The Use of Economic Instruments in Nordic and Baltic Environmental Policy 2001-2005

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The Use of Economic Instruments in Nordic and Baltic Environmental Policy 2001-2005

TemaNord 2006:525

© Nordic Council of Ministers, Copenhagen 2006

ISBN 92-893-1304-8

Print: Ekspresen Tryk & Kopicenter

Copies: 400

Printed on environmentally friendly paper

This publication can be ordered on www.norden.org/order. Other Nordic publications are available at www.norden.org/publications

Printed in Denmark

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Nordic co-operation

Nordic co-operation, one of the oldest and most wide-ranging regional partnerships in the world, involves Denmark, Finland, Iceland, Norway, Sweden, the Faroe Islands, Greenland and Åland. Co-operation reinforces the sense of Nordic community while respecting national differences and similarities, makes it possible to uphold Nordic interests in the world at large and promotes positive relations between neighbouring peoples.

Co-operation was formalised in 1952 when *the Nordic Council* was set up as a forum for parliamentarians and governments. The Helsinki Treaty of 1962 has formed the framework for Nordic partnership ever since. The *Nordic Council of Ministers* was set up in 1971 as the formal forum for co-operation between the governments of the Nordic countries and the political leadership of the autonomous areas, i.e. the Faroe Islands, Greenland and Åland.

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Preface

The Nordic Council of Ministers publishes regular overview reports on the use of economic instruments in Nordic environmental policy (previous editions: 1994, 1997, 1999, 2002).

The present report continues this practice but the scope is extended. The application of economic instruments is not only presented for the five Nordic countries, but also for the three Baltic countries (part I of the report). In addition the report for the first time includes an analytical section, addressing opportunities and difficulties associated with the use of economic instruments in the field of environmental policy (part II of the report).

The report was prepared by the Department of Policy Analysis of the National Environmental Research Institute, Denmark. The team consisted of Stefan Speck, Mikael Skou Andersen, Anders Ryelund, Carey Smith and Helle Ørsted Nielsen. The chapters presenting the situation in the Baltic countries has been compiled and drafted by Kristina Veidemane, Liva Andersone, Jaan Aps, Vilma Valiukaite and Zymantas Morkvenas of the Baltic Environmental Forum.

We gratefully acknowledge the information received from the members of the Environment and Finance Group of the Nordic Council of Ministers.

Kalø, March 2006

Summary

Part I: The application of economic instruments in environmental policy in the Nordic and Baltic countries

The most recent and significant development concerning the use of economic instruments in environmental policy was the approval and launch of the EU Emission Trading Scheme (ETS) during the period 2001–2005. The implementation of the ETS is the first EU-wide economic instrument to be implemented in the Nordic region and, as well, the first supra-national trading scheme in the world. The motive for its introduction is to provide a tool for EU Member States to achieve the targets of the Kyoto Protocol more cost-efficiently.

A second, but equally important development was the adoption of the EU Taxation of Energy Products Directive in 2003, after more than 10 years of discussions and negotiations at the EU level as well as several energy/carbon tax proposals. This new Directive widens the scope of the 1992 energy taxation framework, as minimum tax rates are set for energy products (such as coal, natural gas and electricity) which were not previously covered in the pre-existing energy taxation framework.

These two major pieces of EU legislation have implications for the use of economic instruments in the Nordic and Baltic environmental policy. The EU ETS Directive obliges the Nordic, as well as the Baltic, countries to implement an emission trading scheme. Experiences with such a scheme were gained by Denmark on a small scale during the period 2000–2003 with a national CO₂ quota system. The implications of the adoption of the Taxation of Energy Products Directive, on the other hand, differ to a degree between the Nordic and the Baltic countries. Rather comprehensive national energy taxation frameworks which did not require major changes, were already in existence in the Nordic countries – although Sweden and Norway were required to abolish the complete electricity tax exemption held by the manufacturing industry. In the case of the Baltic countries, introduction of a range of new energy taxes levied on energy products, previously exempt from any taxation was required. However, transitional periods in which to implement these new taxes have been awarded to the three Baltic countries, as to other new EU Member States.

Over the last five years, changes with regard to support schemes for renewable energy have occurred in the Nordic countries. Sweden, for example, has introduced a tradable certificate scheme obliging end-users to buy a portion of the green certificates which relate to electricity consumption. Revision of the support schemes is also under discussion in

other Nordic countries, such as in Denmark by means of switching from the fixed-price system to a quota-based system. Furthermore, the implementation of a common green certificate scheme for Sweden and Norway for 2007 is under consideration.

Despite the emphasis on carbon-energy instruments in recent years, it has to be noted that a greater number of air pollution taxes exist in the Baltic countries as compared to the situation in the Nordic countries. These taxes address emissions and thereby environmental impact more directly. The Baltic countries distinguish between basic rates, which usually apply to emissions within permitted levels, and higher rates, which apply in the case of non-compliance with predefined standards. Such pollution charge schemes also apply to a variety of water pollutants in the Baltic countries. Denmark and Norway have, however, recently introduced new environmental taxes levied on a range of (non-energy related) greenhouse gases (GHG). In 2001, Denmark introduced a tax on perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and hydrofluorocarbons (HFCs) as an additional measure to curb GHG emissions, working alongside the CFC tax which has been in force since 1989. The Norwegian greenhouse gas (GHG) tax entered into force on 1 January 2003 and is levied on perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs).

Although the policy measures agreed in the context of the European Union have been of increased significance for the use of economic instruments in both Nordic and Baltic environmental policy in recent years, notable developments are also taking place as a result of domestic decisions. Sweden is undertaking an overall tax shift replacing income taxes with taxes on energy, transport and pollution amounting to several billion SEK. Estonia in 2005 decided to lower income taxes by 6 percent and substitutes them in part with new environmental taxes.

The existing environmental taxation framework in the areas of water and waste has been revised and refined in certain countries, such as Norway. Since 2003, the landfill tax has been differentiated according to environmental standards allowing a higher tax rate to be charged on waste disposed of at landfill sites with lower environmental standards. A key element of the revision of waste taxation, in Norway, was the redesigning of the incineration tax. Waste delivered to incineration had, until 2003, been taxed at a basic rate and, in addition, a variable rate depending on the percentage of energy recovered. Under the new scheme, the incineration tax is now based on air emissions, thereby providing a clear incentive for the operator of the incinerator to minimise air pollution.

New developments with regard to the application of new economic instruments can be reported in the area of waste, mainly as a consequence of the transposition of the Directive on waste electrical and electronic equipment (WEEE) and of the Directive on end-of-life vehicles (ELV) into national legislation, which in particular stress the importance of producer responsibility. A further innovation can be reported from Denmark,

where a tax on mineral phosphorous in animal feeds has been implemented in 2005, aiming to limit the over-enrichment of freshwaters.

Environmental considerations in vehicle taxation schemes implemented in the Nordic countries are advancing, as e.g. the Norwegian purchase tax is now based on criteria such as weight and engine capacity as compared to the value of the vehicle, which is still the tax base in Denmark. These purchase taxes are still of great significance in terms of their revenue generating potential in Denmark, Finland and Norway. Again, differences between the Nordic and Baltic countries are apparent as countries from the latter (Estonia and Lithuania) have repealed taxes levied on private vehicles during recent years, while maintaining taxes levied on heavy goods vehicles. The interest in road-pricing schemes has received some support in Nordic countries, especially as a consequence of the successful introduction of the London congestion charge in 2003. Discussions surrounding similar schemes are now once again firmly placed on the political agenda. For example, a decision was made in May 2005 for Stockholm to introduce a road-pricing scheme for a trial period of seven months, in 2006.

Part II: An evaluation of the opportunities and difficulties concerning economic instruments

This special section in the recurring Nordic Council report on the use of economic instruments in environmental policy addresses, thematically, the results attained with the use of economic instruments. The policy debate on the potential benefits and difficulties associated with the use of market-based instruments is also addressed – the debate is informed by economic theory and findings from ongoing research in the Nordic countries. Previous reports have addressed economic instruments by reporting on the recent trends in policy instrument applications, but the complexity surrounding these developments in terms of the wider policy debate has led to the inclusion of this special section.

Environmental effectiveness – the first dividend of economic instruments

Experience with economic instruments in the Nordic countries spans almost two decades, and the environmental effectiveness of various environmental taxes and charges have on occasions been studied in some detail – especially in recent years as time-series have become sufficiently extensive. However, disentangling the specific effects of taxes and tax rate changes on the emissions of various pollutants requires not only comprehensive datasets but also advanced econometric techniques.

The Nordic countries pioneered the introduction of carbon and energy taxes and recent studies have addressed their impacts on CO₂ emissions. Despite different methodological approaches, the general result which emerges is that such taxes have made an important difference to emission

levels. In Finland, CO₂ emissions would have been 7 percent higher at the end of the 1990s had the taxes not been introduced, while in Denmark the tax-subsidy scheme on industrial CO₂ emissions caused emissions to decline by 23 percent in just seven years, to a level 31 percent lower than would be the case under a business-as-usual scenario. In Norway and Sweden the energy systems are less carbon-intensive, but the body of research points to more selective impacts for specific sectors.

With regard to taxation in the area of more conventional pollution control, Finland's solid waste has been reduced by around 15 percent compared with the business-as-usual prediction, thanks to the impetus of the national waste tax. In Sweden, the waste tax, introduced in 2001, has undergone a preliminary assessment indicating a reduction of 20–30 kg of waste per inhabitant in its first year of operation. The experience from Denmark, that waste taxes are particularly effective on the heavier waste fractions, e.g. demolition waste, is confirmed by the Finnish experience. Norway also taxes waste – and according to a differentiated formula, matching with the environmental burden more closely than in other countries.

Teasing out the specific effects of an environmental tax relative to other influences remains difficult – and disentanglement of the potential cost-effectiveness of these measures is even more challenging. However, the various studies point also to softer mechanisms linked with environmental taxes, such as general signalling and attention-raising effects, as well as the potential for exploiting synergies when linking tax schemes with more or less voluntary self-commitments, further enhancing behavioural change.

Economic effectiveness – is there a double dividend?

