose of the single market, provisions have now been made to ensure that the retransfer to companies is not larger than their total energy taxation. Concerning competitiveness, the Danish Ministry of Economic Affairs (1996, p.126) stated: 'Danish experience through many years is that we have not damaged our competitiveness because of green taxes. In addition, we have developed new exports in the environmental area'. In the area of wind generated power, Denmark has become the third largest producer of wind mills. In 1996 this sector had a total turnover of 650 million EURO and had created more than 10,000 jobs (Zank 1998). Also energy-related service activities are booming in Denmark. Furthermore, Denmark has become a very attractive market for energy-saving goods; the share of energy-saving refrigerators has increased from 40 percent in 1994 to 85

percent in the year 1996. These refrigerators are up to 35 percent more efficient (Jänicke et al. 1997, p.6). Another remarkable side-effect of the Energy Package in Denmark is a sophisticated overview of the consumption patterns for energy by industry which might provide an information base for further improving energy efficiency and thus competitiveness of Danish industry. The driving force that gave an incentive for advanced monitoring of energy consumption was that the government assumed that all energy consumed would be used for heating, thus being taxed at the highest rate. Hence, industry had a strong interest in providing data on the various uses of energy in order to get a rebate in the end. 'Whereas the Dutch LTA-commitments to energy-efficiency improvements implies no direct incentives to shift to more CO₂ friendly fuels, the Danish taxes are differentiated according to the carbon content of fuels' (Enevoldsen 1998, p. 68). Interestingly, 'fossil fuels employed for non-energy purposes are taxed' (*ibid.*, p. 69). This is a rare feature of a CO₂ tax since normally exempt for competitive reasons. 'firms (...) are threatened with higher CO₂ taxes if they violate the agreement, [which] (...) must be considered a hard incentive' (*ibid.*, p. 69). The environmental effects of the energy package fulfil to a large degree the expectations of the Danish government which are shown here in more detail. Based on the ex post assessment, the CO₂ tax was responsible for a reduction of 1 million t CO₂ in the period 1988-1995 (Danish Government 1999a, p.92). Total CO₂ emissions in 1999 amounted to 55.7 million tonnes, a reduction of 9 per cent since 1988 (Danish Ministry of the Environment, 2000). Energy efficiency in Denmark has improved since 1980 by more than 50 percent (Enevoldsen, 2000, p.22). The corrected industrial CO₂ emissions decreased, especially from the beginning of 1994. It is supposed that 'the introduction of CO₂ taxes and large energy investment subsidies from 1993, followed by a drastic increase of the taxes from 1995, (...) has been very effective from an environmental point of view.' (*ibid.*, p.26). Especially the 'large-scale investment subsidies, generated by the ear-marking of CO₂ taxes and additional environmental funds, has been a crucial means for bringing down CO₂ emissions.' (*ibid.*, p.30). 'From 1996, however, the CO₂ taxes and binding agreements played a greater role for the CO₂ reduction achievements. Thus, in 1997 the production corrected CO₂ emissions fell with app. 5 % (in the 90s this has only been

surpassed by 1993-1994)' (Enevoldsen 1998, p. 66). 'The fact that the interviewed enterprises initiated many projects beyond the agreement obligations over the last two years [1996-1997] indicates a certain innovative drive from the taxes' (*ibid.*, p. 71). 'The speed reduction of CO₂ emissions in the mid-90s can [mostly] (...) be explained by the investment subsidies and by the fact that rising CO₂ tax components were added to relative stable market energy prices' (*ibid.*, p. 67). In the Danish industrial sector the CO₂ emissions were, compared to 1988, 3.0 percent lower in 1996 and 3.4 percent lower in 1997 (*ibid.*, p.65). These reductions seem to be rather moderate compared to the national reduction target of 20 percent for the period 1988-2005, but this 'should be seen against the background of a faster-than-predicted economic growth since 1993.' (Enevoldsen, 1998, p.65). This growth actually caused an increase of CO₂ emissions by 4.6 million t in the period 1988-1995 (Danish Government 1999a, p.92). The incentive effect of the increasing tax in 1997 was perceptible: 'Even though the firms we spoke to are very unhappy about the unilateral Danish CO₂ taxes, many of them agree that they play a strong motivating role for energy decisions. Most important, the tax incentives encourage a speeding up of investments: 'We got started faster than we would have if there had been no taxes. Our major energy initiatives around 1993 would have faded out, had the taxes not been introduced'' (*op. cit.*, p. 68). But there is also a problem with the tax rule in Denmark which prevents recovery of process heat from being profitable to the industries. 'This is because CO₂ taxes are still imposed on the recovered process heat according to the amount of gas which it would have taken to produce the same amount of heat in a gas-fired boiler. In consequence, the economic gain from heat recovery is reduced by as much as 2/3. In combination with the considerable subsidies for heat energy generated by CHPs [which i.a. caused a greater spread of them, see above], this implies that many industries can no longer sell the recovered heat at competitive prices.' (*ibid.*, p. 69). And 'CO₂ taxes have not been sufficient to stimulate increased industrial use of renewable energy (biomass, waste, etc.)' (Enevoldsen 1998, p. 68). The environmental effect of the tax on sulphur emissions is even better than expected. The sulphur content of fuel gas oil has been reduced from 0.2 percent to 0.05 percent within a few weeks of its introduction. The

sulphur content of heavy fuel oil has been reduced from 0.2 percent to 0.05 percent, and the sulphur content of coal has been reduced by about one-third. In addition, the tax had a positive impact on the development of sulphur purification plants and technology (Danish Ministry of Taxation 1998, p.31). The total SO₂ emissions decreased by about 24 percent in the years 1995-1997 (Danish Government 1999a, p. 46). This decrease is mainly due to the 'other sectors', apart from the electricity and district heating sector, with a decrease of 47 percent in this period. The Ministry of Taxation made a market survey on the price differentials with regard to the sulphur content prior to setting the tax rate. They found that basically there are none and thus expected an immediate reaction by a shift to low sulphur fuels. And in fact this happened: most of the decrease in the 'other sectors' already occurred in 1996 (-37 percent) with the biggest role being played by a changeover to low sulphur content fuels (-33 percent). The reduction in the electricity and district heating sector was only 14 percent in 1995-1997. This comparatively low decrease is due to an extraordinary export of electricity in 1996 which was caused by a shortfall of rain in Norway and Sweden to run their hydropower plants, thus leading to increased demand for imports from Denmark where electricity was generated mainly from coal-fired plants. The estimate for 1998 in this sector shows a reduction of over 50 percent, also caused by a changeover to low sulphur fuels, compared to almost no change in the 'other sectors' (-0.4 percent) (*ibid.*). This confirms the assumption of the Danish Ministry, if the time lack caused by the extraordinary electricity export is considered. The tax on sulphur emissions, which has now been levied on the electricity output, will from 2000 be collected depending on the sulphur input of fuels for electricity production, thus giving power plant operators an increased incentive to choose low-sulphur fuels.

Transport

Taxes applied

It is worth noting that the car registration fee in fact almost triples the price of a car above a sales price of EUR 6,820 and is progressively designed. It can be considered as the highest in the EU. In 1997 the taxation of passenger cars was further greened. In addition to VAT, registration tax and a yearly tax (based on the weight of a car), a new green tax was implemented. The

latter rises consistently and proportionally with fuel consumption. A petrol-driven car travelling 100 km on 5 litres of petrol is liable to be taxed at the lowest end of the scale (EUR 59 per year); this goes up to EUR 2,160 for cars consuming more than 22 litres of petrol per 100 km. This change resulted in increased revenue of 1.5 percent compared to the previous weight tax. Green tax and weight tax are increased not – as often done – with inflation, but by wage index in order to maintain the real value of tax (Danish Ministry of Taxation 1999).

Evaluations

'Increasing fixed costs will lead to a decrease in car ownership and may also contribute to a reduction in car use and external costs of car use. Some support for the effectiveness of this policy is the relatively low level of car ownership in Denmark where taxes on new cars are much higher than the EU average. Since car ownership is relatively price inelastic, drastic changes in car costs are needed to have a significant effect.' (Van Wee, 1995). In Denmark, car ownership is 34 per 100 inhabitants, whereas in Germany (with negligible car registration taxes) it is 50 per 100 (calculated after European Commission, 2000c).

Pollution and resources

Taxes applied

Denmark has environmental taxes on carrier bags, chlorinated solvents, CFCs and other ozone depleting substances, certain retail containers, disposable tableware, electric bulbs, pesticides (presently amounting to 35 % of retail price on average), NiCd batteries, drinking water, waste (substantially increased in 1997), and raw materials. Plans have been launched to differentiate the tax on packaging according to the environmental impact, meaning lower taxes for packaging materials such as paper and cardboard, and higher taxes for aluminium and PVC containing material. A tax on PVC plastics and accompanying has been introduced in 2000 since an environmental agreement – similar to the case of batteries – failed its target. According to their evaluation, the experience with these taxes is so positive that chemicals are being considered an interesting field for an expansion of the tax regulation by the Danish government.

Evaluations

Pesticides

'Before the tax was introduced in 1995, it was assessed that pesticide consumption in general would be reduced by 5-10 %. This assumed an immediate price elasticity of 0.5, and a slight effect as a result of the increased development of alternative methods of pest control' (Danish Government 1999c). Although the consumption, in fact, 'fell by 10-13 percent from 1995/96 to 1997, (...) it is not certain that this can be put down entirely to the tax. The doubling of the tax in 1998 is expected to further reduce consumption by approximately 8-10 %' (Danish Government 1999c, p.9). According to Statistics Denmark, from 1994 to 1998 the reduction was 6 per cent, when measured in application frequency of standard doses (Andersen, 2000).

NiCd batteries and chlorinated solvents

These taxes have reduced the consumption of the respective toxic substances. The consumption of the three taxed chlorinated solvents has come down to approximately 40 % compared to the consumption before the tax. The retransfer of revenue in the form of a collection and compensation scheme for used NiCd batteries has led to a marked increase in the quantities collected. The taxes do not cause significant administrative problems, and competitiveness does not appear to be greatly affected (Danish Government 1999b).

Waste

According to OECD (1999b) the Danish weight-based tax on waste is successful in reducing waste. The tax on non-hazardous waste increased the cost of waste dumping by a factor 2 and increased the cost of incineration by 70 percent. Between the years 1985 and 1995 the share of waste dumping to total waste treatment decreased from 39 percent to 18 percent. This stands for a reduction of 1 million tons of waste delivered to sites registered before 1990 and a reduction of about 0.16 million tons to sites registered later due to the tax (Andersen 1998, p.14). Between 1987 and 1993, the amount of total household waste brought to landfills was reduced by 16 percent, construction waste by 64 percent and mixed waste by 22 percent. Manufacturing waste, however, increased by 8 percent. Recycling was promoted considerably: 77 percent for paper and

cardboard, 50 percent for glass. The amount of construction material recycled increased from under 0.8 million tons in 1991 to over 1.6 million tons in 1995. (*ibid.*, p. 15) The quantity of garden and organic household waste composted also rose significantly, from 86,000 tons in 1990 to approximately 500,000 tons in 1994. According to Andersen (2000), the key achievement of the waste tax is a 26 per cent reduction in waste going to landfills and incinerators from 1987-1998, mainly through improved recycling. In late 1996 16 large waste producers were interviewed in-depth about their waste treatment. 13 of them stated that they 'had actively tried to increase their recycling in ways ranging from simply reusing materials on hand to redesigning production processes to incorporate waste products' (Andersen 1998, p. 38). These 13 interviewees were also asked to identify three factors that had contributed to their decision. Ten of them mentioned the possibility of obtaining income from waste products, while eight said that they wished to reduce their waste bill. Of the latter, only two stated that the waste tax was a key factor in their decision-making. Other factors mentioned were to improve corporate image (8), municipal regulations (7), the environmental permitting process (4) and pressure from customers (2). On the question whether the expected increase in the waste tax would have an effect on them, four indicated that they would alter their waste management and eight did not plan to make any changes. One reason for this could be that most of the interviewees do not know the true cost of their waste disposal operations and the potential benefits of adopting greener alternatives. A lack of integrated accounting for waste management activities and the relative low cost of waste management (0.5 percent of a company's turnover) might be the reason for this. (*ibid.*, p. 39) Municipal waste authorities were also interviewed about the particular recycling opportunities they offered their residents and their reasons for doing so. The responses indicate that the municipal council's desire to increase recycling for political reasons was the most significant reason. 'The desire to reduce cost was generally the second most important factor, especially for the heavier types of waste such as garden waste, bulky waste, and construction waste. Furthermore, more than 70 percent of the respondents said that the waste tax played 'some' or 'a decisive' role in their decision to establish [recycling]

facilities for such waste (for construction waste, nearly 50 percent said that the tax played a decisive role).’ The overall reduction was achieved by a comprehensive waste-reduction policy with several elements, including the waste tax. ‘More than 80 percent of the reduction occurred in areas not subject to regulation, such as construction materials and garden waste, where the establishment of new recycling facilities played a prominent role. Particularly in the case of construction materials, the waste tax may have been important in promoting recovery and reuse.’ (*ibid.*, p.40).