While efficient environmental improvements presumably constitute the basic “dividend” from the use of market-based instruments, there has been a great deal of attention paid to the possibility for a second dividend – one of increased employment and improved competitiveness. The possibility of lowering labour taxes, when environment assets are factored-in, exists both with environmental taxes and with the auctioning of emissions trading permits.

To achieve a double dividend requires careful consideration of the revenue recycling method. The most straightforward method is to recycle revenue by lowering social security contributions paid by employers and employees, thereby achieving the double dividend as a consequence of the revenue-recycling effect. However, a tax interaction effect may occur as the increase in energy prices causes employees either to lower labour supply or demand higher salaries in compensation, with the result that the double dividend in terms of an increase in employment will not emerge. Research in recent years has shown that the tax interaction effect can be diminished or avoided through intelligent revenue recycling. The nega-

tive tax interaction effect occurs mainly in stylised analyses where inoptimalities in the present tax system are not taken into account. In fact, the presumption of negative labour supply elasticity is not confirmed in Nordic studies.

Many simulations exploring the double dividend in Computable General Equilibrium (CGE) models were carried out in the 1990s, but hardly any such studies have been published in the last four years. The difficulty with these studies is that they are highly dependent on parameters which need to be assumed by the modeller. Technology, in particular, is a crucial parameter which is not captured well in such models. Also the scope for improved efficiency by means of changes in the use of individual factors of production is often assumed away by neoclassical theory's assumption of optimality and rationality in the management of firms. If the function of market-based instruments is to provide incentives for improving the use of the various factors of production, rather than to improve allocative efficiency, the concept of X-efficiency may contribute to our understanding of the opportunities available for a double dividend.

Opportunities for the further application of market-based instruments

The opportunities for expanding the use of economic instruments in the Nordic countries are coming, more and more, to be related to developments at the EU level. On the one hand, in the energy sector, the introduction of the emission trading system for CO₂ has created an expectation for further innovations in this direction, with more sectors becoming included in the future (aviation, shipping, among others). On the other hand, in the transport sector, road-pricing and aviation taxes have been deliberated for several years and, recently, a proposal for substituting vehicle registration taxes with environmentally related payments was put forward.

Market-based instruments other than taxes and emissions trading have been conceived. In particular, for the purpose of promoting renewable energy, the use of certificates has been making headway in the Nordic countries. Sweden has introduced certificate schemes, while Denmark had planned their introduction, but now takes the position that the high oil prices, alone, should drive renewables. Certificate systems are believed to promote the cost-effectiveness of the extension of renewables, but research comparing certificates with fixed-price support more carefully shows that the margin of difference is small, as the certificates introduce a premium on the uncertainty of investors.

Use of market-based instruments is well established in Nordic countries, but an overview matrix shows that all of the countries still have options to explore, e.g. in the field of water pollution.

Distributional implications

Wherever a tax is introduced there are likely to be concerns about the distributional implications – environmental taxes have not escaped this tendency and they have often been proclaimed as regressive. Research results from Sweden, Norway and Denmark, reviewed in the report, unveil more carefully the precise distributional effects and, in fact, come to more balanced conclusions. These studies take into account both the direct and indirect effects of taxes on equity, as these effects also occur as a result of changes in consumer prices.

The findings show that rural areas are disproportionately burdened by environmental taxes. Another main result is that while energy taxes tend to be distributionally regressive, taxes on transport fuels and pollution are, respectively, progressive and neutral. Lower income households tend to spend a larger share of their disposable income on heating, electricity and water than high-income households – while the opposite is the case for vehicle and transport consumption. To put it simply, richer people drive bigger cars, and for longer distances.

In Denmark, the regressivity of energy taxes is more or less similar to the regressivity of Value Added Taxes (VAT) when measured through the Gini-index. However, compared with alcohol and tobacco taxes, energy taxes are less regressive.

These findings are subject to any subsequent redistributive efforts. A Swedish analysis which incorporates mitigation efforts introduced to neutralise the distributional impacts shows that a change in the personal allowance (standard deduction) was sufficient to neutralise the regressive impacts.

Competitiveness

There are a number of ways to mitigate competitiveness concerns related to market-based instruments. The prevailing approach is to allow energy-intensive companies considerable exemptions or to grandfather permits, but some uneasiness surrounds this approach as it distorts incentives to control carbon in an efficient way, and it introduces different control costs in different sectors of the economy. Strong alternatives are hard to identify, but include a targeted recycling of tax revenue or border tax adjustments but which cannot be applied between EU Member States due to EU internal market rules. Nevertheless, this option may be employed in a worldwide context, i.e. with trading partners outside of the EU. Better even is to move from unilateral action to concerted efforts within regional settings.

Despite the concern expressed by many business enterprises, little is still known about the actual impact on competitiveness of the use of market-based instruments – even indicators for competitiveness are underdeveloped. While one conventional indicator for competitiveness is the trend in unit labour costs, the focus on carbon-energy efficiency would

lead one also to consider unit energy costs. There is little in the Nordic experience, to date, which suggests extensive leakage as a result of stringent environmental policies based on market-based instruments.

Concerns about competitiveness have resurfaced following the introduction of the EU's emission trading scheme. The allocation of permits free of charge, based on a differentiated burden-sharing scheme within the EU, has provided some sectors with considerable assets. Particularly the question of the impact in the electricity sector on electricity prices provides reasons for concern and for reconsidering the free of charge allocation of allowances in the next phase of the emission trading scheme. The Nordic countries have a high trade intensity with the outside world, but there are also sectors which are primarily home-market or EU-oriented, and for which the competitiveness impacts are likely to be rather limited.

Legal aspects of EU rules

Some recent decisions by the European Commission and the EU/EFTA Courts reviewed in the report have underlined that the Nordic countries do indeed operate within the legal framework established by the European Union which commits Nordic governments to follow certain fundamental principles of the European Treaty. These principles have, often in unanticipated ways, affected changes in tax bases and tax rates proposed, and sometimes implemented, by Nordic governments.

The main constraint stems from the State aid rules, which oblige Member States to seek Commission approval for any measure that may constitute State aid. As a functional approach applies, it is particularly exemptions and derogations that attract attention as potential forms of State aid. Although the motive of protecting competitiveness is legitimate, competitiveness should be safeguarded in a non-discriminatory matter. For instance, governments in several countries are considering removing the CO₂ tax for sectors covered by the emissions trading scheme, but the European Commission has, to date, not approved such moves. There are also obligations from the Taxation of Energy Products Directive, in particular to follow the minimum tax rates agreed.

Introduction

What are economic instruments and why use them in environmental policy?¹

Providing a comprehensive definition of economic instruments (EIs) is a difficult and complex task owing to the large and diverse set of policy measures they comprise. Generally, a distinction can be made between market-based instruments (MBIs) and non-market based instruments, also known as regulatory, command and control measures. The main focus of this report is directed at the former. However, the latter are also significant because, in practice, the effectiveness of EIs depends on achieving the right mix of the two, i.e. a policy package combining market-based and non market-based economic instruments.

The theoretical rationale for using EIs in environmental policy is to secure an optimal level of pollution and to achieve optimum rates of resource use and depletion. The key difference between the two types of intervention is that the former relies on market mechanisms as markets are seen as an efficient means to allocate scarce resources and the latter is reliant upon regulation. Furthermore, economic instruments and, in particular, environmental taxes are launched for different reasons; some are introduced to offer incentives by changing behaviour and others to raise revenue. Another motivation for their introduction is the argument that these instruments are cost-effective, encourage efficiency, create dynamic incentives and hence encourage innovation. In addition, the application of EIs is perceived as useful in addressing environmental challenges from diffuse pollution sources (e.g. cars, pesticides) (OECD, 2001 and EEA, 2005a).

The practical reason for implementing market-based economic instruments in environmental policy is to send out a signal that the use of a resource imposes costs on others, i.e. some form of external costs that are not covered in the price of the product or service. To overcome such environmental problems, economic instruments increase efficiency in resource use (thereby decreasing total demand and reducing environmental damage) and/or generate revenue. These two aims can at times be mutually exclusive. For example, a tax that is high enough to create an incentive for polluters to stop polluting would not generate much revenue where polluters would rather reduce pollution than pay the tax.

The main reasons for many environmental problems can be traced back to two fundamental causes: (i) policy failure and (ii) market failure.

¹ This section is based on Speck and Özdemiroğlu (2004).

- Policy failure arises from government policies that generate “perverse” incentives with regard to resource use and environmental pollution. In other words, these policies encourage over-exploitation of resources and the generation of excessive amounts of waste and other emissions. Policy failure shows itself in the form of environmentally damaging subsidies. These are those subsidies that are put in place to enhance the competitiveness of certain products, processes, economic sectors or regions and that, together with the prevailing taxation regime, (unintentionally) discriminate against sound environmental practices. For instance, such environmentally damaging subsidies can be found in water pricing regimes where water users are prevented from facing the full cost of water use.
To recommend and implement new economic instruments to reduce pollution, while such environmentally damaging subsidies are still in place, evidently cannot represent an efficient policy move. Identification and removal of such subsidies will not only bring about environmental benefits and lead to substantial budgetary savings, but will often cause the users of the natural resources to face higher bills. The removal of subsidies is, therefore, by no means easy – especially considering the political and distributional implications as well as the potential fear of the loss of competitiveness.
- Market failure, on the other hand, refers to the lack of actual markets for certain environmental goods or services and/or the failure of conventional markets to consider the environmental impacts of man-made goods and services or the exploitation of natural resources. In other words, prices in actual markets generally do not reflect the “true” or “full” cost of producing the goods and services, leading again to over-exploitation of natural resources and excessive amounts of waste and other pollution. The environmental impacts, therefore, are external to the market mechanism and are often referred to as “externalities”. The use of economic instruments, such as taxes, is an increasingly common approach to internalise these externalities in the price of the goods and services and is in accordance with the Polluter Pays Principle (PPP), one of the central tenets of environmental policy at EU as well as national level.

MBIs, in particular taxes and charges, have been introduced as one way to implement the Polluter pays principle (PPP), which has become widely accepted as the general framework for internalising environmental externalities. In 1972, the principle was adopted by the OECD Council as an economic principle for allocating the costs of pollution prevention and control (OECD, 1972). The primary concern of the Council in 1972 was to address the international economic and trade implications of environmental policies. The OECD recommendation provided guidelines that place restrictions on the role of government subsidies in order to ensure

that polluters pay the costs of protection measures made necessary by their activities. With regard to environmental protection measures, the Council (OECD, 1972, Annex, A.4) found that they "...should not be accompanied by subsidies that would create significant distortions in international trade and investment." Rather, by placing costs of pollution prevention on polluters, the PPP demands that the cost of protection activities be reflected in the market prices of goods and services.