CFCs

The tax is levied on CFC if used for manufacturing certain products with a special rate of DKK 30 (EUR 3.97) per kilogram net weight of substance (European Commission, 1997, p. 84). ‘Other taxable substances are regulated by the Montreal Convention on those which damage the ozone layer. However, the substances are only subject to tax when used in the production or maintenance of certain products such as refrigerators, freezers, etc.’ (*ibid.*, p.84). The tax rate ‘is intended to eliminate the existing price difference between ozone-detrimental products and substances which are less damaging. (...) According to figures published in the Danish Statistical Review 1994, the consumption of these ozone-depleting substances has dropped by approximately 50 percent between 1986 and 1992. In real figures the consumption of CFC has dropped by 5,660 tons in 1986 to 2,225 tons in 1992, whereas the consumption of halones has dropped from 127 tons in 1986 to 44 tons in 1992. Seeing the consumption as an indication of the damage to the ozone layer, the quantitative effects of this measure is considered to be significant. However, it is also evident that other factors play a major role such as consumers’ growing demand for environmentally-friendly household appliances. This tendency has been supported by taxation’ (*ibid.*, p. 85). The overall environmental effect is rated as ‘positive to very positive’ (*ibid.*, p. 85). However, one should keep in mind that there was a border tax adjustment, i.e. the tax was refunded for CFC in exported products. As 95 per cent of Danish refrigerators are exported, it is difficult to claim that the change in CFC use in this industry was due to the tax (Andersen, 2000).

Disposable tableware

The purpose of this tax, which exists since 1982, is to reduce the use of disposable tableware. In recent years, the revenues from this tax are declining. This indicates a decline in the use of disposable tableware, which may be, however, attributable to other factors, such as changes in consumer’s preferences. Still, the tax may also have had an effect (Danish EPA, 2000).

Retail containers

The tax on certain retail containers used to be volume-based, which did not provide sufficient incentives to producers to reduce the amount of materials used for packaging. Therefore, since 1998 weight-based elements have been included in the tax base (Danish EPA, 2000).

Estonia

In Estonia, charges on air and water pollution and waste are applied since 1994, next to the usual energy and transport taxes. The revenues are used to finance environmental projects. In 1997-1998, a packaging excise tax was introduced on drink packaging, with the aim to stimulate recovery. Packagings of which at least 60 per cent are reused are exempted. The tax is reported to be successful: deposit refund systems, which had disappeared following the collapse of the centrally planned economy, were re-introduced. More than 50 per cent of alcohol and soft drink packagings were collected in 1997. A CO₂ emission charge is to be implemented in the year 2000 (REC 1999).

Finland

In 1990, Finland was the first country to introduce a CO₂ tax and has implemented several more environmental taxes. Revenues are partly used to reduce personal income tax and indirect labour costs.

Energy

Taxes applied

The CO₂ tax was introduced with almost no exemptions, but at a low level. The system has been changed several times for the purpose of consistency with the European Union, although EU plans for introducing harmonised energy taxation have not yet been implemented. The initial input-based tax system consisted of a tax on CO₂ (75 percent) and on energy (25 percent). The system was again revised in 1997. One major

reason for the reform was the unsuitability of the input taxation of the electricity for the opening of the Nordic electricity market. The Finnish government was also concerned that input taxation of electricity might conflict with EU legislation, which found expression in the challenge of Outokumpu Oy, a large mining and metal engineering company, at the European Court of Justice (verdict of April 2, 1998). The company imported electricity from Sweden (Vattenfall) and considered its imports as being discriminated against because Finnish customs added an import tax. The import tax happened to be higher than the tax on domestic hydro power, though lower than the taxes on some other domestically produced electricity. But a major reason for the verdict against Finland was that the tax law did not even provide the possibility for proving that it was 'green' electricity. The input tax on electricity was transformed into a general tax on electricity, thus only the energy content was taxed from 1997 on. Rates were increased substantially. Furthermore, a differentiation between sectors was introduced. Whereas households have to pay the full rate of FIM 0.041/kWh (about EUR 0.0069) since September 1998, industry and agricultural greenhouses pay FIM 0.025 (about EUR 0.0042).

Evaluations

An assessment of the significance and scale of the impact of the CO₂ tax on emissions showed a reduction of 4 million tonne in carbon dioxide emissions in 1998 compared to 1990. Without the energy taxation, emissions would have been 7 per cent higher than the 57 million tonnes actually recorded in 1998 (PMOPS, 2000).

Pollution and resources

Taxes applied

Finland applies environmental taxes to non-refillable soft drink and alcoholic beverage containers (with a lower rate for recyclable containers) and to waste delivered to landfills. The waste tax has a number of exemptions. The tax applies to waste delivered to municipal landfills.

A tax on fertilisers was applied from 1976 until 1994. It was not primarily intended as an environmental tax, but as an instrument to finance agricultural export subsidies. The tax rate was low until 1992, when it was raised to FIM 2.9 (EUR 0.5) per kg N. The tax was abolished when Finland joined the EU in 1995.

Evaluations

The impact of the fertiliser tax on fertiliser use is unclear. The large tax increase in the early 1990s was accompanied by a decrease in fertiliser use, but this decrease can largely be explained by the simultaneous growth of the area under set-aside (Zeijs 1999, p. 54-55).

France

Environmental taxes and charges have existed in France for a long time, although their role has always remained relatively modest. With the change of government in 1998, the interest in environmental taxes has grown.

In 1998, the 'general tax on polluting activities (TGAP)' was created, which comprises several smaller environmental taxes that are now easier to administer under a uniform scheme. The tax base is to be broadened and tax rates are to be increased. TGAP will be introduced in three stages:

1999: TGAP covers five fees (on VOC, SO₂, NO_x, and HC emissions into air, on lubricants, on aircraft noise, on household waste and on treatment and storage of special industrial waste) currently administered by ADEME

2000: extension to tax on the P-content in detergents and softeners, on pesticides and on granulates

2001: extension to intermediate energy consumption of companies for reduction of greenhouse gases.

Energy

Taxes applied

Fuel taxes in France are high compared with the EU average. In its 1999 budget the French government started to increase the mineral oil tax on diesel by 0.01 EUR/litre p.a. over a period of seven years (thus overall 0.07 EUR/litre, plus VAT). The objective is to phase out a – from an environmental point of view – unjustified subsidy for diesel given its lower taxation. Still, this policy is moderated by the factual exemption of long-distance transport through a reimbursement scheme.

In order to reduce working hours from the year 2000 on, incentives such as reduced social security contributions will be provided. This will be financed by an increase in

environmental taxes. A general energy tax is to be introduced in 2001, starting at a rate of FRF 260 per tonne of carbon (EUR 39 per tonne CO₂), possibly further increasing afterwards. The tax will apply to firms using more than 100 petroleum equivalent tons (PET) of energy annually. Energy intensive industries may be exempted in exchange for voluntary commitments to reduce CO₂ emissions.

Pollution and resources

Taxes applied

A 'parafiscal charge on air pollution' was introduced in 1985. Since 1990, it applies to emissions of SO₂, NO_x and VOCs from large combustion plants, waste incinerators and other plants emitting more than 150 tonnes per year. The charge rate is FRF 180 per tonne. The revenues are used to subsidise qualified investments by emitters into technical emission abatement and measurement. The rates of the charge are too low to have any incentive function (cf. Cansier and Krumm, 1997). New taxes, among others on fertilisers, are being considered.

Germany

In April 1999, following a long and intensive debate, Germany implemented the first step of an Ecological Tax Reform. It is the first out of at least five steps to be implemented in order to reduce non-wage related labour costs. In the first step, obligatory contributions to the social pension funds were decreased by 0.8 percent. Further steps foresee an additional overall reduction of 1.0 percent by 2003.

Energy

Taxes applied

The reductions in taxes on labour are to be financed by an increase in mineral oil excises on mineral oils (EUR 0.031/litre) and gas (EUR 1.636/MWh) as well as by the introduction of an electricity tax (EUR 0.01/kWh) in the first step. For steps numbers 2-5 only taxes on transport fuels (EUR 0.031 p.a.) and electricity (EUR 0.003 p.a.) will be further increased. A reduced rate of 20 percent applies to all producing business (this statistical class comprises mainly manufacturing companies and mining) and agriculture (apart from their use of gasoline and diesel transport fuels). In addition, those companies whose energy tax burden exceeds the factor 1.2 of the reduction in social security contributions will

be reimbursed the complete amount above that factor. The agricultural sector is treated similar to producing business, except for the reimbursement mechanism. Further preferential treatment (complete exemption from existing mineral oil taxes) is provided for cogeneration plants (producing electricity and heat) with an efficiency of at least 70 percent, use of natural gas as motor fuel and contracting of energy services. In addition, the tax on electricity for all rail transports and the tax on mineral oil for local public transport have been reduced to 50 percent of the normal rate.

Transport

Taxes applied

Since 1997, the tax rates of the annual motor vehicle tax are related to the size of the engine and to the emission characteristics including CO₂ and other pollutants of the vehicle.

Pollution and resources

Taxes applied

In the early and mid-90s, some Länder introduced a tax on groundwater extraction and use, as well as a tax on hazardous and also normal waste. However, several companies challenged the taxes in court and mostly succeeded. As a consequence some of them are still in force, but collection has been ceased.

On the local level, a tax on packaging was successfully levied, first in the town of Kassel in 1995. About 500 municipalities started to follow this example, which succeeded in reducing packaging waste dramatically. Again, legal concerns were raised and thus this kind of levy was ceased though it had proved to be very successful.

Greece

Energy

Taxes applied

The current levels of excise taxes on petrol and diesel in Greece are below the minimum levels as proposed by the European Commission in its draft Directive.

Transport

Taxes applied

Vehicles with anti-pollution technology are subject to a reduced rate of the registration tax.

Hungary

Hungary has a number of environmentally motivated product charges in place, e.g. on car tyres and car batteries, packaging materials, refrigerators and refrigerants, batteries and lubricants. Charge rates are generally too low to reduce consumption of these products, but there are still some effective built-in incentives: e.g. exemptions for recycled packaging, and lower charge rates for environmentally less harmful and eco-labelled products. The introduction of emission/effluent charges (in addition to the already existing Non Compliance Fees) is planned.

Iceland

Energy

Taxes applied

In contrast with the other Nordic countries, Iceland does not (yet) apply any energy taxes apart from mineral oil excise taxes.

Pollution and resources

Taxes applied

Iceland levies a charge on toxic substances, to finance the collection, treatment, recycling and destruction of toxic waste. The rate of the levy is differentiated according to 11 product categories, including mercury, paint, batteries and ozone depleting substances.

Ireland

Ireland has recently taken measures to raise more tax revenues and to improve the environment domestically (EFILWC, 1999). In the comprehensive Finance Bill 1999 on environmental taxation (Irish Department of Finance, 1998), eight options/areas for change or additional environmental taxes in Ireland are discussed:

- A revised scheme of vehicle registration tax (VRT) for private vehicles
- Motor fuel taxes
- Proposals to encourage greater use of public transport
- application of standard rate of VAT on all energy products
- combined heat and power
- fertilisers
- plastic bags
- landfill tax

The paper is the outcome of a tax strategy group that also involved the Environment

Ministry and serves as a discussion paper to further develop policy initiatives in the area of environmental taxation. The first item (on VRT) has already been implemented.

Energy

Taxes applied

Wastewater is partly charged according to BOD. Greenhouse gas taxation is proposed in the latest 'Millennium Report' on Ireland's state of the environment (Irish EPA, 2000).

Transport

Taxes applied

Given the dramatic increase in car purchases between 1995 (87,000) and 1998 (147,000), it was considered necessary to increase and further differentiate the Vehicle Registration Tax (VRT). As of January 1999, the lowest rate of VRT applies to cars up to 1,400 cubic centimetres (cc), the medium rate from 1,400 cc to 2,000 cc, and the highest rate for cars in excess of 2,000 cc. As a consequence, the volume of new cars purchased in the 0-1,400 cc class increased by 45 percent in the first three months of 1999. Irish EPA (2000) proposes taxes and charges to discourage vehicle use in urban areas.

Pollution and resources

Taxes applied

An environmental tax on plastic carrier bags (EUR 0.04 per bag) was announced in August 1999 and approved by the government in June 2000. In Irish EPA (2000) a tax on fertilisers is suggested to discourage overuse, as well as waste charges and taxes.

Italy

Energy

Taxes applied

In Italy energy is already taxed comparatively high. From 1999 on the Italian government continues to raise annually excise taxes on gasoline, diesel, coal, and mineral oils for the next five years as part of a plan to reduce greenhouse gas emissions. Italy has thus become the first country among the Mediterranean EU member states which uses energy taxes systematically as an instrument to combat climate change. In 1999 the tax revenue is expected to be about 1.5 billion EUR. The revenues are going to be used in three ways: cutting employers' social security contributions, funding employment programmes in southern Italy and energy saving investments.

*Pollution and resources***Taxes applied**

Italy applies taxes on NO_x and SO₂ emissions, as well as on the landfilling of waste. There are plans for a weight based waste tax.

Latvia

Since 1995, Latvia has an extensive system of environmental taxes and charges. The revenues flow into the state, regional and local environmental funds. Emission charges are levied on several kinds of air and water pollution. Furthermore, product charges are levied on lubricant oils, batteries and accumulators, CFCs, mercury lamps, tyres and packaging. The extraction of natural resources is also subject to an environmental charge (REC, 1999).

Lithuania

Lithuania has an elaborate system of air pollution charges. A draft law on the introduction of product charges is under preparation. Several raw materials are subject to a natural resource tax (REC, 1999).

Luxembourg

In 1999, the Luxembourg government has published a National Plan for Sustainable Development. This plan mentions, among others, the possible introduction of taxes on the use of non-renewable natural resources and fiscal measures favouring activities with ecological added value. In the government agreement of August 1999, a study was announced on the feasibility of an ecological tax reform. In May 2000, a national strategy for the reduction of greenhouse gas emissions was presented, containing concrete proposals (Luxembourg Ministry of Environment, 2000).

*Energy***Taxes applied**

Taxes on petrol in Luxembourg are currently lower than in any other EU Member State.

In the May 2000 greenhouse gas reduction strategy, the following proposals are put forward:

- introduction of an electricity tax after the 'Danish model', i.e. with reimbursement opportunities for enterprises that submit themselves to environmental or energy

audits and that make efforts to improve their energy efficiency;

- excise tax or VAT differentiation favouring biofuels, natural gas and LPG;
- a feasibility study on a CO₂/energy tax.

*Transport***Taxes applied**

The greenhouse gas reduction strategy also includes the proposal to differentiate the vehicle circulation tax. Cars with higher fuel consumption should be taxed at a higher rate.

The Netherlands

The Netherlands has been using environmental taxes for more than a decade and has decided to increase them further in the years to come. A second Green Tax Commission was installed in 1999. For the year 2001, a broad review of the tax system is foreseen, with an increased role for environmental taxes.

*Energy***Taxes applied**

For years, a *fuel tax* on all fossil fuels has been a major instrument in this policy area. Since 1992, the tax rates are based on the energy content as well as the carbon content of the fuels (on a 50/50 basis). In 1995, a tax on uranium use was added so that all non-renewable fuels used for energy generation are taxed. In 1996, when a breakthrough regarding a EU-wide CO₂/energy tax appeared out of sight, the *regulatory energy tax* was designed and implemented. To avoid competitive disadvantages for large energy users, consumption above 170,000 m³ gas and 50,000 kWh was not taxed while the first 800 m³ of natural gas and the first 800 kWh electricity were also exempt for social reasons. The tax is revenue neutral: taxes paid by households are channelled back by lowering income tax according to a detailed scheme in order to mitigate distributional consequences. Also, business was compensated by lowering employers' social contributions. In 1998, the Cabinet agreed on some options of the White Paper of the Dutch Green Tax Commission: a doubling of revenues of the energy taxes with NLG 3.4 billion over three years. Part of the increase in revenues will be used for environmental purposes: half a billion NLG will be used to stimulate energy efficiency and renewable energy. The tax limit for electricity has been extended from 50,000 kWh to 10 million

kWh and for natural gas from 170,000 m³ to 1 million m³ (equalling about 10 million kWh), while the tax exemption floor remains at 800 kWh and 800 m³. With the introduction of the regulatory energy tax, horticulture in greenhouses was exempt, but this exemption was lifted in 2000. Horticulture pays a reduced rate. Instead there is an environmental agreement of the Dutch agro-industry to increase energy efficiency by 50 percent between 1980-2000. The tax also provides for refunds to other sectors committing themselves to improve their energy efficiency.

Still, a different focus of the mix of instruments is now being applied, since environmental agreements appear not to be sufficiently effective. An evaluation of the Dutch energy policy showed that the fast energy-efficiency improvements did not produce more drastic CO₂ reductions due to the growth in industrial production. 'We must therefore conclude that although the LTAs [Long Term Agreements] have had a positive effect on industrial energy-efficiency it has been insufficient to off-set the growth in CO₂ emission following from increased production. (...) Still, however, the meagre results on CO₂ emissions reveal the limited environmental effectiveness of the long-term agreements. One important problem with the design of the LTAs is that they do not offer sufficient incentives for shifts to fuels with lower CO₂ content. (...) The Dutch government is becoming aware of the limited CO₂ reduction potentials of the voluntary LTAs. As a counter-move, the government now tries to address the problem via massive subsidy programmes.' (Enevoldsen 1998, pp.73).

Evaluations

The *general fuel tax* was analysed by the State Agency for Health and Environment (RIVM 1996). This showed that in 1994 CO₂ emissions would have been 1.7 million tons higher than in the actual situation. In general, the Dutch Green Tax Commission (1998) assigns as a rule of thumb a reduction of 1 to 1.5 million tons CO₂ to a raise in revenue of the fuel tax of about NLG 1 billion. The '*regulatory energy tax*', introduced in 1996, has not yet produced measurable impacts on energy saving behaviour in firms or households (cf. SEO, 1998; Daamen and Bos, 1999). However, it has made energy conservation investments more attractive for firms, leading to shorter payback times and an increase of the amount of profitable

energy saving options by about 5 per cent. It has also stimulated the use of renewable energy (Dutch Ministry of Finance, 1999).

Transport

Taxes applied

Electric cars are exempted from the annual car tax. A differentiation in the car tax according to fuel efficiency is planned.

Pollution and resources

Taxes applied

Charges on *water pollution* are levied by the state and regional water boards. They are primarily intended as a source of financing for waste water treatment and water quality management.

In 1995 two new environmental taxes were introduced:

1. tax on *groundwater extraction* to compensate for the price difference with surface water that requires more treatment; and
2. a tax on *waste* disposed on landfills to compensate for the price difference for incinerated waste which is considered to be environmentally preferable.

The introduction of the *high VAT tariff* of 17.5 percent on *drinking water* in 1999 is intended to provide an incentive for more efficient water use. The first NLG 60 is tax exempted, because Parliament felt that this would reflect the price of the corresponding amount of water necessary as a basic need. The measure is expected to save about 5 to 10 million m³ of water annually. New taxes on the extraction of surface minerals and on pesticides will be introduced. All Dutch environmental taxes have recently been linked and indexed to inflation rates in order to prevent a degressive incentive function. Recently, the Dutch environment minister announced that the possible introduction of a tax on *fireworks* will be investigated. Possible taxes on aggregates and on leisure boats are under study.

Evaluations

The *water pollution charges* on industrial discharges to surface water are high enough to have an incentive effect, i.e. to stimulate industries to reduce these emissions. This effect has been confirmed by academic studies (cf. Leek et al., 1996). It was expected that the *groundwater tax* would result in a more efficient use of water. An evaluation in 1997 showed that groundwater extraction by

industry had decreased in line with expectations. Estimated declines in drinking water use from groundwater were for households 1.3 to 8 % (6-36 mio. M³), for SME's 1.9 to 12.6 % (2-13 mio. M³) and for industry 2.1 to 12.6 % (2-13 mio. M³). For self-extractions of groundwater the expected decline was 5.7 to 34.0 % (14-85 mio. M³) for industry and 8.5 to 51.0 % (2-13 mio. M³) for agriculture. However, small scale self-extraction (that is tax exempted) by households and agriculture had increased versus expectations (Vermeend and Vaart, p. 38).

Norway

Energy

Taxes applied

In Norway CO₂ emissions are taxed via taxation on gasoline, natural gas, oils and coal. The taxation has been discussed in an environmental tax commission which proposed a comprehensive scheme for integrating environmental policies 'especially with economic policies, emphasising cost-efficiency and greater use of environmental pricing, notably to curb emissions to the air' (Moe 1999 p.98). In April 1998 the Government submitted many proposals to Parliament, most of which were adopted. The CO₂ tax was expanded to include the supply fleet in the North Sea, air transport and coastal goods transport (rate NOK 100, equivalent to EUR 11.29). For those sectors still exempt from the tax (e.g. processing industry and fisheries), Parliament asked the Government to come up with deliberations of how to include them in a domestic emissions trading scheme. The Norwegian economy is highly dependent on the extraction and export of fossil fuels. The petroleum sector is contributing up to 15 percent of GDP. Furthermore, the CO₂ taxation takes the ambitious Norwegian employment objectives into consideration by lowering social security contributions. In addition to energy and CO₂ taxes, Norway has a tax on sulphur in fuels as well. The tax rate doubled in 2000 (to NOK 6, or EUR 0.73 per kg SO₂). The Norwegian industry proposed to replace the tax by a voluntary agreement to reduce the total SO₂ emissions, accompanied by a tax of the original rate of NOK 3, to go into a fund from which development and building of flue gas cleansing equipment can be financed. Norway introduced a CO₂ and sulphur emission tax on aviation fuels on 1 January 1999. This tax related both to domestic and

international air traffic. However, the international part of the tax was already abolished after a few months, because it was incompatible with international agreements under which aviation fuels remain untaxed. For domestic flights, the tax was maintained. (See also Section 3.3.1).

Pollution and resources

Taxes applied

Norway applies environmental taxes on pesticides, beverage containers, lubricant oils and waste.

Poland

Poland has a comprehensive system of air pollution charges, with relatively high charge rates. Revenues are an important source of financing investments in pollution control, through environmental funds at different administrative levels. Since 1995, there is an excise tax on plastic packaging.

Portugal

The tax on petroleum products, the car tax and the municipal tax on motor vehicles, and different road taxes represented a total revenue of PTE 521 billion in 1994.

Energy

Taxes applied

The tax on petroleum products is, with total revenue of PTE 409 billion, the most important environmental tax. In 1994 the tax on petroleum products together with the 16 percent VAT represented more than 70 percent of the product price for unleaded and 'super' petrol. There is a tax differentiation on heavy fuel oil according to sulphur content. The market share of low sulphur fuel is still low (11 per cent in 1995) because the electricity companies are exempt from the tax and are consuming the majority of heavy fuel oil (European Commission, 2000d).

Transport

Taxes applied

The car tax doubled in revenue reaching PTE 124.8 billion in 1994, as did the municipal tax on motor vehicles with PTE 8 billion in 1994.

Pollution and resources

Taxes applied

Environment-related charges also increased steadily between the years 1990 and 1994 up to PTE 17.4 billion. Around 86 percent of

the total environment-related charges is raised with the sewage charge (PTE 15 billion in 1994). Other environment-related charges are a charge for urban solid waste (PTE 1.6 billion in 1994) and hunting licences (PTE 0.8 billion), both collected by local governments.

Romania

In Romania, tax rates for less polluting vehicles are reduced by 30 to 40 percent, and import duties for cars with catalytic converters are also reduced. A recent study analyses the potential role of economic instruments, including fiscal measures, in stimulating the use of unleaded petrol and low-sulphur diesel (REC, 1999). Apart from Non Compliance Fees, there are no air emission charges or taxes in Romania, although they have been proposed. Water extraction and effluent charges do exist. Some waste related product charges (e.g. on packaging material, tyres, batteries, newsprint) are being considered (REC, 1999).

Slovakia

The 1992 General Environmental Act states that the role of charges is to exercise financial pressure on the polluter in order to reduce pollution. Another function is to generate financial funds and consequently invest them in activities aimed at pollution prevention. The charge system is currently under revision in the light of the envisaged EU membership. Slovakia has charges on several air pollutants, on substances and products damaging the ozone layer and on the conversion of agricultural and forest land to other purposes. Reduced road tax rates apply to commercial vehicles which are equipped with catalytic converters or which use LPG or natural gas as a fuel (REC, 1999).