The integration of environmental concerns into economic growth and development policies has emerged as a priority concern of modern environmental policies since the 1970s. During the 1970s and 1980s, environmental policies in industrialised countries were primarily based on a system of technical regulations. However, it became increasingly recognised that traditional regulatory environmental policy, despite some successes, failed to address new environmental pressures and prevent further unacceptable environmental damage. Moreover, these policies imposed potentially high costs to achieve environmental quality objectives. In recent years, economic instruments, as opposed to "command and control" regulations, have been recognised for their flexibility and cost-effectiveness in attaining environmental objectives (OECD, 2001 and EEA, 2000 and 2005a). Another reason for the widespread application of market-based economic policy instruments was their successful implementation (see, for example, the discussion in earlier reports of the Nordic Council on economic instruments; SEPA, 1997; DEPA, 1999 and Andersen et al., 2001).

Types of economic instruments

Market-based instruments (MBIs) comprise a rather broad group of policy instruments. Their common element is found in their reliance on market price mechanisms to internalise costs and provide financial incentives to economic actors to improve their environmental performance.

Due to their flexibility, these economic instruments (EIs) are traditionally discussed against regulatory or "command-and-control" instruments. While theoretical treatments often consider MBIs as alternatives or substitutes to regulatory instruments, the margin between the two is at times very narrow. Many of the most effective examples of achieving environmental policy targets illustrate that regulatory and economic instruments can be interrelated and complementary.

Moreover, several environmental pressures exist for which the application of MBIs alone is not an effective policy tool. For example, MBIs may not be appropriate in areas such as hazardous wastes, or concentrated "hot spot" pollution areas that pose a risk to public health. In such cases, the use of MBIs is limited and needs to be utilised in conjunction with other policy measures.

Evaluations of the different instruments applied in environmental policies show that MBIs are regularly introduced in parallel with other policy measures, so it is often difficult to isolate the impact of the instrument when reviewing environmental quality trends (Andersen et al., 2001 and Ecotec et al., 2001).

The most common economic instruments in use today fall into one of two categories:

- Instruments that use existing markets – these involve moving towards free market prices, on the one hand, (by removing or reducing subsidies and perverse incentives, i.e. policy failures) and moving beyond free market prices (by addressing market failure), on the other.
- Instruments that create new markets – these represent a relatively new approach to solving environmental problems. The instruments do not affect prices directly, but by means of designing an institutional and regulatory framework addressing current shortcomings and failures in environmental policy.

Market-based instruments – using existing markets

MBIs belonging to this group are generally more common today and the instruments presented in this section belong to this category.

Environmental taxes and charges can be used to reflect the additional costs to others (the external costs or externalities) that are created by the use of resources. Environmental taxes and charges can be based on emissions, inputs and outputs. As a result of the varying concepts of the role and purpose of these instruments in practice, however, a generally accepted definition of the term “environmental taxes and charges” does not exist in the current literature.

The current widely accepted definition by the European Commission, the European Statistical Office (Eurostat) and the OECD is based on the rationale that an environmental tax is defined through the *tax base*. According to this definition, an environmental tax is “a tax whose tax base is a physical unit (or a proxy of it) that has a proven specific negative impact on the environment” (OECD, 1997 and EC, 1997). This definition is, in itself, interesting as it does not take into account the *intent* and *motivation* of the tax, i.e. the reasoning behind introduction of these instruments is of no relevance.

Furthermore, a distinction is generally made between the terms tax and charge. Taxes are generally defined as compulsory, unrequited payments to general government. Taxes are unrequited in the sense that benefits provided by the government to taxpayers are not normally in proportion to the associated payments. Charges or fees are defined as compulsory requited payments to either general government or to bodies outside general government, such as for instance an environmental fund

or a water management board (see for a more detailed discussion OECD, 2001 and EEA, 2005a)².

This distinction is important for the analysis in the Baltic countries. While taxes may be earmarked for certain purposes — and are in some OECD countries — the term charge has generally been applied in Central and Eastern European countries when their explicit role is for raising revenues for environmental funds.

As environmental concerns received greater attention, environmental taxes were recognised by public policy-makers for their potential to simultaneously address environmental concerns, finance public services, raise public revenues and potentially replace other taxes. Today, a commonly used classification of taxes and charges distinguishes between three types, based on their function in public/environmental policy.

- The first type is revenue-raising taxes, which may influence behaviour, but still yield substantial revenues over and above that required for related environmental services or regulation.
- The second type is incentive taxes, which are levied with the objective of changing environmentally damaging behaviour without the intention to raise revenues. Indeed, the success of such a tax may be judged by the extent to which initial revenues from it fall as behaviour changes.
- The third type is cost-covering charges or user charges/fees or tariffs, whereby those making use of the environment contribute to, or cover, the cost. This type of MBI recognises that many individuals, as well as economic sectors, receive important benefits from the use of the environment, but may pay very little or nothing for this right, often leading to poor levels of service or over-use of the resource. The introduction of user charges is one way to capture part of these benefits, improve levels of management and service and share the benefits from the exploitation of natural resources. For example, user charges are imposed to finance public provision of water and sanitation services. The level of a cost-covering charge is determined by the service it is intended to deliver and revenues are primarily used to finance collective services, e.g. water supply, wastewater and waste collection.

These three types of environmental taxes are not mutually exclusive – a cost-covering charge may have incentive effects, for example to encourage the rational use of water; an incentive tax may raise revenues; and a revenue-raising tax may be partially used to finance related environmental purposes. In particular, cost-recovery user charges must reflect pure market prices for a good or service and, at the same time, play an

² Although this differentiation between the terms “tax” and “charge” looks precise, the actual definition of the terms is rather country-specific, as discussed in Nordic Council, 1999. The authors tried to follow the international definition as far as possible and we are aware that this can lead to some problems and misunderstandings.

important role both as a financing tool for public services, i.e. covering the full-costs of delivering the service, and as an incentive instrument that reduces environmental pressure. In practice, the design of overall tax regimes and the environmental concerns being addressed tend to influence which of these functions is primarily being served. Moreover, the type of instruments selected may also determine their impact on broader public policy.

Subsidy removal or reduction is a classic and well-known example of policy reform – reduction in, or elimination of, subsidies normally results in reduced environmental impact (from reduced use of the previously subsidised resources or services) and monetary savings to the governments. Subsidy removal, however, represents only a first step and is always hotly debated. It should, furthermore, be stated that not all subsidies are provided in the form of payments; they can also be in the form of goods and services, such as roads and other infrastructures, which are provided free of charge.

Markets are also useful in the establishment of performance bonds and deposit-refund systems (DRS). Performance bonds can be used in the field of environmental pollution policy. In general, performance bonds are payments to authorities which take place prior to an activity that is potentially environmentally harmful. These bonds are refunded if environmental regulations are met, and forfeited if they are not. These are used less frequently than other economic instruments due to difficulties in monitoring environmental damage and legal restrictions in setting up contracts, and have been applied mainly where there is a clear potential for environmental damage, such as surface mining.

Deposit-refund schemes require a deposit to be paid upon the purchase of potentially polluting products. This deposit is refunded if the product or its residues are returned for disposal and *re-use or recycling*, thereby avoiding pollution. This is a type of economic instrument which is designed to encourage re-use or recycling, and/or to cover the costs of environmentally sound waste disposal. These systems provide incentives to prevent pollution, and reward good behaviour. Deposit-refund systems are often applied to widely used products such as beverage containers, and have sometimes been applied to end-of-life vehicles. They can be considered a valuable tool for environmental management, although in general they are not powerful enough for major environmental problems, because of their often voluntary character and the low value of the deposits. The use of deposit-refund systems on bottles, cans, etc., however, has proved very effective in reducing the amount of material disposed of into the general waste stream. This type of system has been extended beyond bottles and cans to include disposable batteries, lubricating oils, electronic equipment, white goods (refrigerators, stoves, washing machines) and vehicles. Companies and consumers are encouraged to take a life

cycle approach to product management. Designed appropriately, deposit-refund systems can provide an accurate reflection of environmental costs.

Economic instruments – creating new markets

The second group of economic instruments, i.e. those that create new markets, involves defining property rights, privatising and decentralising, establishing tradable permits and rights, and creating international offsets.

The establishment of property rights as well as privatisation and decentralisation can play an important role in moving many aspects of environmental management out of the state sector, which is often starved for capital. Environmental management is relocated into more commercial operations where there is strong incentive both to generate revenue and to make investments that will increase revenue in the future. Water and sanitation works are typical examples of these.

Tradable permits and rights involve the explicit creation of a market in environmental resources, encouraging efficient resource use and fostering the recognition that these resources are scarce and valuable. For the tradable permits to function well, first, the permit must actually create a property right. Second, the question of the initial allocation of permits must be handled equitably. Finally, there must be no artificial obstructions in relation to trading permits. One of the earliest examples of introducing this type of EI in Europe was in Iceland in 1984, when individual tradable quotas were implemented (see Sections 1.6 and 5.5).

International offset systems extend the notion of a market for environmental resources across country boundaries, permitting firms and institutions to meet environmental objectives by purchasing abatement wherever on the globe it may be cheapest. Carbon offsets and joint implementation projects are examples of this type of instrument. “Debt-for-nature”, or “environment swaps”, can also be characterised as a form of international offset system. The concept behind this approach is to reduce the debt burden of a country by making an agreement between the indebted country and the creditor countries. This deal grants the possibility of writing off some of the debt, on condition that the released funds are used to achieve predetermined environmental goals.

In addition to the MBIs described here, voluntary approaches have increasingly been used. There are many different types of voluntary approaches, with an equally wide range of terminology used to describe them. However, they can be usefully classified into the following three broad categories (see, for a detailed discussion of this type of economic instruments: Ten Brink, 2002):

- Unilateral commitments – where individual firms, or groups of firms, set up environmental improvement programmes without any external involvement and communicate these to their stakeholders

- Public voluntary schemes – where public bodies develop general schemes that define minimum standards of performance and individual firms decide whether to join (eco-labelling is an example of this type of economic instrument)
- Voluntary or negotiated agreements – where government interacts with firms (either individually or collectively) to agree a performance target (or targets) and to define the commitments and/or obligations of both sides.