Slovenia

In 1997, Slovenia was the first CEE country to introduce a CO₂ tax on fossil fuels. Charges on water use and on waste water were introduced in 1995 (REC, 1999). These newly introduced environmental taxes and charges in Slovenia explicitly aim at providing incentives to reduce emissions and the use of natural resources.

Spain

Spain opposes the introduction of common minimum energy taxes in the EU (cf. Section 3.2.1), because of fears that higher energy taxes would be harmful to industry and spur inflation.

Pollution and resources

Taxes applied

The autonomous regional government of Galicia has created a tax on acidifying pollutants. Since 1996 it has levied a tax on emissions of more than 1000 tons of SO₂ and/or NO_x per year. The tax is reported to cover only two large power plants (UN-ECE, 1999). On the Balearic Islands, specific installations that damage the environment (e.g. installations involved in the production, storage, transformation, distribution or supply of electricity or fuels and telecommunications) are taxed at a rate of 1 per cent of the enterprise's gross revenue. The regional government of the Balearic Islands has decided to introduce an eco-tax on tourism, to alleviate the effects of mass-tourism on the environment (ENDS Daily, 2000a). All visitors to hotels, apartments and campsites on the islands will be taxed an amount between EUR 0.25 and EUR 2.00 per night. The revenues, estimated at EUR 60 million per year, will go to an environmental regeneration fund.

Sweden

Sweden was the first country to implement a tax shift from income taxes to taxes on energy and pollution. In 1988, as part of a major tax reform, the Swedish Commission of Environmental Charges was appointed. The Commission was supposed to explore the possibilities of an ecological tax reform by shifting the tax burden from labour to pollution. More specifically, the Commission studied among other topics the effects of an Ecological Tax Reform on the environment, competitiveness, employment, resource efficiency, and the tax revenue (Brännlund 1999 p.70). The activity of the Commission resulted in the adoption of a number of environmental taxes by the Swedish Parliament in 1991. Among others the Parliament introduced taxation on fossil fuels, CO₂, sulphur, NO_x, electricity, beverage containers, domestic air travel, vehicles, fertiliser, pesticides, a producer tax on hydroelectric power and on nuclear power, gravel, and batteries. A further ecological tax reform including a shift of

taxes of approximately SEK 30 billion for the years 2001-2010 is proposed in the Government Budget Bill 2001. In 2000, the government-appointed Committee on Climate Change proposed a package of measures in order to help reaching the Kyoto targets for greenhouse gas emissions. Among the proposals is the introduction of an emissions-based car tax.

Energy

Taxes applied

At the time when the reform was undertaken, it was expected that more countries would soon introduce carbon-energy taxes or similar measures on industrial energy use. The Swedish government gradually realised that this could take a long time, and in 1992 the energy tax burden was partly shifted from industry to households. The CO₂ tax was reduced to 25 percent of the normal rate and the energy tax component was abolished, but the tax burden was not shifted back to labour. Instead CO₂/energy taxes on households were increased. Reflecting the recent more widespread practice of carbon-energy taxation and the increase in energy use by industry (Swedish EPA 1997, p. 42), the Swedish Parliament increased the CO₂ tax to 50 percent of the original level in July 1997. For 2001, an increase to SEK 0.53 per kg of CO₂ is proposed. The *sulphur tax* is levied on the sulphur content of coal, peat, motor fuel and heating oil. The tax rate is SEK 30 per kg of sulphur. For oil this means a tax of SEK 27 per m³ of oil for each tenth of a percent by weight of sulphur in the oil. Fuels with sulphur content below 0.1 percent are exempt (Swedish EPA 1997, p. 24). Taxes on *diesel oil* and *petrol* are differentiated according to an environmental classification. The diesel tax will be increased by SEK 0.10 by 2001. The tax on *electricity* will be increased by SEK 0.018 per kWh. This increase will not apply to manufacturing, agricultural and forestry industries.

Evaluations

In order to better evaluate the environmental impacts of various taxes, it is useful to keep in mind the developments in the use of energy. 'The total energy use in Sweden has been almost constant over the period 1974-1994 in spite of the fact that the GDP has increased by approximately 43 percent (fixed prices) during the same period.' The energy used by housing remained more or less constant, the energy used by industry decreased somewhat and

transport-related energy use increased during that period. 'The total energy use per unit of output in the Swedish industry has decreased during the period. (...) The use of oil has decreased while electricity has increased slightly.' (Brännlund 1999, pp.77-78). The *CO₂ tax* has probably had a degree of indirect effect by raising awareness of the environmental problems caused by the burning on fossil fuels. It is estimated that in 1994 the Swedish CO₂ emissions were 5 million tonnes (9 percent of total emissions) lower than they would have been without the tax. It furthermore caused a shift in district heating from fossil fuel to bio-fuels over 2 years and increased the competitiveness of combined heat and power production. (*ibid.*, pp.47)'The amount of biomass fuel used at Swedish heating plants doubled between 1990 and 1995, from 10.2 TWh to 20.4 TWh, or from 25 per cent to 42 per cent of total district heating supplied. Use of biomass fuel had begun to rise prior to this but the increase accelerated following the introduction of the carbon dioxide tax in 1991 and the rise in 1993 (...) the proportion of district heating production based on fossil fuels has fallen from 36 per cent to 30 per cent, since total district heating production has risen. If the relative proportions between fossil fuels and their total share of district heating production had remained the same as when the carbon dioxide tax was introduced, carbon dioxide emissions would have been about 1.5 million tonnes higher than they are today. (...)

Specific oil consumption in industry, calculated as kWh per unit (krona) production value declined continuously from 1973 to 1992. Following the sharp fall in energy taxes on industry in 1993, specific oil consumption has instead risen somewhat. It is difficult to see how any other factor could have played a significant part in this trend reversal.

It is the pulp and paper industry that seems to be responsible for almost all the increase in industrial oil consumption during the period. (...) Specific oil consumption increased by 50 per cent between 1992 and 1995 at the same time as specific biomass fuel and electricity consumption fell somewhat. (...) If we conservatively assume that the pulp and paper industry would have had the same specific oil consumption in 1995 as in 1992 if there had been no tax reduction, then oil consumption in 1995

would have been about 1.9 TWh lower than it in fact was and emissions of carbon dioxide would have fallen by approximately 500,000 tonnes' (*ibid.*, pp.49). The Swedish *sulphur tax*, which was already introduced in 1991, resulted in a decreasing sulphur content of oil-based fuels. The sulphur content of light oils in 1995 was 0.076 percent which is less than half of the legal limit (0.2 percent) (Swedish EPA, 1997, p. 27). The tax gave incentive to emission abatement measures in combustion plants. The tax incentive was at a tax rate of SEK 30 per kg sulphur and an assumed average treatment cost of SEK 10-15 per kg sulphur considerably high. The total socio-economic gain is estimated as 'at least SEK 110 million' (*ibid.*, p.29). The Swedish EPA estimates that annual emissions (1989-1995) of sulphur dioxide (SO₂) have been reduced by ca. 19,000 tons due the tax (*ibid.*, p. 28). This stands for 30 percent of the total reduction emissions in that period for which the tax is responsible (*ibid.*, p. 30). The introduction of differential taxation is seen as the main reason for the rapid changeover to *unleaded petrol* (Swedish EPA 1997, p. 84.). The tax differentiation on *diesel oil* and *petrol* according to *environmental classification* has also induced rapid substitution processes (*ibidem*, p. 85-90).

Transport

Taxes applied

A tax on hydrocarbons (HC) and NO_x had been levied on *domestic air transport* since 1989, but had to be abolished in 1997 due to EU Single Market concerns. These concerns were eventually supported by a verdict in 1999.

Sweden applies a system of differentiated *vehicle taxes*, based on environmental classification. The sales tax on the most polluting (class 3) cars was increased by SEK 2,000 in 1993, whereas it was lowered by SEK 4,000 for the least polluting (class 1) cars. A further increase of SEK 2,500 for diesel cars older than 1994 is foreseen by 2001. When Sweden entered the EU in 1995, the reduction of the sales tax on class 1 vehicles was replaced by an exemption from the annual vehicle tax for their first five years. Revenues from the *vehicle scrapping charge*, which exists already since 1975, are used to finance the premiums paid when car hulks are delivered to an authorised car-scrapping firm. VAT on public transport will be decreased from 12 to 6 % by 2001.

Evaluations

The *tax on domestic air transport* has led the domestic airline (it was only one at that time) to change the combustion chamber of its Fokker F28 engines. This has reduced hydrocarbon emissions by about 90 percent (Brännlund, 1999, p.72). In addition to this did the tax raise 'the level of environmental awareness in the aviation industry and led to greater consideration of environmental aspects in the corporate decision-making process' (Swedish EPA, 1997, p. 93) It is concluded that the *vehicle scrapping charge/premium* system has achieved its original purpose, viz. to prevent scrap cars from being abandoned. However, it has not accelerated the rate at which old cars are scrapped or air pollution caused by their emissions (Swedish EPA, 1997). *Vehicle taxes*: In the period 1993-1996, the share of newly registered cars belonging to class 1 or 2 increased from 16 to 75 %. Given the fact that the tax differentiation amounted to only a few per cent of the purchase price, it seems likely that the impact should be attributed mainly to 'soft effects', such as better consumer information and awareness (cf. Swedish EPA, 1997).

Pollution and resources

Taxes applied

An NO_x charge, based on recorded emissions irrespective of the fuel used and levied at a rate of SEK 40 per kg NO_x was introduced in 1992 (Swedish EPA 1997, p. 31). Originally, the charge was confined to large combustion plants which are able to monitor and record their emissions with improved and cheaper monitoring facilities. In 1996 the charge was extended to smaller boilers (*ibid.*, p. 28). Revenues are returned to the charge payers in proportion to their share in the total energy production. Thus the refund system is an incentive to minimise NO_x emissions per energy unit. 'the average cost of nitrogen removal for the measures taken as a consequence of the NO_x charge may be estimated at less than SEK 10 per kg NO_x' (*ibid.*, p.39). There are three different *battery charges* in Sweden. In 1996 there was one for alkaline/mercury oxide batteries (SEK 23/kg), one for nickel-cadmium (NiCd) batteries (SEK 46/kg) and one for lead (starter) batteries, (SEK 40 each) (Swedish EPA 1997, p.97). The tax on *beverage containers* was abolished in 1993 when producer responsibility for packaging was introduced. Since 1994, the tax on *commercial fertilisers* applies to nitrogen (SEK 1.80 per kg) and to the cadmium content of

phosphorus fertilisers (SEK 30 per gramme of cadmium exceeding a concentration of 5 grammes per tonne phosphorus). *Pesticides* are taxed at a rate of SEK 20 per kg of active substance. A tax on *landfilled waste* was introduced on 1 January 2000.

Evaluations

The *NO_x charge* provided an incentive for monitoring and abatement measures in liable plants. Emissions per energy unit fell by about 60 percent between 1990 and 1996, whereas total emissions fell by approximately 50 percent, from about 24,500 tonnes to 12,500 tonnes. According to the Swedish EPA, 'NO_x emissions in 1995 would have been 10,000 tonnes greater if the nitrogen oxides charge had not existed. (...) 10,000 tonnes is equivalent to about 25 per cent of all NO_x emissions from combustion for energy generation, or just under 3 per cent of total Swedish NO_x emissions' (Swedish EPA, 1997, p.36). Originally the Swedish government expected a reduction of only 5,000-7,000 tons. Emissions from boilers subject to the charge would have been 80 % higher. The *battery charges* do not have any direct effect on purchasing patterns. However, the revenues from these charges are used to finance the disposal of spent batteries. For lead accumulator batteries, the collection rate has meanwhile increased to almost 100 per cent, but for other batteries it is much lower (60-70 per cent for mercury batteries and 35 per cent for NiCd batteries) (Swedish EPA, 1997, p. 98-101). At its current rate, the *fertiliser tax* is calculated to reduce the total nitrogen dosage by around 10 per cent. The charge on cadmium has an impact on the cadmium content in commercial fertiliser, but the extent of the effect is not yet known (Swedish EPA, p. 62). Total *pesticide* use, in volume terms, had declined by 35 per cent in 1995 as compared with the average figure for the years 1981-1985. The charge/tax has discouraged use to some extent, but it is mainly the indirect effects of the charge, i.e. the financing of advisory services, research and development, which have led to a decrease in the use of pesticides (Swedish EPA, 1997, p. 69).