To date, the experience with MBIs belonging to this second group has been growing in the Nordic and Baltic countries, in particular with regard to the recent implementation of the EU emission trading scheme. However, environmental taxes and charges remain the most widespread economic instruments in environmental policy used in the Nordic and Baltic countries.

The historical and current development of economic instruments

In earlier decades, environmental policy was primarily based on regulatory, command and control measures with only around 150 economic instruments in use in OECD member countries in 1987 (OECD, 1989). However, this has changed during the last twenty or so years as many European countries, in particular the Nordic countries, have implemented a wide range of economic instruments (see, for example, the five reports published by the Nordic Council of Ministers presenting the development of economic instruments in Nordic countries). It is interesting to note that during this period perceptions relating to the use of economic instruments have changed over time: in the past, environmental taxes have regularly been seen as substitutes for command and control policy measures, whereas they are currently observed more as tools which complement command and control instruments. This new development is reflected in the widely accepted viewpoint that environmental objectives may be achieved most effectively within a policy package of regulations and economic instruments (EEA, 2005a). Recent experience confirms that policy packages consisting of a mix of different instruments – including environmental taxes, emission trading schemes and command and control measures – are being implemented more often in environmental policy, in particular in the field of waste.

However, this policy development is associated with the transference of power within governments, namely between the ministries of the environment and the ministries of finance/taxation. The ministries of the environment, or environmental authorities, have the responsibility for establishing regulatory policy measures rather than environmental taxes, which

come under the jurisdiction of the ministries of finance/taxation. This change in responsibilities may lead to some conflict as it can be expected that the primary political goal of the ministries of finance is to raise revenue, and not necessarily to achieve environmental objectives (which should be assumed is the political goal that the ministries of the environment are eager to accomplish). Furthermore, the setting of standards as part of a regulatory process can regularly be carried out by the relevant environmental authorities publishing decrees. This is in sharp contrast to policies associated with the development of economic instruments, such as environmental taxes, which require approval from national parliaments.

The current political climate is rather opposed to the implementation of new economic instruments or to an increase in the rates of already existing environmental taxes. Reasons are manifold, although the main cause for this situation is the energy price development, in particular the dramatic increase in the raw oil price on the world market during 2005 (see also Section 10.4). Some parts of the population are, in fact, requesting a reduction in energy taxes, in particular those levied on transportation fuels. This development may also be assigned to the fact that public acceptance of environmental taxation has changed over the years.

While environmental taxes were implemented during the 1990s, there was a significant degree of public support for the environmental motives for their introduction. This rather positive attitude towards environmental taxation changed as the mistrust of environmental politics developed, with environmental policy often being seen as a means of raising revenues for the national coffer rather than a means to achieve environmental objectives (see also Klok et al. (forthcoming)).

Another reason for the reduced interest in the further application of MBIs by political decision-makers is concern for the competitiveness of European industry compared with its counterpart in countries with looser environmental regulations and lower or no environmental/energy tax burden (see Section 10.6 for a detailed discussion). This situation is rather peculiar as the call for the extensive use of EIs is still on the political agenda and is supported by international organisations, such as the EEA and the OECD.

However, the suitable design of economic instruments is of fundamental significance so that the advantages in terms of static and dynamic efficiency, which are associated with their use unlike regulatory measures, can be realised. Currently, discussions are emerging in the context of over-regulation as different economic instruments are being used simultaneously, addressing the same environmental problem. The most prominent examples are the overlap between the emission trading scheme and energy/CO₂ taxes levied on the energy consumption of industries, as well as the various support schemes for renewables and the levying of taxes on these energy products (see Section 10.4 for a detailed discussion).

Part I
The Use of Economic
Instruments in Environmental
Policy in the Nordic and Baltic
Countries

1. Main developments in EU environmental policy legislation and implications for environmental policy instruments in the Nordic and Baltic countries

1.1 Introduction

In recent years, EU environmental policy has been influenced by the discussion on competitiveness issues, in particular in the context of the Lisbon strategy (2000), which has established the objective for the EU for the year 2010 "... to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion".

For a considerable period policy makers in the Nordic countries have been considering how environmental policies by promoting resource efficiency as well as product and process innovations may contribute to enhance competitiveness. The increased orientation towards the use of flexible, market-oriented policy instruments, that allow citizens and companies leeway and discretion in their choices as to how they can meet environmental targets, needs to be seen also in this perspective. The focus on the economics of environmental policies has promoted the adoption of more incentive-based approaches and the Nordic countries have been pioneers in the use of market-based instruments, not only with regard to environmental taxes but also in emissions trading. Nordic initiatives and experiments have frequently inspired similar approaches in the EU, still policy measures agreed in Brussels play a more and more important role in Europe, including for the Nordic region. CO₂ emissions trading, which was pioneered at the national level in Denmark, has become a joint instrument at the EU level following adoption of the EU Emission Trading Directive (2003/87/EC), which entered into force on 25 October, 2003. We introduce this report with an overview of recent EU legislation that sets the framework for policies and instrument choice in the Nordic-Baltic region.

Although the European framework is important it does not preclude unilateral policies, and in the past five years we have seen various national endeavours to promote the use of economic instruments in environmental policy. A number of innovative economic instruments have

been introduced in the individual Nordic countries. Tax schemes have been extended to include greenhouse gases other than CO₂ in Norway and Denmark. There is also a tendency to refine existing environmental taxes to reflect better and more accurately the emissions or environmental damages involved so as to improve cost-effectiveness. Large scale environmental tax reforms whereby income taxes are exchanged with taxes on energy, transport and pollution are currently phased in both in Sweden and Estonia

It is important to stress that not all Nordic countries are members of the EU, but that through the European Economic Area (EEA) there is a great deal of coordination. In fact, under the rules of the agreement, the countries of the European Free Trade Area (EFTA) – including Norway and Iceland – participate in the European Union's single market and in associated fields. The agreement further stipulates that EFTA countries, such as Norway, have to incorporate EU legislation, including regulations and directives in the field of environment and energy policy, into national policies.

The EU was extended on 1 May, 2004 to include the 10 new EU member countries including the three Baltic states. Hence all the Nordic and the Baltic countries are faced with similar issues with regard to transposing EU environmental legislation into national policies. The challenges are somewhat higher in the Baltic countries than in the Nordic countries, as the time-frame for transposing EU legislation has been rather short. Nevertheless, it is appropriate to consider the European framework for the use of economic instruments in Nordic-Baltic environmental policies.

1.2 Economic instruments linked to energy and air emissions

1.2.1 The European Union Emission Trading Scheme

The European Union decided to implement the European Union Emission Trading Scheme for greenhouse gases (ETS) which started on a pilot basis on 1 January, 2005 (Directive 2003/87/EC: "Directive on establishing a scheme for greenhouse gas emission allowance trading within the Community"). Emission trading is a relatively new economic instrument implemented in EU Member States, but is included in the Kyoto Protocol to the United Nations Framework Convention on Climate Change as a "flexible mechanism", together with the Clean Development Mechanism (CDM) and Joint Implementation (JI). The ETS is one of the key policy instruments of the EU strategy to comply with the greenhouse gas reduction targets established under the Kyoto Protocol.

The ETS is the first transnational greenhouse gas emission trading scheme in the world and, in addition to the 25 EU Member States, the EEA countries are also participating in this scheme. It is worthwhile mentioning that the emission trading does not require unanimity in the European Council. Instead, it can be approved by a qualified majority of EU Member States. This is significant, as decisions concerning the implementation of energy/CO₂ taxes require unanimous voting by all EU Member States. A key obstacle has, therefore, been avoided; one which led to rejection of the early proposal for introducing an EU-wide CO₂ taxation scheme in 1992 (COM(1992)226), as well as the 1997 proposal (COM(1997)30).

The ETS is divided into two phases – during the first period, from 2005 until 2007, the trade is restricted to CO₂ emissions from large combustion installations (such as energy production), refineries, the pulp and paper industry, as well as process emissions from the production of iron, steel and cement – although certain energy-intensive sectors, such as the chemical sector and the production of aluminium, are excluded. The second phase covers the years 2008 to 2012, i.e. the first commitment period in the Kyoto Protocol. This represents an international commitment to reduce emissions of greenhouse gases (GHGs) as compared to the first period of the EU ETS where no such international reduction commitment existed. It can, furthermore, be expected that the coverage of economic sectors will be extended and other GHGs besides CO₂ will be traded.

The EU trading scheme is a mandatory “cap and trade” scheme, as compared to the “baseline and credit” alternative. The characteristics of the former scheme are that absolute emission quotas are issued to each installation and permits are given to the installations covered under the ETS, allowing them to emit greenhouse gases as well as obliging them to monitor and report emissions. Emission allowances, which are part of the permit scheme, grant an upper limit (cap) on the annual allowed emissions. Each installation has to surrender allowances equivalent to the CO₂ emission actually emitted. In the case that an installation keeps below the allocated emission allowances, it can sell the surplus allowances on the market. Where the installation exceeds the cap, then it must buy allowances on the market, offsetting the deficit³. In 2004, the so-called “Linking Directive” (Directive 2004/202/EC) was adopted, providing legal background ensuring that emission reductions accomplished under the Clean Development Mechanism (CDM) and Joint Implementation (JI) schemes are in compliance with the ETS. This means that market participants of the EU emission trading scheme can purchase CDM credits, which then can be offset against their emission reduction obligations under the ETS.

Although this economic instrument has been applied in the US for many years, European countries have not gained much experience in this

³ See for a more detailed discussion on emission trading schemes: EEA, 2005a.

field, to date. Emission trading must be described as a flexible instrument, displaying features similar to those of environmental taxes. The underlying rationale of the scheme is that a price is placed on emissions, as all participating market players can sell and buy emission allowances.