Switzerland

In order to introduce a multi-step tax reform, the Swiss Environmental Protection Law was recently adapted in such a way that it allows market-based instruments. Additional revenues have to be recycled in the economy.

Energy

Taxes applied

The first environmental tax introduced under the new legislation was a tax on light fuel oil with a sulphur content above 0.1 percent. In October 1999, the Swiss parliament proposed to create a new tax on non-renewable energy. It should be introduced in 2001 and the rates will be gradually increased. The revenues should partly be used to subsidise renewable energy and energy conservation, and partly to reduce social contributions. The Swiss population turned the proposals down in a referendum in September 2000. A new CO₂ tax will be proposed after 2004 if assessments indicate that Switzerland will not meet its target of 10 % CO₂ emission reduction over the period 1990-2010.

Transport

Taxes applied

Since 1997, the airport of Zürich applies a system of emission charges for landing aircraft.

A kilometre tax for heavy goods vehicles, with rates related to distance driven, weight and emissions, is in force since 1998.

Pollution and resources

Taxes applied

A system of charges on (products containing) organic solvents has started on 1 January 2000. The system is intended to reduce VOC emissions. The charge rate is CHF 2 (EUR 1.29) per kg VOCs, to be increased to CHF 3 (EUR 1.94) in 2003. The revenues are recycled on a per capita basis to all Swiss citizens, together with the revenues from the charge on sulphur in heating oil. For reasons of administrative efficiency, this is done through a reduction in medical insurance premiums.

In 2001, a tax on the landfilling and export of waste will be introduced. The revenues of the tax will be used to clean up contaminated sites.

Turkey

With the exception of taxes on energy and motor vehicles, environmental taxes are not yet being used on a large scale in Turkey.

Energy

Taxes applied

Energy taxes in Turkey do not include explicit environmental elements. Contrary to

most European countries, mineral oil excise taxes are levied at *ad valorem* rates. Natural gas is subject to a reduced VAT rate (8 per cent instead of 15 per cent).

Transport

Taxes applied

Turkey levies air pollution and noise charges on aircraft. However, the charge rates are not related to actual emissions. Of the revenues from the Motor Vehicles Acquisition Tax, 25 per cent is earmarked for the Environment Fund (OECD 1999a).

United Kingdom

'Budget 99 presents the biggest ever package of environmental tax reforms in this country.' (UK Government, 1999). It comprised 22 measures in all. Furthermore, Budget 2000 included reforms to existing environmental taxes and new measures and more of the Finance Bill in 2000 was taken up by environmental tax reform than ever before. Some of the most important features of these budgets were:

- an industrial energy tax, the Climate Change Levy, being introduced from April 2001; the levy package has exemptions for electricity generated from 'new' renewables and 'good quality' Combined Heat and Power Plants, discounts for energy intensive sectors signing up energy efficiency targets, and levy funded energy efficiency measures,
- a new fiscal incentive to encourage the greater use of ultra-low sulphur petrol and a freeze in duty on road fuel gases,
- Vehicle Excise Duty (VED) on fuel-efficient cars were reduced (VED will be charged at a lower rate for cars with engines of 1200CC or less),
- a major revenue neutral reform of the taxation of company cars from April 2002; the tax charge will be graduated according to the level of the car's CO₂ emissions,
- a graduated VED system for new cars based primarily on CO₂ emissions from March 2001,
- increases to the landfill tax to encourage waste minimisation and recycling; the tax will escalate until at least 2004,
- the introduction of an aggregates levy from April 2002,
- the introduction of a lower rate of VAT for installation of energy saving materials.

The Government is fully supported by the Sixth Report of the Environmental Audit

Committee of the House of Commons. They say, 'In terms of environmental taxation, we fully recognise the positive aspects of what the Government has achieved and the commitments it has made,' (UK Environmental Audit Committee 2000, paragraph 5). The Committee further argues for the establishing of a Green Tax Commission to evaluate and follow more closely the progress towards environmental taxation, (paragraph 6).

Energy

Taxes applied

It is particularly worthwhile to note that a tax on the use of energy by the non-domestic sector (including industry, commerce, agriculture, and the public sector), known as the Climate Change Levy, will be introduced from April 2001. The following background is required in order to better understand this decision, as many other countries aim at reducing the energy taxation burden for their business sector. In 1993, Prime Minister John Major intended to increase the VAT rate on the domestic use of light fuel heating oil from then 0 percent, via 8 up to 17.5 percent. When the rate reached 8 percent, social and equity concerns became dominant which forced the government to interrupt a further increase. After the change of government, this rate was reduced to 5 percent. Hence, an increase in energy taxation on households is perceived as difficult. In order to ensure that industry would contribute to the reduction of greenhouse gases, the former President of the Confederation of British Industry (CBI) and the Chairman of British Airways, Lord Collin Marshall, was asked early in 1998 by the Chancellor of the Exchequer, Gordon Brown, to analyse the potential use of economic instruments for industry. In his report in November 1998, Marshall stated: 'Hence, my conclusion is that there probably is a role for a tax if businesses of all sizes and from all sectors are to contribute to improved energy efficiency and help meet the UK's emissions targets,' (Marshall 1998). The Marshall Report also recommended a role for emissions trading. In response to this, the UK government has been working with business to develop the framework for a voluntary scheme by April 2001. All revenue from the Climate Change Levy will be returned to the non-domestic sector. The bulk of the revenue (estimated at £1 billion for the 2001 – 2002 financial year) will be recycled to business through a 0.1 percentage point cut in employers' national

insurance contributions (NICs). The remainder (approximately £150 million) will be used to provide additional support for business energy efficiency measures and to provide incentives for investments in energy efficient technologies and adoption of energy from renewable sources. The last-named are subject to EU State Aids approval.

After fierce industry protests against the tax, the government came up with some concessions in 1999. Energy-intensive industries will benefit from significantly lower tax rates (up to 80 %) if they agree targets for improving energy efficiency or reducing carbon emissions. About 25 industrial sectors are presently negotiating with the Government for energy efficiency agreements. These will require demanding energy efficiency or carbon saving targets to be met in exchange for the 80 % discount from the Levy. These agreements are also subject to EU State Aids approval. Because of its unique nature, as an energy intensive sector exposed to significant international competition, and consisting mainly of very small scale producers, horticulture will receive a temporary discount of 50 % to allow energy efficiency measures are introduced.

The UK introduced a *Fuel Duty Escalator* already in 1993, which aimed at

- 'raising the state revenue for new infrastructure measures,
- influencing the behaviour of the motorists (less car usage), and
- environmental reasons – to fight against air pollution and carbon dioxide emissions' (Swedish EPA 1999, p. 27).

The tax was bringing in annual increases on fuel duty of 3 percent in real terms in 1993. 'The escalator was increased to 5 per cent in November 1993. The July 1997 budget included a commitment to annual increases of 6 per cent in real terms in the duty on road fuels, except road fuel gases' (UK DETR 1999). In the 1999 PBR the Chancellor announced that the duty on fuel would be set on a Budget-by-Budget basis. The UK applies a *reduced excise tax rate on ultra low-sulphur diesel (ULSD)*. The differential is currently at 3 pence per litre. A similar opportunity now exists for Ultra-Low Sulphur Petrol (ULSP), and the Government will introduce a differential of 1 penny per litre in favour of ULSP relative to unleaded from October 2000.

The reform of the taxation of company cars will remove tax incentives to drive extra business miles and encourage company car drivers to choose more fuel-efficient models. Previous to reform, three quarters of company cars had engines of greater than 1,600cc compared with a third of private cars. This means that company cars tend to produce more CO₂ than private cars for every mile travelled. From 1 April 2000, the rate of VAT on the installation of energy saving materials such as loft and wall insulation in all homes has been cut to 5 percent (applies to both labour costs and materials when supplied by the person doing the installation). This measure is designed to tackle fuel poverty and improve health and living standards by warming homes and lower fuel bills. The increase in energy efficiency will also reduce greenhouse gas emissions.

Evaluations

'There is [...] increasing evidence available on the actual impacts of the [*fuel duty*] *escalator*. This suggests that fuel consumption from the road transport sector has gone down as a result of the escalator. According to the latest *Continuing Survey of Road Goods Transport*, for instance, there has been a marked improvement in the average fuel consumption of lorries since the escalator was introduced in 1993, with the average miles per litre for articulated lorries over 33 tonnes increasing by 13 per cent between 1993 and 1998. Anecdotal evidence from DETR's Energy Efficiency Best Practice Programme also indicates that more fleets are beginning to introduce more fuel saving measures, as a result of higher fuel prices' (UK DETR 1999). The *tax reduction for ultra low sulphur diesel* is considered to be a success. The graph below 'shows the dramatic effect this policy has had on the use of ultra low sulphur diesel. The proportion of diesel sold which meets this specification had increased to 43 per cent by February 1999. The further increase in the duty differential in Budget 99 will turn almost the whole diesel market to ULSD by the end of this year, leading to significant reductions in emissions from diesel fuelled vehicles, and contributing to improved air quality for everyone, especially in congested urban areas.' (UK Government 1999).

Pollution and resources

Taxes applied

A landfill tax was introduced in 1996. It is explicitly intended to be an incentive to

reduce the amount of waste landfilled. The current standard rate is 11 GBP per tonne for non-inert wastes and 2 GBP for inert wastes. The revenues are earmarked to be recycled to businesses in the form of a reduction in employers' National Insurance Contributions. The rate for non-inert waste is to rise by 1 GBP each year until at least 2004. In February, Prime Minister Blair announced that the plan to introduce a pesticides tax has been dropped (ENDS Daily 2000b). In Budget 2000, the Chancellor decided to address the environmental costs of aggregates extraction and transportation by introducing an aggregates levy of £1.60 per tonne from April 2002. This levy is based on independent research commissioned by the Department for the Environment, Transport and the Regions that has verified that there are significant environmental costs associated with quarrying that are not already covered by regulation, including noise, dust, visual intrusion, loss of amenity and damage to biodiversity. The levy will bring about environmental benefits by making the price of aggregates better reflect their true social and environmental costs, and encouraging the use of recycled aggregates. All revenues raised will be recycled to business through a 0.1 percentage point cut in employer national insurance contributions and a new 'Sustainability Fund' aimed at delivering local environmental benefits to areas subject to the environmental costs of aggregates extraction. The Government is now consulting on how this fund can best be used. These measures are in line with the Government's strategy of, over time, shifting the burden of taxation

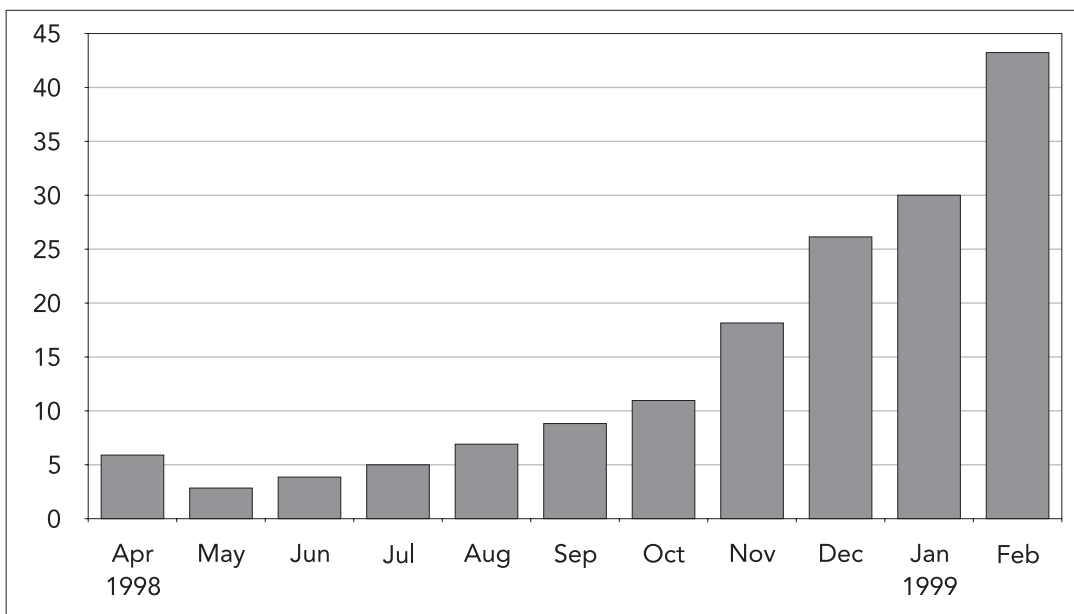
from 'goods' such as labour to 'bads' such as environmental pollution. From 1 April 2000, the rate of VAT on the installation of energy saving materials such as loft and wall insulation in all homes will be cut to 5 percent (applies to both labour costs and materials when supplied by the person doing the installation). This measure is designed to tackle fuel poverty and improve health and living standards by warming homes and lower fuel bills. The increase in energy efficiency will also reduce greenhouse gas emissions.