The ETS Directive set out the rules and regulations governing the way in which EU Member States allocate the allowances to the installations covered under the Directive. Furthermore, Member States are requested to allocate at least 95 percent of allowances free of charge during the first period (based on historic data (“grandfathering”) and on projected emissions) and at least 90 percent of the allowances during the five year period, 2008–2012. As seen in Table 1.1 below, the majority of Nordic and Baltic countries grandfathered all allowances and only Denmark and Lithuania opted for “auctioning” at least a small share of allowances.

Table 1.1 Overview of country-specific features of ETS

	DK	EST	FIN	ICL	LT	LV	NO	SW
Number of installations covered	357	43	535		96	93	51	499
Business as usual 2005–2007 (mill tonne CO ₂)	39.3		46.8 ¹					26.6
Allowance allocation (mill tonne CO ₂)	33.5	18.9	45.5		13.7 for 2005–2007; 4.6 per year	34.4 for 2005–2007; 13.8 05 10.3 in 06 and 07	6.8	22.9
Percentage reduction	15%		3%				5%	14%
Kyoto target	-21%	-8%	0%	+10%	-8%	-8%	+1%	+4%
Percentage of emission allowances auctioned	5%	all free of charge	all free of charge			1.5%	all free of charge	all free of charge
Percentage of CO ₂ emission covered by ETS sectors	45% in 2002		59% in 2002		38%	45%	10%	29% in 2002

Although the Norwegian ETS is associated with the EU ETS, some interesting features of this trading scheme are of note. First of all, the scheme only covers 10 percent of Norwegian CO₂ emissions as compared to an average of around 45 percent in EU Member States as a whole. Only industries which are not subject to CO₂ taxation, but which fulfil the criteria of the EU ETS, currently take part in the scheme. One of the arguments for restricting participation to these industries is the potential risk of losing competitiveness. This argument is of significance in that certain industrial sectors in the other Nordic countries are not only affected by the ETS, but by national energy/CO₂ taxation schemes as well. However, discussions are underway to aim to revise energy/CO₂ taxation taking into account the competitiveness argument.

1.2.2 The Danish Emission Trading Scheme

Denmark implemented a national CO₂ quota system for the period 2000–2003 as part of the 1999 Electricity Reform. This scheme was a forerunner to the EU ETS, but on a very small scale. The aim of the scheme was to reduce CO₂ emissions from the electricity generation sector by 1 million tonnes annually over the four year period. All electricity generators with emissions exceeding 100,000 tonnes CO₂ were included in the scheme and the allowances were allocated to them based on the producers' emissions during the period 1994–1998. It was planned that producers would face a financial burden of 40 DKK (5.4 EUR) per tonne CO₂ in cases when the allocated quotas were exceeded.

1.2.3 Major development of EU legislation concerning energy taxation

A major milestone in the field of energy taxation was the adoption of the “Taxation of Energy Products Directive” (Directive 2003/96: Directive on restructuring the Community framework for the taxation of energy products and electricity) in 2003. The adoption of this directive must be seen as the final stage of the attempt to establish an energy/CO₂ tax scheme at EU level.

The potential for using energy/CO₂ taxes to reduce greenhouse gas emissions was first addressed in 1992 when the Commission proposed the introduction of an energy/CO₂ scheme (COM(1992)226). The aim of the proposal was to stabilise the EU's CO₂ emissions and was a response to the United Nations Framework Convention on Climate Change. The proposal was rejected by EU Member States and was finally withdrawn by the Commission in 2001. The next attempt on the part of the Commission, in reply to the lack of progress in the field of energy taxation, was the 1997 proposal (COM(1997)30), which – after revisions and amendments – led finally to the adoption of the 2003 Taxation of Energy Products Directive.

The 2003 Directive outlines the fiscal framework and structures for the taxation of energy products and it also determines the minimum levels of taxes to be imposed on energy products and electricity. It came into effect in January 2004 and the two directives from 1992, namely Directive 92/81/EEC (Directive on the harmonisation of the structures of excise duties on mineral oils) and Directive 92/82/EEC (Directive on the approximation of the rates of excise duties on mineral oils), were repealed. In 2004, the European Council adopted a further Directive (Directive 2004/74/EC) in the context of the Taxation of Energy Products Directive providing transitional arrangement for the new EU Member States (see the individual country chapters – Estonia (Chapter 3), Latvia (Chapter 6) and Lithuania (Chapter 7) – for a more detailed discussion on the transitional arrangements applicable to the three Baltic countries). New EU Member States have now the opportunity to apply for temporary ex-

emptions and reductions in the levels of taxes imposed on energy products. The Baltic countries made use of this opportunity as illustrated in the country chapters below. The Taxation of Energy Products Directive is in line with the Community commitment of integrating environmental concerns into other policy areas, in this case energy policy. The directive is certainly not solely an environmental measure, but one which should also contribute to improvements in the functioning of the Internal Market. This latter point is likely to be achieved by reducing the existing distortions in competition between Member States caused by differences in the taxes levied on energy products in each country. Furthermore, the directive should play a role in creating a more balanced playing field for mineral oils in relation to other energy products (used as substitutes for mineral oil products) that were not previously subject to any EU tax harmonisation rules and, therefore, frequently not taxed at all.

The version of the directive finally adopted is considerably weaker than the 1997 proposal, but at least it extended the scope of the energy taxation framework beyond only mineral oil products, the focus of the pre-existing EU framework. The new directive established minimum excise taxes also for other energy products, such as coal, coke and natural gas, as well as for electricity. The minimum tax levels under the 2003 directive are less stringent than the ones proposed in 1997, with the consequence that a significant number of the longer-established EU Member States, in particular the Nordic countries, are not required to increase the current national energy tax level, whereas the new Member States do have to increase energy taxes (see, for a more detailed discussion: EEA, 2005a: Chapter 3). The directive has had quite some implications for electricity taxation, in particular in Sweden and Norway, as industrial sectors have previously been exempt from electricity tax. In addition, some Member States, both new and old, are required to introduce new energy taxes – taxes on coal, coke, natural gas and electricity had not been applied in all European countries before 2004.

Some special tax provisions granted to industry as well as to households are an integral part of the new directive. The main regulations affect the commercial use of energy products allowing, for example, energy intensive companies to apply for a zero energy tax rate. However, this possibility is attached to the condition that the companies are participating in either a voluntary agreement scheme or a tradable permit scheme.

1.2.4 The energy and air pollution taxation framework in Nordic and Baltic countries

Energy taxation schemes implemented in the Nordic countries are relatively similar, with the exception of the Icelandic scheme which is not as complex and extensive as in the other four Nordic countries. The situation in the Baltic countries concerning energy taxation is similar to the

Icelandic case. However, the three Baltic countries have implemented a far-reaching air pollution charging scheme, differing clearly from the situation in the Nordic countries. During the last five years, no major changes or developments in terms of energy taxation have occurred in the Nordic countries, in comparison with the developments made in the 1990s.

Energy/basic taxes are, in general, most significant, given that the share of these taxes in the total tax burden on different energy products is still the highest. However, as Tables 1.2 to 1.7 illustrate, this is not the case in Sweden, where the CO₂/energy component is regularly higher. Taxes levied on energy products – either basic energy or CO₂/energy taxes – are by far the biggest revenue generators and, thereby, fulfil the purpose of their introduction – i.e. fiscal purposes (see also the discussion in Nordic Council, 2002).

The developments concerning energy taxation during the last five years have been as follows:

- the reduction of the Danish CO₂ tax rates from 100 DKK per tonne CO₂ (13.5 EUR) to 90 DKK per tonne CO₂ (12.2 EUR) in 2005. At the same time, the CO₂ tax scheme has been extended by imposing a CO₂ tax on petrol. These changes in the taxation framework have not affected the overall size of taxes levied on the different energy products, i.e. the nominal energy tax rates have not been revised since 2001 with the consequence that the real value of energy taxes has been reduced during this period. No changes occurred with regard to sulphur taxation.
- the Finnish government raised energy taxes in 2002, but subsequently all taxes on the different energy products have been frozen. The current CO₂ tax rate is 18.1 EUR per tonne CO₂.
- the Icelandic energy taxation framework is still lagging behind the situation found in the other Nordic countries. This is partly based on the special energy supply conditions prevailing in Iceland. Renewable energy sources, such as hydropower and geothermal energy, dominate the energy supply to households and industry. Comparable excise taxes are only levied on petrol. Diesel used for transport purposes is, itself, not subject to an excise tax. However, diesel-powered vehicles are subject to a special transport-related tax scheme, based either on the weight of the vehicle or on a mixture of weight and distance travelled. However, the taxation framework is being revised during 2005 and an *ad quantum* excise tax on diesel is replacing the special tax scheme (see Section 1.7 and Chapter 5 for a more detailed analysis).
- a number of changes in the energy/CO₂ taxation framework took place in Norway. First of all, all energy related taxes have been increased annually according to the inflation rate, leaving the real value of energy taxes constant. Secondly the energy/CO₂ taxation framework underwent some significant changes. The SO₂ tax imposed on the

consumption of coal and coke, as well as the SO₂ tax levied on refineries, was removed in 2002 and replaced by a voluntary agreement to cut SO₂ emissions further. In addition, this led to the situation that the use of coal and coke is no longer subject to any taxation in Norway, as the CO₂ tax on coal and coke was abolished from 1 January, 2003. However, the CO₂ tax is still levied on the use of petrol, auto diesel and mineral oils (except in the fishery sector), and on CO₂ emissions from offshore petroleum activities. The onshore consumption of natural gas is still exempt from any energy taxation. The Norwegian manufacturing and mining industry kept their tax-free status with regard to electricity taxation until 2004. The adoption of the 2003 Taxation of Energy Products Directive at EU level and its transposition into Norwegian legislation affected these industries – the tax exemption ceased and an electricity tax for industry was implemented. The CO₂ tax rate differs according to energy product and amounts to 171 NOK per tonne CO₂ (21.6 EUR) for heavy fuel oil, 198 NOK per tonne CO₂ (25.1 EUR) for light oil and to 337 NOK per tonne CO₂ (42.7) on petrol. It is reported that the CO₂ tax applies to 64 percent of all CO₂ emissions making the CO₂ tax the most important policy measure in the context of climate change.