Evaluations

The evaluation of the *landfill tax*, which was done by surveying a large number of waste producers, users and landfill operators, suggests that the tax induced an important change in behavioural patterns across the waste sector which could be amplified by raising the tax level. 'A number of companies are investing in Materials Recovery Facilities (MRFs). (...) It seems fair to say that these investments are motivated by the landfill tax, (...) and though some companies were moving in this direction anyway, the tax has clearly made investments in MRFs more attractive.' (EFILWC, 1998). Of about 72 companies interviewed, 64 percent recycled, re-used or minimised their waste after the tax was introduced (*ibid.*, p. 37), whereas only 29 percent were already engaged in re-use, recycling and minimisation beforehand (*ibid.*, p. 43). 13 percent knew about the tax but did nothing, and 11 percent knew about it, analysed their situation, though did nothing (*ibid.*, p.37).

Growth in market share of ultra low sulphur diesel after 1998 Budget

Figure A.



Source: HM Customs and Excise

Annex II: Acronyms and abbreviations

ASA	Air Services Agreement
AT	Austria
BE	Belgium
BOD	Biological Oxygen Demand
CAEP	Committee on Aviation Environmental Protection (of the ICAO)
CFCs	chlorofluorocarbons
CH	Switzerland
CHP	combined heat and power generation
CO ₂	carbon dioxide
DE	Germany
DETR	Department for Environment, Transport and Regions (United Kingdom)
DK	Denmark
EAP	Environmental Action Programme
EC	European Commission or European Community/Communities
ECOFIN	Directorate-General for Economic and Financial Affairs (EC)
EE	Estonia
EEA	European Environment Agency or European Economic Area
EL	Greece
EMU	European Monetary Union
EP	European Parliament
EPA	Environmental Protection Agency
ES	Spain
ETR	Ecological Tax Reform
EU	European Union
EUR	Euro
FCCC	Framework Convention on Climate Change
FDE	Fuel Duty Escalator
FI	Finland
FR	France
GB	Great Britain
GBR	Green Budget Reform
GDP	Gross Domestic Product
ICAO	International Civil Aviation Organisation
IE	Ireland
IGC	Intergovernmental Conference
IMO	International Maritime Organisation
IS	Iceland
IT	Italy
Kcal	kilocalories
KWh	kiloWatt-hour
LT	Lithuania
LTA	Long Term Agreement

LU	Luxembourg
LV	Latvia
MEP	Member of the European Parliament
MSW	Municipal Solid Waste
NCV	Net Calorific Value
NL	Netherlands
NO	Norway
NO _x	nitrogen oxides
ODP	Ozone Depleting Potential
ODS	Ozone Depleting Substances
PT	Portugal
REC	Regional Environmental Centre for central and eastern Europe
RIVM	Dutch National Institute of Public Health and the Environment
RTK	Revenue Tonne Kilometre
SE	Sweden
SK	Slovakia
SO ₂	sulphur dioxide
UK	United Kingdom
ULSD	Ultra Low Sulphur Diesel
UNECE	United Nations Economic Commission for Europe
VAT	Value Added Tax
VOC	volatile organic compound
VRT	Vehicle Registration Tax
WTO	World Trade Organisation

Annex III: Tax rates for energy products in the EU, in euros

Product	Current minimum rates (Directive 92/82/EEC)	Minimum rates (Commission proposals in COM(97)30)				Existing rates in Member States (2000 or latest available data)*															
		1/1/98	1/1/00	1/1/02		AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES	SE	UK	
motor fuels																					
unleaded petrol (per 1000 litres)	287	417	450	500	408	494	518	561	586	562	325	374	542	347	592	349	372	517	782		
leaded petrol (per 1000 litres)	337	417**	450**	500**	480	552	606	636	627	614	344	459	578	399	659	486	405	593	876		
gas oil (diesel) (per 1000 litres)	245	310	343	393	283	290	346	325	367	367	250	325	403	253	347	246	270	364	766		
LPG (per 1000 kg)	100	141	174	224	261	0	393	0	107	313	101	110	285	101	103	100	795	304	215		
kerosene (per 1000 litres)	245	310	343	393	282	551	350	299	366	500	245	343	337	294	327	295	292	341	759		
natural gas (per G.J)		2.9	3.5	4.5	0	0	9.8	0	0	0	0	0	0	0	0	0	0	0	0		
heating fuels																					
gas oil (per 1000 litres)	18	21	23	26	69	5	268	64	78	61	18	47	403	5	139	75	79	208	50		
heavy fuel oil = 1 % sulphur (per 1000 kg)	13	18	23	28	36	6	304	54	23	18	39	13	64	6	31	12	13	221	45		
other heavy fuel oil (per 1000 kg)	13	22	28	34	36	6	304	54	23	18	38	13	64	19	31	27	13	221	45		
kerosene (per 1000 litres)	0	7	16	25	282	0	263	54	78	0	245	50	337	0	46	103	144	192	0		
LPG (per 1000 kg)	0	10	22	34	44	0	333	0	0	26	13	38	190	0	0	7	7	134	0		
natural gas (per G.J)	0	0.2	0.45	0.7	1.38	0.3	0.98	0.55	0	0	0	0	0.54	0	5.74	0	0	0.85	0		
solid energy products (per G.J)	0	0.2	0.45	0.7	0	0	7.1	1.6	0	0.6	0	0	0	0	0.4	0	0	1.2	0		
electricity (per MWh)	0	1	2	3	7.3	1.4	14	6.9	6.4	10	0	0	27	0	50	5.0	2.0	17	1.0		

* If several rates exist within one category (e.g. due to different specifications of the fuel, or exemptions/reduced rates for specific users), the highest existing rate is reported.

** Minimum rates for leaded and unleaded are the same, but actual rate for leaded petrol should be higher than for unleaded.

Grey cells indicate tax rates that are higher than the minimum rates for 1/1/1998, according to COM (97)30

Sources: Calculations based on European Commission (1997a; 1999b; 2000d); OECD (2000)

Annex IV: Opinions of some stakeholders on environmental taxation/economic instruments

Global institutions

- ‘1. Each Party included in Annex I, (...) shall:
 - (a) Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as: (...) Progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all greenhouse gas emitting sectors that run counter to the objective of the Convention and application of market instruments;
 - (b) Co-operate with other such Parties to enhance the individual and combined effectiveness of their policies and measures adopted under this Article. To this end, these Parties shall take steps to share their experience and exchange information on such policies and measures, including developing ways of improving their comparability, transparency and effectiveness. The Conference of Parties serving as the meeting of the Parties to this Protocol shall, at its first session or as soon as practicable thereafter, consider ways to facilitate such co-operation, taking into account all relevant information.’
(*Kyoto Protocol to the United Nations Framework Convention on Climate Change, 10.12.1997, Kyoto, Article 2*).
- ‘We reaffirm that we consider climate change an extremely serious threat to sustainable development. We will therefore work towards timely progress in implementing the Buenos Aires Plan of Action with a view to early entry into force of the Kyoto Protocol. In particular, we encourage decisions on the operation of the Kyoto mechanisms and on a strong and effective compliance regime. We underline the importance of taking action to reduce greenhouse gas emissions through rational and efficient use of energy and through other cost-effective means. To this end, we commit ourselves to develop and implement domestic measures including under the UN Framework Convention on Climate Change. We also agreed to exchange experience on best practices. We will also promote increasing global participation of developing countries in limiting greenhouse gas emissions. We welcome the action already taken by developing countries and stress the need to support their efforts through financial mechanisms, the development and transfer of technology, and capacity-building. We note the important role that the Clean Development Mechanism (CDM) can play in these areas. We also welcome the intention announced by some developing countries in Buenos Aires to undertake further commitments to abate their greenhouse gas emissions.’
(*G8 Communiqué Cologne 1999, section 3, VIII. Redoubling Efforts to Protect the Environment, <http://www.library.utoronto.ca/g7/summit/1999koln/finalcom.htm>*)
- ‘We note with concern that CO₂ and other greenhouse gas emissions particularly in the transport sector are continuing to rise rapidly worldwide. We therefore consider it an urgent necessity to exploit the potential for emission reductions in that sector as far as possible, e.g. by reducing fuel consumption by shifting modes towards more environmentally responsible means of transport, and by introducing and increasing the use of alternative fuels and propulsion systems. We are furthermore of the opinion that the use of measures, such as fiscal and economic instruments, fuel efficiency standards and transportation demand management can make an effective contribution to improving energy efficiency and to containing and reducing emission levels. (...) We reaffirm the commitment under the Kyoto Protocol to pursue limitation or reduction of emissions from aviation and marine bunker fuels and request ICAO and IMO to redouble their efforts to pursue these objectives. Sustainable mobility requires internalisation of the external costs of transport. In this context ICAO and IMO should also consider a review of the prevailing policy on aviation and marine fuels.’

(*Environment and Transport, sections 16 and 18, Communiqué, Meeting of G8 Environment Ministers in Schwerin, 26-28 March 1999, <http://www.bmu.dk/english/g8/komm0328e.htm>*)

European institutions

- ‘The Commission urges the Ecofin Council to adopt as a priority the Proposal for Directive on an energy product tax. Moreover, Member States should develop other appropriate fiscal incentives to improve energy efficiency and to reduce greenhouse gases emissions.’
(*Preparing for the Implementation of the Kyoto Protocol*, COM (99)230, European Commission, <http://europa.eu.int/comm/dg11/docum/99230.en.htm>)

- ‘The European Council emphasises the need to make tax systems in Europe more employment-friendly and to combat harmful tax competition: Confirming the conclusions of the Vienna European Council, the European Council calls for: (...) the Council to continue its work on a framework for the taxation of energy on the basis of the ECOFIN Council report, bearing in mind the impact it will have on the environment.’ (paragraph 22).

‘(...)The European Council also considers an appropriate framework for energy taxation to be necessary and urges the Council (Economic and Financial Questions) to reach an early decision in the course of its discussions. The European Council takes note of the incoming Presidency’s initiative to step up the Community’s activities on climate matters.’ (paragraph 31).

‘It calls upon the Council (Economic and Financial Questions) to report back to it in 2000 on the integration of environmental issues and sustainable development into each of the policy areas.’ (paragraph 32).
(*Council Conclusion of the EU Summit in Cologne, June 1999*)

Industry

- ‘The Kyoto Protocol establishes three flexible economic mechanisms: trading, joint implementation and the Clean Development Mechanism. If these mechanisms are designed and operated according to market principles, they can contribute to significantly lowering the

We will:

1. develop a pilot internal trading system which will assist Shell companies to reduce their GHG emissions efficiently and gain experience in the operation of such a trading
2. provide practical support to the development of national and international emission trading systems
3. seek out opportunities to invest in “Clean Development Mechanism” and “joint implementation” projects.”

cost to society of greenhouse gas emissions reductions.

(<http://www.shell.com>)

- ‘Making market forces work in this way to protect and improve the quality of the environment – with the help of (...) a judicious use of economic instruments in a harmonious regulatory framework is an on-going challenge that the world faces in entering the 21st century.’
(*The Business Charter for Sustainable Development, International Chamber of Commerce, <http://www.iccwbo.org/Commissions/Environment/charter.htm>*)
- ‘Hence, my conclusion is that there probably is a role for a tax if businesses of all sizes and from all sectors are to contribute to improved energy efficiency and help meet the UK’s emissions targets.’
(*Lord Marshall, Economic instruments and the business use of energy, p.2, November 1998*)
- ‘(...) personally speaking I have nothing against environmental taxation, as long as the taxes are designed reasonably: First of all the tax base must be specified. Secondly, the taxpayers should have the possibility to adapt their behaviour to them and thirdly, it should not be the case that ecotaxation becomes a cheap way of increasing government income.’
(*John Browne, chief executive BP, in: Die Zeit, 43/1997*)
- ‘Regardless of its actual construction, eco-taxes should enhance sustainable economics. Hence the question is not whether ecotaxation is necessary, but how to achieve its introduction with as much consent as possible.’
(*Klaus Steilmann, entrepreneur, in ‘Die Woche’, 30.10.1998*)
- ‘We support the law (CO₂ tax) because industry is given the opportunity to find

the most effective ways to reduce emissions.'