- the Swedish CO₂ tax rates have increased dramatically, amounting, since 2000, to an almost 150 percent increase, rising to a level of around 915 SEK per tonne CO₂ (100 EUR). However, these increases have been partially offset by a simultaneous decrease in the basic energy tax rates during the same period. Nevertheless, an overall increase in the nominal tax rates must be reported for all energy products. The largest increases affected coal and natural gas, where the nominal tax rates more than doubled since 2000. The lowest increases occurred in transport fuels (petrol and diesel), where the increases total between 10 percent (petrol) and 25 percent (diesel). Interesting to note is the fact that – although the nominal tax rates have increased significantly – the effective taxes paid by industry, agriculture, forestry and fishery have only increased by around 3 percent between 2000 and 2005, meaning that there has effectively been a reduction in the tax burden in real terms. Since 1 July 2004, the Swedish manufacturing industry has been faced with an electricity tax as a consequence of the adoption of the “2003 Taxation of Energy Products Directive”. This economic sector had previously been granted a complete tax exemption of the electricity tax since 1993, when a major revision of the energy taxation framework took place in Sweden (see, for a discussion: Nordic Council, 1994, 1996 and 1999). However, the Swedish government published a bill in 2004 providing energy intensive companies the possibility of obtaining a full tax exemption if they participate in a voluntary agreement aiming to improve their energy efficiency. Such a policy is consistent with the

rules of the 2003 Energy Tax Directive, as briefly discussed above. The sulphur tax and the NO_x taxation scheme, which were both introduced at the same time in 1991, have not been revised recently, i.e. all guidelines which energy products and sectors paying the taxes are subject to remain unchanged, as do the tax rates.

The energy taxation schemes implemented in the three Baltic countries are based on excise / energy taxation as their main component. In addition, all three countries introduced rather extensive and complex systems of air pollution charges levied on a range of different air pollutants, including CO₂, SO₂ and NO_x emissions. However, the underlying principle of these air emission systems differs from the Nordic air pollution taxes and is discussed in Section 1.3.7 below.

The new Taxation of Energy Products Directive has some severe impacts on the energy taxation framework in the Baltic countries. On the one hand, already existing energy taxes levied on mineral oil products have to be increased during the coming years and, on the other hand, new energy taxes have to be introduced, in particular for energy products, such as coal, natural gas and electricity, as the Tables 1.2 to 1.7 below clearly illustrate.

The following tables present the actual situation concerning the total tax burden levied on the major energy products in the Nordic and Baltic countries.

Table 1.2 Taxes on unleaded petrol in Nordic and Baltic countries in 2005
(unit: EUR/1000 l)

	Basic/energy	CO ₂ /energy	Total
Denmark ¹⁾	518	30	548
Estonia	288		288
Finland ²⁾	539	42	581
Iceland	130	355	485
Latvia	274		274
Lithuania	287		287
Norway ³⁾	493	95	588
Sweden ⁴⁾	319	236	555
EU minimum level			359

¹⁾ a rebate of 4 EUR per 1000 l is applicable for petrol stations with vapour recovery

²⁾ tax rate is given for reformulated ("greener") unleaded petrol and the strategic stockpile fee of 7 EUR per 1000 l is not included

³⁾ since 2005 Norway differentiates the tax rates based on the sulphur content; rate is given for sulphur free and the rate for low sulphur is 5 EUR per 1000 l higher

⁴⁾ tax rate is given for unleaded petrol – class 2

Table 1.2 presents the current energy tax rates levied on unleaded petrol. The tax rates in Estonia, Latvia and Lithuania are below the EU minimum level in 2005. The Icelandic situation is of note, because the special excise tax is in excess of the general excise tax. The tax rates in the other four Nordic countries are rather similar to each other, but exceed the EU minimum tax level by more than 50 percent.

Table 1.3 Taxes on diesel (propellant) in Nordic and Baltic countries in 2005
(unit: EUR/1000l)

	Basic/energy	CO ₂ /energy	Total
Denmark	375	13	388
Estonia	245		245
Finland ¹⁾	295	48	343
Iceland			-
Latvia	234		234
Lithuania	245		245
Norway ²⁾	363	64	427
Sweden ³⁾	142	290	432
EU minimum level			302 (valid from January 2004) 330 (valid from January 2010)

¹⁾ rate is given for diesel – environmental class 2; a rebate of around 27 EUR per 1000 l is applicable for diesel with a lower sulphur content is; the strategic stockpile fee of 4 EUR per 1000l

²⁾ since 2000 Norway differentiates the tax rates based on the sulphur content; rate is given for low sulphur diesel and high sulphur diesel. Since 2005 rate is given for low sulphur diesel; the rate for sulphur free diesel is around 6 EUR per 1000 l

lower

³⁾ tax rate is applicable for diesel – class 2

Tax rates levied on gas oil used for transport purposes (i.e. diesel) in the Nordic countries, with the exception of Iceland, are in excess of the EU minimum tax rates, compared with the situation in the Baltic countries where all the taxes are lower. The situation in Sweden is interesting because the energy/CO₂ tax component exceeds the basic excise tax in 2005, which was not the case in 2001 (Nordic Council, 2002). The highest diesel taxes are currently in Sweden, closely followed by Norway.

Table 1.4 Taxes on light fuel oil (heating purposes – households)
in Nordic and Baltic countries in 2005 (unit: EUR/1000l)

	Basic/energy	CO ₂ /energy	Total
Denmark ¹⁾	250	32	282
Estonia	44		44
Finland ²⁾	19	48	67
Iceland			-
Latvia	20		20
Lithuania	21		21
Norway ³⁾	51	64	115
Sweden ⁴⁾	82	290	372
EU minimum level			21

¹⁾ additionally, a SO₂ tax applies: the rate is 2.7 EUR per kg sulphur in case that the sulphur content of the fuel oil exceeds 0.05 percent or 1.4 EUR per kg SO₂ emitted

²⁾ a strategic stockpile fee and an oil pollution fee is not included in the above figures; these taxes amount to 3.9 EUR per 1000 l

³⁾ the SO₂ tax has not been considered and is set at a rate of 8.8 EUR per 1000 l for each 0.25 percent sulphur content in the fuel

⁴⁾ the SO₂ tax of 3.3 EUR per kg sulphur applies; the tax applies for each tenth of a percentage point by weight of sulphur

Table 1.4 shows considerable differences between the situation in the Nordic countries as compared to the Baltic countries. However, the tax rates in the Baltic countries are, by and large, in accordance with the EU minimum levels. Tax rates also display some rather large variations be-

tween the Nordic countries, which was not the case with regard to the tax rates levied on transport fuels. The Swedish tax rate is more than five-fold higher than the rate applicable in Finland, and it also exceeds the EU minimum level by seventeen-fold. Only in Denmark, does the basic excise tax exceed the CO₂/energy component.

Table 1.5 Taxes on coal in Nordic and Baltic countries in 2005 (unit: EUR/tonne)

	Basic/energy	CO ₂ /energy	Total
Denmark ¹⁾	195	30	225
Estonia	0.3 EUR/GJ		0.3 EUR/GJ
Finland ²⁾		43.5	43.5
Iceland			-
Latvia			-
Lithuania			-
Norway			-
Sweden ³⁾	34.8	252.5	287.3
EU minimum level			0.15 EUR/GJ (business use) 0.3 EUR/GJ (non-business use)

¹⁾ additionally, a SO₂ tax applies: the rate is 2.7 EUR per kg sulphur in case that the sulphur content of coal exceeds 0.05 per cent or 1.4 EUR per kg SO₂ emitted

²⁾ the strategic stockpile fee of 1.2 EUR per tonne of coal is excluded

³⁾ the SO₂ tax of 3.3 EUR per kg sulphur applies; the tax applies for each tenth of a percentage point by weight of sulphur

The tax rates in Table 1.5 provide a somewhat distorted picture, because the majority of coal consumed is tax exempt, as it is used either as a reducing agent or as a raw material in industrial processes. Therefore, only a small proportion of coal used in the countries is levied with the tax rate shown above. Estonia is the first of the three Baltic countries to introduce a tax on coal as required under the Taxation of Energy Products Directive. The tax came into force on 1 July, 2005. As mentioned above, Norway ceased to tax coal in 2003.

Although most of the Nordic countries levy a tax on natural gas, some differences in the taxation framework can be found. Finland taxes natural gas with a reduced CO₂ tax rate under the premise of making natural gas more competitive compared with other energy products. In addition, the tax on peat is not based on carbon content in Finland. Norway still exempts natural gas consumption, on the mainland, from all taxes. The wide range of tax rates is again observable in the table above, as well as the fact that natural gas is not subject to any energy taxation in the Baltic countries.

Table 1.6 Taxes on natural gas in Nordic and Baltic countries in 2005
(unit: EUR/1000m³)

	Basic/energy	CO ₂ /energy	Total
Denmark	274.2	26.9	301.1
Estonia			-
Finland ¹⁾		18	18
Iceland			
Latvia ²⁾			-
Lithuania			-
Norway ³⁾		95.3	95.3
Sweden ⁴⁾	26.5	217.4	243.9
EU minimum level			0.15 EUR/GJ (business use) 0.3 EUR/GJ (non-business use)

¹⁾ the strategic stockpile fee of 1 EUR per 1000 m³ is applicable

²⁾ Latvia and Lithuania do not tax the consumption of natural gas, but the extraction of natural gas is subject to a natural resource taxes in both countries. Estonia also makes use of natural resource taxation, but has not introduced a resource tax on natural gas. However, Estonia levies a resource tax on the extraction of oil shale.

³⁾ tax rate only applies for the petroleum sector on the continental shelf – otherwise natural gas consumption is tax exempt

⁴⁾ the sulphur tax also applies to natural gas

Electricity taxes are levied in all Nordic countries, with the exception of Iceland. Also, the Baltic countries have not implemented any taxes on electricity to date, although electricity generation in Lithuania was subject to a production tax up to the year 2002.