(R. Burgholz member of the Swiss Association of Trade and Industry, in: 'Taking stock of green tax reform initiatives', Carola Hanisch in: 'Environmental science & technology' December 1, 1998/ Volume 32, Issue 23/ pp.540, American Chemical Society)

incentive for industry to stop being wasteful, become more efficient, and ensure that they will be in competitive shape to do business in the 21st century.' (Tony Juniper, Friends of the Earth Campaigns and Policy Director, Press Release, Friday 5 June 1998, <http://www.foe.co.uk/pubsinfo/info-team/pressrel/1998/19980605155622.html>)

Trade union

- 'An energy tax, well shaped and carefully implemented, could constitute a considerable incentive to achieve greater energy efficiency and reduce energy consumption. Increases in energy efficiency would also make a substantial contribution towards job creation in the EU: 100,000 jobs could be created by the year 2000 according to the White Paper on Growth, Labour and Employment.' (Willy Buschak in 'ETUC and the Kyoto Process', <http://www.etuc.org/Policy/Environment/Climate/kyoto.cfm>)

Environmental NGOs

- 'Energy taxes are good for jobs, good for the economy and good for the environment. They will create the

- The members of the Climate Alliance (Klima-Bündnis/Alianza del Clima) are convinced that the introduction of an ecological tax reform is indispensable to achieve climate protection goals. An ecological tax reform gives incentives to enhance the more parsimonious use of the environment and natural resources, while at the same time reducing burdens on labour as a factor of production. It thus combines climate protection with positive economic effects: It creates incentives for innovation and investment in energy efficiency, and makes it also possible to increase employment by reducing nonwage labour costs. A common, step-wise and EU-wide approach guarantees greatest effectivity. (Resolution adopted by the General Assembly of 20th May 1999 in Apeldoorn, <http://www.klimabuendnis.org>)

Annex V: Overview of taxes and charges in 11 countries in central and eastern Europe

Overview of economic instruments for environmental policy used in central and eastern Europe, 1999											
	Country										
	Bul-garia	Croa-tia	Czech Rep	Esto-nia	Hun-gary	Latvia	Lithu-ania	Po-land	Roma-nia	Slova-kia	Slove-nia
Motor fuel taxes/charges											
Excise tax	x	x	x	x	x	x	x	x	x	x	x
CO ₂ tax											x
VAT	x	x	x	x	x	x	x	x	x	x	x
Other energy products											
Excise tax	x	x	x		x	x	x	x		x	x
CO ₂ tax											x
VAT	x	x	x	x	x	x	x	x	x	x	x
Air emissions—Pollution Charges											
NO _x			x	x		x	x	x		x	
SO _x			x	x		x	x	x		x	
Emission non-compliance fee	x		x	x	x	x	x	x	x	x	
Transport related taxation											
Vehicle tax	x	x	x		x		x	x	x		
Highway toll			x		x					x	
Road tax		x	x				x		x		
Sales tax	x							x			
Import duty	x	x		x	x		x	x	x	x	
Registration charge	x			x			x	x		x	
Company car tax	x										
Air transport											
Noise tax/charges etc.			x								
Agricultural inputs											
Fertilisers								x			
Soil protection charge					x						
Waste related product charges											
Ozone depleting substances			x			x				x	
Batteries/accumulators					x	x					
Carrier bags											
Disposable containers/packaging				x	x	x					
Tires					x	x					
Light bulbs						x					
Lubricants						x					
Refrigerators					x						
Waste											
Municipal waste user charges	x	x	x	x	x		x	x	x	x	x
Waste disposal charge/tax			x	x	x	x		x		x	
Waste non-compliance fees		x		x	x	x	x	x		x	
Deposit refund schemes			x		x		x			x	
Levy on nuclear account	x		x		x	x				x	

	Bul-garia	Croa-tia	Czech Rep	Esto-nia	Hun-gary	Latvia	Lithu-ania	Po-land	Roma-nia	Slova-kia	Slove-nia
Instruments for managing water quality											
Water consumption charge	x	x		x	x		x	x	x	x	x
Sewage treatment charge	x	x	x	x	x		x	x	x	x	x
Water effluent charge/tax		x	x	x		x	x	x	x	x	x
Water pollution non-compliance fee	x	x		x	x	x	x	x	x	x	
Water extraction charge/tax		x	x	x	x	x	x	x	x	x	
Natural resource mining											
Mining charges/ taxes	x	x	x	x	x	x	x	x		x	
Instruments for biodiversity and nature protection											
Charges for conversion of agricultural and forest land			x							x	
Hunting charges	x			x			x				x
Natural park entrance charges								x			
Nature protection non-compliance	x			x	x		x	x		x	
Tree cutting charges/ taxes	x					x	x	x			

Source: REC/Sofia Initiative Database of Environmental Taxes and Charges

References

- Andersen, M.S. 1998, *Assessing the Effectiveness of Denmark's Waste Tax*, in: Environment May 1998, Volume 40, Number 4, Washington
- Ballard, Shoven and Whalley, 1985, *Excess Burden*, Cambridge Econometrics, Washington CE
- Becker, H. 1992, *Reduzierung des Düngemittleinsatzes. Ökonomische und ökologische Bewertung von Maßnahmen zur Reduzierung des Düngemittleinsatzes – Eine quantitative Analyse für Regionen der Europäischen Gemeinschaft. (Reduction of nutrient input – Economical and ecological effects of measures to reduce nutrient input – Quantitative analysis for regions and for the European Union)*, Schriftenreihe des Bundesministers für Ernährung, Landwirtschaft und Forsten. Reihe A: Angewandte Wissenschaft Heft 416, p.152. In: Zeijts 1999
- Bleijenberg, A.N.; R.C.N. (1998) *Wit: An European Environmental Aviation Charge. Feasibility Study*. Amsterdam
- Bosquet, 2000, Environmental tax reform: does it work? A survey of empirical evidence, in: *Ecological Economics* 34 (2000) 19-32.
- Brännlund, Runar, *Green Tax Reforms: Some experience from Sweden*, In: Schlegelmilch, Kai (ed.) 1999, *Green Budget Reform in Europe ñ Countries at the Forefront*, Springer, Berlin, p. 67-91.
- Cook, Elisabeth (Ed.) 1996, *Ozone Protection in the United States: Elements of Success*. World Resources Institute, Washington
- Cyprus Ministry of Agriculture, Natural Resources and the Environment 2000, *Action Plan for the Protection of the Environment*
- Daamen and Bos (1999) *Reactions of Dutch Households to the Energy Tax*, University of Leiden (in Dutch)
- Danish Environmental Protection Agency, 2000, *Economic instruments in environmental protection in Denmark*
- Danish Government 1999a, *Evaluering af gronne afgifter og erhvervene (Evaluation of Green Taxes and Trade Industry)*, Copenhagen (in danish, <http://147.29.40.164/gronne/index.htm>)
- Danish Government 1999b, *Evaluation of Green Taxes and Trade Industry*, English Summary, Copenhagen (available under <http://www.skm.dk/sgk-skmg1.htm>)
- Danish Government 1999c, *Note on the Danish Pesticide Tax*, Copenhagen
- Danish Ministry for the Environment, 1997, *Status of the Minister for the Environment's Action Plan for Reducing the Consumption of Pesticides*, Copenhagen (<http://www.mst.dk/activi/06050000.htm>)
- Danish Ministry of Economic Affairs 1996, *Environmental Taxes, Tax Reform and the Internal Market – Some Danish Experiences and Possible Community Initiatives*, in: European Foundation for the Improvement of Living and Working Conditions: Environmental Taxes and Charges. National Experiences and Plans. Luxembourg 1996
- Danish Ministry of the Environment and Energy 2000, *Energy Policy Report 2000*
- Danish Ministry of Finance 1995, *Energy Tax on Industry in Denmark*, Copenhagen 1995
- Danish Ministry of Taxation 1998, *Energy Taxes: The Danish Model*, Copenhagen
- Danish Ministry of Taxation 1999, *A green taxation of passenger cars in Denmark*, Copenhagen
- Dutch Green Tax Commission 1997/8, *A Summary of its three reports 1995-1997*, The Hague

- Dutch Ministry of Finance 1999, *Annual Report on the Regulatory Energy Tax* (in Dutch)
- EEA 1996, *Environmental Taxes. Implementation and Environmental Effectiveness*, Copenhagen
- EEA 1997, *Environmental Agreements, Environmental Effectiveness*, Copenhagen
- EEA 1998, *Europe's Environment: The Second Assessment*, Copenhagen
- EEA, 1999a, *Monitoring Progress Towards Integration – a contribution to the Global Assessment of the Fifth EAP- Interim Report*, Copenhagen (forthcoming)
- EEA, 1999b, *Environment in the European Union at the turn of the century*, Copenhagen
- EEA, 2000, *Environmental Signals 2000 – European Environment Agency regular indicator report*, Copenhagen
- EEA/UNEP 1999, *Chemicals in the European Environment: Low Doses, High Stakes?* Copenhagen
- EFILWC – European Foundation for the Improvement of Living and Working Conditions 1996, *Environmental Taxes & Charges. National Experiences & Plans. Papers from the Dublin workshop*, Office for Official Publications of the European Communities, Luxembourg
- EFILWC – European Foundation for the Improvement of Living and Working Conditions 1998, *Employment and Sustainability: The U.K. Landfill Tax*, Office for Official Publications of the European Communities, Luxembourg
- EFILWC – European Foundation for the Improvement of Living and Working Conditions 1999, *Economic Instruments for Sustainable Development – Improving the External and Working Environments*
- EIM/Haskoning 1999, *Study on a European Union wide framework for environmental levies on pesticides*. Zoetermeer
- ENDS Daily 2000a, May 25 *Spain's Balearic Islands Government Proposes Ecotax on Tourists*
- ENDS Daily 2000b, February 1, *Great Britain Abandons Plans for a Pesticide Tax*
- Enevoldsen, Martin, 1998, *Joint environmental policy-making and other new abatement strategies for industrial CO₂ Pollution*, Agricultural University, Wageningen
- Enevoldsen, Martin, 2000, *Industrial Energy Efficiency*, in: Mol, A.P., Lauber, V., Liefferink (eds.), *The Voluntary Approach to Environmental Policy: Joint Environmental Policy Making in Europe*, forthcoming 2000
- Environmental Audit Committee 1999: Eighth Report, London, 20 July
- European Commission 1992a, *Proposal for a Council Directive introducing a tax on carbon dioxide emissions and energy*, COM (92) 226 final
- European Commission 1992b, *Directive 92/82/EEC on the approximation of the rates of excise duties on mineral oils*, Brussels
- European Commission 1993, *Growth, Competitiveness, Employment: the Challenge and Ways forward into the 21st Century*, White Paper, Bulletin of the European Communities Supplement 6/93, Luxembourg
- European Commission 1995: *Amended proposal for a Council Directive introducing a tax on carbon dioxide emissions and energy*, COM(95) 172, Brussels
- European Commission 1997a, *Proposal for a Council Directive Restructuring the Community Framework for the Taxation of Energy Products*, COM(97)30, Brussels
- European Commission 1997b, *Tax Provisions with a Potential Impact on Environmental Protection*, Luxembourg

European Commission 1997c, *Environmental Taxes and Charges in the Single Market*, COM(97) 9, Brussels

European Commission 1999a, *Level of Indirect Taxation on Energy Products in Member States* (working document). European Commission, Brussels

European Commission 1999b, *Excise Duty Tables*, Brussels

European Commission 1999c, *Single Market and Environment*. Dok Nr Sek (1999)777, Brussels

European Commission 1999d, *Commission Working Document – From Cardiff to Helsinki and beyond*, SEC(1999)1941

European Commission 1999e, *Communication from the Commission on Air Transport and the Environment*, COM (1999) 640

European Commission 2000a, *Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee – Taxation of aircraft fuel*

European Commission 2000b, *Communication from the Commission to the Council and the European Parliament, Bringing our needs and responsibilities together-integrating environmental issues with economic policy*, Brussels

European Commission 2000c, *Transport in figures*

European Commission 2000d, *Database of economic instruments in the European Union Member States, plus Norway and Switzerland* (http://www.europa.eu.int/comm/environment/enveco/env_database/database.htm)

Eurostat, 2000, *Environmental taxes in the EU*, Statistics in focus Theme 2 – 20/2000, [and](#)

Eurostat 2000, *Structures of the taxation systems in the European Union 1990-1997*, Catalogue No KS-28-00-147-EN-C

Goodwin, P.B., 1992, *A Review of Demand Elasticities with Special Reference to Short and Long Run Effects of Price Changes*, Journal of Transport Economics and Policy, pp. 155-169, in: European Commission 1997

Hansen, Jens, Holger Helbo: *Green Tax Reform in Denmark*, In: Schlegelmilch, Kai (ed.) 1999, *Green Budget Reform in Europe – Countries at the Forefront*, Springer, Berlin, p. 51-66

Heady, C.J., et al., 2000, *Study on the relationship between environmental/energy taxation and employment creation*, University of Bath

Hoerner, A. 1998, *Harnessing the Tax Code For Environmental Protection: A Survey of State Initiatives*. In: Special Supplement to Tax Analyst, No. 16.

Hofreither, M.F. and Sinabell, F., 1998, *The Austrian Levy on Mineral Fertilisers. Selected Observations*. Department of Economics, Politics and Law. University of Resource Science, Vienna. In: *Proceedings of Workshop. Economic instruments for nitrogen control in European agriculture (Nitrotax)*, p.67-78. Research Centre on Animal Production (CRPA), Reggio Emilia, Italy. In: Zeijts 1999

INFRAS/IWW, 2000, *External Costs of Transport – Accidents, Environmental and Congestion Costs of Transport in Western Europe*. Zurich/Karlsruhe

IPCC 1999, *Special Report on Aviation and the Global Atmosphere*. (in print). Summary for Policymakers, available at IPCC, Geneva, Switzerland

Irish Department of Finance 1998, Finance Bill 1999. Environmental Taxation. Tax Strategy Group. 23 October

Irish EPA 2000 *Ireland's Environment – A Millennium report*

- Jänicke, Martin, Mez, Lutz, Bechsgaard, Pernille, Klemmensen, Børge 1997 *Innovationswirkungen branchenbezogener Regulierungsmuster am Beispiel energiesparender Kühlschränke in Dänemark*, Berlin
- Kasa, S. 1999, *Social and political barriers to green tax reform. The case of CO₂-taxes in Norway*. Policy Note 5,. Oslo (<http://www.cicero.uio.no/Publications/Policynotes/pn1999-05.html>).
- Klarer, J. 1999, *Economic Instruments and Environmental Funds for Environmental Policy in CEE*, In: Schlegelmilch, Kai (ed.) 1999, *Green Budget Reform in Europe – Countries at the Forefront*, Springer, Berlin, p. 201-258
- Kleijn, H. and J. Klooster, 1990, *Het bewijs van de prijs*, Ministerie van Verkeer en Waterstaat, Den Haag, in: European Commission 1997
- Kraemer, R.A. 1995, *The effectiveness and efficiency of water effluent charge systems: case study on Germany* Paper prepared for the OECD Environment Directorate In: OECD 1997
- Larsen, B.M., R. Nesbakken 1997, *Norwegian Emissions of CO₂ 1987-1994. A study of some effects of the CO₂ tax*, Environment and Resource Economics, No. 3., p.275-290
- Luhmann, H.-J./Ell.R./Roemer 1998M.: *Unevenly Distributed Benefits from Reducing Pollutants, especially Road Traffic Emissions, via Reducing Road Transport*. In: Environmental Fiscal Reform – Final Report, Wuppertal.
- Luxembourg Ministry of Environment, 2000, National Strategy for the Reduction of Greenhouse Gas Emissions
- Marshall, C. 1998, *Economic instruments and the business use of energy*. London November 1998 (<http://www.hm-treasury.gov.uk/pub/html/reg/ecinst.html>).

Ministries of Finance/Taxation, partly also of the Ministries of Economic Affairs – Homepages:

Austria	http://www.bmf.gv.at/
Belgium	http://minfin.fgov.be
Bulgaria	http://www.government.bg/eng/cm/administration.html (under construction)
Cyprus	http://www.pio.gov.cy/cygov/ministry/mfinance/index.htm
Czech Republic	http://www.mfcr.cz/scripts/hpe/default.asp
Denmark	http://www.fm.dk http://www.skm.dk/
Estonia	http://www.fin.ee/
Finland	http://www.vn.fi/vn/vm/english/mof.htm
France	http://www.finances.gouv.fr http://www.finances.gouv.fr/impots_et_taxes/mesures/99/disposition-9.htm
Germany	http://www.bundesfinanzministerium.de/ http://www.bmu.de
Greece	http://www.primeminister.gr/links_en.htm (links to gov. sites; pages of the Ministry of Finance missing)
Hungary	http://www.meh.hu/pm/default.htm
Iceland	http://brunnur.stjr.is/interpro/fjr/fjr.nsf/pages/english-index
Ireland	http://www.irlgov.ie/finance/ http://www.irlgov.ie/finance/tsg/tsg9841.htm
Italy	http://www.finanze.it/
Latvia	http://www.fm.gov.lv/
Lichtenstein	http://www.firstlink.li/regierung/stab_finanzen.htm
Lithuania	http://www.finmin.lt/
Luxembourg	http://www.etat.lu/Fl/
Malta	http://www.magnet.mt/ministries/finance/
Netherlands	http://www.minfin.nl/ http://www.minez.nl/
Norway	http://odin.dep.no/fin/eng/index.html http://www.finans.dep.no/
Poland	http://www.mst.gov.pl/
Portugal	http://www.min-financas.pt/futuro/
Romania	http://www.mfinante.ro/
Slovakia	http://www.finance.gov.sk/

Slovenia	http://www.sigov.si:90/mf/angl/
Spain	http://www.dgip.es/
Sweden	http://www.regeringen.se/inenglish/index.htm http://www.rsv.se/
Switzerland	http://www.admin.ch/dff/ http://www.efd.admin.ch/
United Kingdom	http://www.hm-treasury.gov.uk/

Moe, T.: *Policies for a Better Environment and High Employment*, In: Schlegelmilch, Kai (ed.) 1999, *Green Budget Reform in Europe. Countries at the Forefront*, Springer, Berlin, p.93-107.

NEI, 1991, *Price Elasticity of Energy Use in Road Traffic*, Netherlands Economics Institute, Rotterdam (in Dutch)

NIS, Portuguese National Institute of Statistics, 1997, *Environmental-related taxes, charges and subsidies in Portugal*, provided by Eurostat, Luxembourg

Nordic Council of Ministers, 1999, *Factor 4 and 10 in the Nordic Countries*, TemaNord, Copenhagen

Norwegian Agricultural Inspection Service 1999, *Guidelines for classification of plant protection products in tax classes differentiated according to health and environmental factors*. Ås

OECD 1989, *Economic Instruments for Environmental Protection*, OECD, Paris

OECD 1994a, *Taxation and the Environment in European Economies in Transition*, GD(94)2,

OECD 1994b, *Applying Economic Instruments to Environmental Policies in OECD and Dynamic Non-Member Economies*, OECD, Paris.

OECD 1994c, *Managing the Environment: the Role of Economic Instruments*, OECD, Paris

OECD 1994d, *Environment and Taxation: the Cases of the Netherlands, Sweden and the United States*, OECD, Paris

OECD 1995, *Environmental Taxes in OECD Countries*, OECD, Paris

OECD 1996, *Implementation Strategies for Environmental Taxes*, OECD, Paris

OECD 1997a, *Evaluating Economic Instruments for Environmental Policy*. OECD Environment Directorate, Paris

OECD 1997b, *Environmental Taxes and Green Tax Reform*. OECD Environment Directorate, Paris

OECD 1998a, *Improving the Environment Through Reducing Subsidies*. OECD Environment Directorate, Paris

OECD 1998b, *Statistics on Eco-Taxes: Progress Report*. OECD Environment Directorate, Paris

OECD 1999a, *Consumption Tax Trends*, Paris

OECD 1999b, *Economic Instruments for Pollution Control and Natural Resources Management in OECD Countries: A Survey*. Revised Working Paper, March 1999 OECD Environment Directorate, Paris

OECD 1999c, *Environmental Taxes – Recent Developments in China and OECD Countries*, OECD Environment Directorate, Paris

OECD 1999d, *The Price of Water – Trends in OECD Countries*, Paris

OECD 2000, *Database on environmentally related taxes* (<http://www.oecd.org/env/policies/taxes/index.htm>)

OECD/IEA 1997a, *Quarterly Prices and Taxes*, 1998

OECD/IEA 1997a: *Energy Prices and Taxes*, Fourth Quarter 1996, Paris

- Oosterhuis, F.H, F.M. Brouwer, H.J. Wijnants, *A possible EU wide charge on cadmium in phosphate fertilisers: economic and environmental implications* – Final report to the European Commission
- Prime Minister's Office Publications Series (PMOPS) 2000, Environmental and energy taxation in Finland – Summary of the Working Group report
- RCEP, 1994, *Royal Commission on Environmental Pollution, Eighteenth Report: Transport and the Environment*, HMSO, London, in: European Commission 1997
- REC 1999, Sourcebook on Economic Instruments for Environmental Policy, Budapest
- REC 2000, Sofia Initiative on Economic Instruments – Database on Environmental Taxes and Charges (http://www.rec.org/REC/Programs/Sofialnitiatives/Ecolnstruments/Database/SIEI_database.html)
- Resource Analysis et al.(1999): Analysis of the taxation of aircraft fuel. (VII/C/4-33/97). Report produced for European Commission. Final Report, January 1999 (forthcoming)
- RIVM, Dutch National Institute of Public Health and the Environment 1996, *Ecologisering van het belastigstelsel: Indicative berekeningen van de milieu-effecten van belastingen op het terrein van energie en verkeer en vervoer, (Ecologizing the tax system: indicative calculations of the environmental effects of taxes on energy and transport)*. Achtergronddocument no 408130 001, Bilhoven
- Roy, R., 1998, Infrastructure Cost Recovery under Allocatively Efficient Pricing, UIC
- Schlegelmilch, Kai (ed.) 1998a, *Green Tax Commissions*, EU Environmental Policy Research Briefs No.4, Dublin
- Schlegelmilch, Kai (ed.) 1999, *Green Budget Reform in Europe. Countries at the Forefront*, Springer, Berlin, Heidelberg, New York
- Schlegelmilch, Kai, 1998b, *Energy Taxation in the EU and some Member States*, Heinrich-Böll-Stiftung, Brussels Office, Wuppertal November, (also available under http://www.wupperinst.org/Publikationen/Taxation/index_e.html, German summary: <http://www.wupperinst.org/Publikationen/Taxation/tax.pdf>)
- SEO (1998) *Research of the Impact of the Regulatory Energy Tax in Business Firms*, University Amsterdam
- Skatteministeriet, 2000, *Grønne afgifter – sætter pris på miljøet*, København
- Sterner, T., 1990, *The Pricing of and Demand for Gasoline*, Swedish Transport Research Board, TFB-Report 1990:9, Stockholm, in: European Commission 1997
- Swedish Board of Agriculture, Emmerman, A., 1999, *Taxes on pesticides – Swedish experiences*, presented in March in Brussels, Stockholm
- Swedish Environmental Protection Agency 1997, *Environmental Taxes in Sweden*, Stockholm
- Swedish Environmental Protection Agency 1999, *Key Role-Players in the Process towards Sustainable Transport in Europe*, A report from the Swedish Euro-EST project, No. 4979, Stockholm
- Togeby, Mikael 1998: *Evaluation of the Danish CO₂ taxes and agreements*, Copenhagen
- UK Department for the Environment, Transport and the Regions (DETR), *The Environmental Appraisal of the Fuel Duty Escalator*, Memorandum, London ()
- UK Department of the Environment, Transport and the Regions, 1999, *The Government's Response to the Environment, Transport and Regional Affairs Committee's Report – The Operation of the Landfill Tax*
- UK Environmental Audit Committee 2000, *Sixth Report*
- UK Government 1999, Budget 1999, London

UK Round Table on Sustainable Development, 2000, *Not too difficult! – Economic instruments to promote sustainable development within a modernised economy*, London

Van Wee, B., 1995, *Pricing Instruments for Transport Policy*, in *Environment, Incentives and the Common Market*, edited by F.J. Dietz, H.R.J. Vollebergh and J.L. de Vries, Kluwer Academic Publishers, the Netherlands

Vermeend, W. and Van der Vaart, J., 1998, *Greening Taxes: The Dutch Model, Ten years of experience and the remaining challenge*, Kluwer

Weizsäcker, E.U. von 1996, A. Lovins, H. Lovins, *Factor Four – doubling welfare and halving resource consumption*,

Zank, Wolfgang 1998: *Profitable Mühlen. Um die Umwelt zu schonen, setzt Dänemark verstärkt auf Windstrom*, in: DIE ZEIT, Nr. 2, 2. January 1998

Zeijts, H. van (ed.), 1999, *Economic Instruments for Nitrogen Control in European Agriculture*, Centre for Agriculture and Environment, Utrecht