Table 1.7 Taxes on electricity in Nordic and Baltic countries in 2005 (unit: EUR/MWh)

	Basic/energy	CO ₂ /energy	Total
Denmark			
Heating purposes	68.7	12.1	80.8
Other purposes	77.4	12.1	89.5
Industry	1.3	7.3	8.6
Estonia			-
Finland			
Household	7.4	0	7.4
Industry	4.5	0	4.5
Iceland			-
Latvia			-
Lithuania			-
Norway			
Households	12.1	0	12.1
Industry	0.6	0	0.6
Sweden			
Households	28.3	0	28.3
Rate applicable in the northern part of Sweden	21.6	0	21.6
Industry	0.6	0	0.6
EU minimum level			0.5 (business) 1 (non-business)

The various electricity tax rates between the Nordic countries, as well as between different consumer groups within the same country, differ

greatly. Differences also exist in electricity generation as, for example, electricity production in Norway is primarily based on hydrogen power and, as such, is not CO₂ intensive. Therefore, Norway has not introduced a CO₂ tax on electricity. All four Nordic countries have introduced special tax provisions for industry as shown in Table 1.7. The tax rates in the two countries which only introduced an electricity tax very recently, i.e. Norway and Sweden (obliged under the Taxation of Energy Products Directive), are set at the EU minimum level. Industries in Denmark and Finland face a relatively higher tax, but one which is still much lower than those which other economic sectors have to pay.

The Nordic countries can still be described as forerunners in energy taxation in the European Union, but the lead has narrowed. Although some EU Member States, such as Germany and the UK, either introduced new energy/CO₂ taxes or increased existing ones, the overall scope of the energy taxation framework of the Nordic countries still out-performs the situation in other EU Member States in terms of the number of energy products being taxed, as well as the tax rates, themselves. With regard to transport fuels, Nordic countries still tax these with relatively high energy taxes, but taxes in countries, such as Germany, the Netherlands as well as France, are similar in size. The UK currently levies absolutely the highest tax rates on transport fuels, exceeding the Nordic country rates by more than 100 EUR per 1,000 l for unleaded petrol. The margin is even higher in the case of diesel fuel, amounting to more than 250 EUR per 1,000 l compared with Sweden, which has the highest tax rate in the Nordic region⁴. The situation is different when analysing the level of energy taxes applicable to other forms of energy consumption, as here the Nordic countries have the highest tax rates within the EU. However, it should be taken into account that the Nordic countries have implemented a wide range of tax exemptions and reductions, especially for industry.

1.2.5 Special tax provisions granted to specific economic sectors

Special tax provisions for industries – either in the form of complete tax exemption or reduced tax rates on energy consumption – are almost the rule and not an exception in the Nordic countries. For an overview of how these special tax provisions have developed over time in the Nordic countries, see: Nordic Council, 1994, 1996, 1999 and 2002. All these policies have in common that they aim to protect domestic industries in response to the potential risk of a loss of competitiveness arising from unilateral imposition of high energy taxes⁵. Some of these tax provisions

⁴ See, for an overview of energy taxes applied in EU Member States, the “Excise Duty Tables” regularly published by the European Commission, DG Taxation and Customs Union (http://europa.eu.int/comm/taxation_customs/taxation/excise_duties/energy_products/rates/index_en.htm).

⁵ See, for a more detailed discussion on the different provision schemes implemented in Denmark, Finland and Sweden: Speck, 2005; this report is an output of the EU funded research project “COMETR – Competitiveness effects of environmental tax reform”.

are directly in accordance with EU legislation as, for instance, when energy products are used as raw materials in industrial processes.

The country specific rules implemented during the 1990s are still widely in place in the Nordic countries. The Danish energy taxation framework for industry is probably the most complex, because the effective CO₂ tax burden depends on the specific energy use, differentiated between space-heating, light and heavy processes. In addition, the tax burden can be further reduced if companies complete an agreement to improve energy efficiency. In addition, the industrial sector as a whole is completely exempt from the basic energy tax payment.

Swedish industry, agriculture, forestry and fisheries are not subject to the basic energy tax either, and these sectors are eligible to receive major support in terms of reduced CO₂ tax levels. As discussed above, Swedish CO₂ taxes have been increased quite dramatically over the past years as part of a “10-year tax shifting programme”, using the revenues generated by environmental taxes to reduce taxes and charges levied on labour. However, the effective CO₂ tax burden of energy products, other than transport fuels, has been kept almost constant during this period, as the actual share that has to be paid by industry and the other sectors has been revised. In the year 2000, industry received a 50 percent reduction in the nominal CO₂ tax rate and this share increased to 79 percent in 2005. Swedish energy intensive industry is, furthermore, eligible for a tax refund if the CO₂ tax bills exceed 1.2 percent of the sales value.

The development of the Swedish electricity tax is also interesting, as industry was completely exempt from this tax between 1993 and June 2004. Since then, the manufacturing industry has faced an electricity tax of 5 SEK per MWh as compared to a tax rate of 50 SEK per MWh in 1992. As discussed above, the re-introduction of the electricity tax for industry is a consequence of the newly adopted EU Directive on Energy Taxation.

The Norwegian energy taxation framework applies very sector specific rules in the form of reduced tax rates. The sectors benefiting from these rules are the pulp and paper industry, the fishmeal industry as well as the domestic transport sector (aviation and shipping). In addition, some energy products, such as coal and natural gas, are tax exempt. However, the tax exemption on natural gas is only applicable for the mainland, meaning that natural gas on the continental shelf is fully taxed. Norway was also obliged to extend the scope of electricity taxation – as was the case in Sweden – by levying a rather low tax on industrial electricity consumption. The new tax rate, introduced in 2005, amounts only to a fraction of the electricity tax imposed on industrial electricity consumption in the early 1990s.

Finland does not grant energy/CO₂ tax reductions programmes on the same scale as Denmark, Norway and Sweden. This is not too surprising,

as the energy taxes are in general lower in Finland than in the neighbouring countries⁶.

Energy tax exemptions and reductions are still possible under the 2003 Energy Products Tax Directive, although these policy measures can distort competition and may, therefore, be illegal. Therefore, these special tax provisions have to be reported to the European Commission, following the regulations as established in Article 87(1) of the EU Treaty and further outlined in the Community Guidelines on State aid on environmental protection. The guidelines lay down the conditions under which such tax provisions may be allowed (cf. Section 10.7 of this report).

1.2.6 Support schemes for renewable energy

Since 2001, different directives have been adopted at the EU level aimed at increasing the share of renewables. First and foremost, the RES-E Directive (2001/77/EC “Directive on the promotion of electricity produced from renewable energy sources in the internal electricity market” – RES-E), setting indicative targets for electricity generated from renewable energy sources (see Table 1.8), has to be mentioned.

Table 1.8 Overview of national indicative targets for electricity generated from renewable energy sources (RES-E)

	RES-E % in 1997	RES-E% 2010
Denmark	8.7	29
Estonia	0.2	5.1
Finland	24.7	31.5
Iceland		
Latvia	42.4	49.3
Lithuania	3.3	7
Norway		
Sweden	49.1	60

Source: EC, 2004

The Nordic, as well as the Baltic, countries are making widespread use of support schemes for renewable energy sources, including green certificates, investment aid, tax exemptions and / or reductions, tax refunds and direct price support mechanisms aimed at promoting renewable energy sources. Such support schemes can all be applied under current EU policies, but should be notified to the European Commission under the EU State aid rules, in order to obtain approval, before they can actually be implemented.

The support schemes implemented in the Nordic countries have been revised during recent years. Denmark ceased use of the relatively high feed-in tariffs and applies, instead, settlement prices in the form of price

⁶ A detailed analysis of the different tax provisions in the three Nordic EU Member States by calculating effective tax burden for industries can be found by Speck, 2005. This analysis shows that effective industrial energy/CO₂ tax rates are almost in the same range, i.e. the huge variation between them is reduced.

supplements or premiums. A recent European Commission report states that: “In the new Danish political climate change, renewables are of less importance (EC, 2004, p.20)”. This policy development reflects that granting a price supplement on the relevant spot prices can be seen as not sufficient to attract new investments, thereby raising the question of whether the indicative RES-E target can be achieved in 2010, considering that the renewable energy market has declined. Financial support is also granted for combined heat and power plants (CHP). The implementation of electricity certificates is currently under discussion.

Renewables are granted energy tax exemptions in Finland, and this is perceived as an important policy measure to promote renewable energy sources. Support schemes for RES-E were introduced in 1997 and, since 2003, the support varies according to the particular renewable energy source, with the highest level of support reserved for wind power and electricity produced from forest chips. In addition, investment subsidies are provided for developers of RES-E, amounting to up to 40 percent for wind, for example.

A major change in renewable energy policies took place in Sweden in 2003. Until 2003, Sweden promoted the use of renewables via energy tax exemptions and environmental bonus schemes. The 2003 policy change led to a change in direction of the support programme with the introduction of a tradable certificate scheme. The new scheme obliges end-users to buy a portion of green certificates in relation to electricity consumption; the initial share was set to 7.4 percent in 2003, increasing to the final goal of 16.9 percent of electricity consumption coming from RES-E in 2010. Energy-intensive industry is not obliged to fulfil these requirements. A penalty factor for non-compliance is incorporated into the scheme, requiring that consumers who fail to comply were faced with a bill of 19.3 EUR/MWh in 2003 and 26.5 EUR/MWh in 2004. This policy is expected to provide some further incentives to invest in renewables in a cost-efficient way and to achieve the national RES-E target, set at 10TWh additional RES by 2010. Apart from the certificate scheme, investment grants are still available which reduce the costs by around 15 percent for wind energy investments. Environmental taxation schemes are also in place in Swedish energy policy, explicitly addressing combined heat and power (CHP) production with the aim of facilitating co-generation. Renewables are also exempt from energy taxation.

The Norwegian support scheme for renewables is managed by the government agency Enova SF. Norway follows the policy adopted in Sweden, by setting a national target in absolute values, as compared to the approach followed by the EU. The overall objective is to reach a combined target of 12 TWh in 2010 by investing in RES-E and energy savings. Investment subsidies for wind power projects and other renewable energy projects are available, amounting to up to 25 percent of investment costs. The implementation of a common green certificate

scheme for Sweden and Norway was discussed and may affect the current support schemes. However, the Norwegian Government abandoned the idea of joining the Swedish's green certificate system in early 2006.

Support schemes for RES-E are not restricted to the Nordic countries, and are also in place in the Baltic countries. The Estonian government adopted the Electricity Market Act (EMA), which came into force in 2003, setting a feed-in tariff for RES-E at 1.8 times the residential price. This feed-in tariff will be paid for 7 years for biomass and hydro and 12 years for wind (but with 31.12.2015 as a cut-off). The buying obligation for the electricity produced from other renewable sources is valid until 31.12.2008. In 2001, Lithuania adopted the "Procedure for promotion of purchasing of electricity generated from renewable and waste energy sources" (Resolution No. 1474 of December 5, 2001) and, as a result, feed-in tariffs have been available for hydro, wind and biomass since 2002.

Directive 2003/30/EC ("Directive on the promotion of the use of bio-fuels or other renewable fuels for transport") deserves some attention when analysing economic instruments. Again, the directive sets indicative targets for the minimum share of biofuels and other renewable fuels on the market, amounting to 2 percent by the end of 2005 and 5.75 percent by 31 December 2010. The Community framework on energy taxation (Directive 2003/96/EC) allows and encourages Member States to exempt or reduce excise duties levied on the sale of biofuels.

Several Nordic and Baltic countries are currently making use of tax exemptions for biofuels as described in the EU Member States reports on the implementation of Directive 2003/30/EC⁷.

1.2.7 Air pollution taxes and charges

The number of different air pollution charges implemented in Nordic countries is rather small, in direct contrast to the situation in the Baltic countries, as shown in Table 1.9. The Nordic taxes on air pollutants are frequently not levied on emissions, but are levied on energy products, instead, as a form of proxy. The approach chosen in the Baltic countries differs in that the emission charges are levied on the actual quantities emitted, in the same way for air as for water pollutants. Furthermore, the schemes distinguish between basic rates, which usually apply to emissions within permitted levels, and higher rates, applying in the case of non-compliance with predefined standards (see for a more detailed discussion of the functioning of these charging schemes: EEA, 2005a, Chapter 3, Box 3.11).

⁷ See for the EU Member States reports: http://europa.eu.int/comm/energy/res/legislation/biofuels_members_states_en.htm

Table 1.9 Overview of air emission taxes and charges implemented in the Nordic and Baltic countries

Pollutant	DK	EE	FI	IC	LA	LI	NO	SW
CO ₂	X	X	X		X		X	X
NO _x		X			X	X		X
SO _x	X	X			X	X	X	X
Other GHGs	X						X	
Other air emissions		X			X	X		

Denmark and Norway have recently introduced taxes levied on a range of (non-energy related) greenhouse gases (GHG). In 2001, Denmark introduced a tax on perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and hydrofluorocarbons (HFCs) as an additional measure to curb GHG emissions, working alongside the CFC tax, which has been in force since 1989. The Norwegian greenhouse gas (GHG) tax entered into force on 1 January 2003 and is levied on perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs). These gases were added to the gases CO₂, CH₄ and N₂O under the 1997 Kyoto Protocol. These GHG taxes are supplements to the existing energy/CO₂ taxation framework on fossil fuels in the two countries and the tax rates are based on the associated global warming effect.

An overview of air pollution tax rates is shown in Table 1.10. Large differences in the current tax rates between the countries can be found. However, these data offer only an indication of the situation and the effective tax burden, which emitters are actually subject to, can be much lower in practice, as discussed in Section 1.3.5. Sweden is still the only Nordic country which introduced a NO_x charge. This charge was introduced in 1992 and only large combustion plants for energy production generating more than 25 GWh are affected. When assessing this instrument, two features are worth mentioning: firstly, the revenues generated are recycled back to the plants liable to the charge, in relation to the energy produced and secondly, around 5 percent of total NO_x emissions are subject to the charge.

Table 1.10 Air pollution taxes and charges in 2005 (EUR per tonne of pollutant)

	CO ₂	SO ₂	NO _x
Denmark	12	1,333	-
Estonia	0.7	8.8	20.2
Finland	18	-	-
Iceland	-	-	-
Latvia	0.14	43	43
Lithuania	-	90	170
Norway	22–25 depending on energy product	¹⁾	-
Sweden	88	3,300	4,400

¹⁾ the tax rate is 8.9 EUR per 1,000 l mineral oil

1.3 Economic instruments used in water policy – water quantity as well as water quality issues

1.3.1 The Water Framework Directive

A major piece of legislation in the last five years has been the Water Framework Directive (2000/60/EC “Directive establishing a framework for the Community action in the field of water policy”), which was adopted in October 2000. The Water Framework Directive (WFD) will repeal a number of the existing water directives, transforming EU water legislation as well as national water policies. The directive has a broad scope covering surface waters, i.e. lakes, rivers, transitional waters and coastal waters. The WFD is, in itself, innovative because, for the first time, quantitative aspects of water management are addressed. The purposes and main objectives of the WFD are to protect and improve ecosystems, and promote sustainable water consumption, which should be based on the long-term protection of available water resources. The underlying approach of the WFD is a holistic one, because it requires that water management must be undertaken in a comprehensive and integrated way through the development of Water Management Plans. These plans should be developed for each individual river basin, which often requires that several Member States will have to coordinate their policies and not simply focus on national borders.

The WFD marks a clear shift in the European debate on water and economic instruments (mainly user charges for water supply and wastewater services, environmental taxes, and charges in the form of water abstraction taxes and taxes on wastewater). Indeed, the directive asks Member States, “... to take account of the recovery of the costs of water services, including environmental and resource costs...” It further asks Member States to ensure by 2010:

- That water pricing policies provide adequate incentives for users to use water efficiently, and thereby contribute to the environmental objectives of this directive,
- An adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture to the recovery of the costs of water services [...] taking into account the polluter pays principle.

The practice of using economic instruments varies widely between Nordic and Baltic countries. User charges are instruments implemented in all countries. However, the design and structure of user charges can differ within countries – they can either comprise a fixed amount to be paid by consumers or be based on actual metered consumption (or comprise a mixture of both systems). The apparent variability in the rates is not surprising considering these are frequently set by municipalities to achieve

full financial cost recovery, i.e. the revenues generated by the user charges should cover all costs associated with the delivery of drinking water as well as the effective treatment of wastewater.

1.3.2 Economic instruments applied in water management policy in the Nordic and Baltic countries

Denmark introduced a tax on tap water in 1994 and a tax on wastewater in 1997. The rates of these two taxes have not been revised since their introduction and can be seen to be rather high when compared with rates in the Baltic countries (Table 1.11). However, the level of the Danish wastewater tax is similar to the rates of wastewater taxes implemented in the Netherlands and Poland (EEA, 2005b). In addition, industry and agriculture are not required to pay the tax.

The situation is different in the Baltic countries in that they all have introduced quite complex water-related taxes, in the form of water abstraction taxes and water pollution taxes. The tax rates of the former are differentiated according to the source and use of water abstracted. The structure of the latter is often very complicated, because a wide range of computed formulae (sometimes rather complex) are used in calculating tax levels – most often based on the presence of specific chemicals in the discharges.

Table 1.11 Comparison of taxes and charges levied on water supply and wastewater

	Tax on water supply	Tax on wastewater Rates for major pollutants are given
Denmark	0.7 EUR/m ³	Yes BOD – 1490 N – 2700 P – 13,500
Estonia	0.005 – 0.0423	Yes BOD 360 N tot 340 P tot 543
Finland	-	-
Iceland	-	-
Latvia	0.003 (surface water) – 0.29 (groundwater)	Yes
Lithuania	0.0003 – 0.02 and for groundwater 1.2	Yes BOD 222 N tot 174 P tot 869
Norway	-	-
Sweden	-	-

1.4 Economic instruments addressing waste issues and the different types of waste

The sheer number of economic instruments used in waste policy has increased during recent years, as has the number of amendments and revisions to the structure of these instruments. Experience gained with waste-related taxes and charges dates back to the 1970s, when the first charges for environmental protection levied on beverage containers were introduced in the Nordic countries.

1.4.1 User charges on waste

User charges are still the most common type of economic instrument applied in waste policy. In general, user charges are set so that they comply with the principle of full cost recovery, meaning that costs associated with the collection, handling and disposal of wastes should be balanced by the revenues generated via user charges. Municipalities are often responsible for implementing national waste policies and are also in charge of setting the rates of waste user charges. A tendency towards the differentiation of waste user charges can be seen recently to have become more common in the Nordic and Baltic countries, whereby rates are commonly set according to the volume or the weight of municipal waste, the frequency of the collection or set taking into account the operation of any recycling or home-composting schemes. The setting of waste user charges still differs in Iceland from the situation in other countries, because the charges can still be levied as a surcharge on the real property taxes. This approach is rather simple to administer, but does not necessarily align with environmental considerations as it does not promote any changes in human behaviour. The setting of waste user charges which depend on the weight or volume of waste promotes environmental behaviour in that consumers can influence their waste bill, by reducing the amount of waste to be disposed of.

A tendency throughout the Nordic countries for rising waste charges is apparent, as discussed in the country chapters below. These increases can partly be attributed to the rise in waste taxes.

1.4.2 Waste taxes

Waste management policies pursued by the individual Nordic countries, in particular in relation to waste taxes, differ. Table 2.12 illustrates that waste taxes are in place in all Nordic countries, with the exception of Iceland. Only waste disposed of at landfill sites is levied with a tax in Finland and Sweden, as compared to the situation in Denmark and Norway where the tax applies to waste delivered to both landfill sites and incineration plant. However, in Sweden, introduction of an incineration

tax is currently under discussion. Although Finland doubled their waste tax between 2002 and 2005, the rate is still the lowest among the four Nordic countries. The most interesting development is reported in Norway, where the whole structure of the landfill and the incinerator waste taxes has been changed. Since 2003, the landfill tax has been differentiated according to environmental standards allowing a higher tax rate to be charged on waste disposed of at landfill sites which have lower environmental standards. A key element of the revision of waste taxation was the redesigning of the incineration tax. Until 2003, waste delivered to incineration has been taxed at a basic rate and, in addition, a variable rate depending on the percentage of energy recovered. Under the new scheme, the incineration tax is based on air emissions, thereby providing a clear incentive for the operator of the incinerator to minimise air pollution.

Landfill taxes are also in place in Estonia and Latvia. The rates for municipal solid waste are rather low when compared to the rates applicable in the Nordic countries. However, higher rates are charged for hazardous waste as shown in Table 1.12.

Table 1.12 Comparison of waste taxes (EUR per tonne MSW)

	Landfill tax	Incineration tax
Denmark	51	45
Estonia	2- up to 252 depending on hazardousness of waste	-
Finland	30	-
Iceland	-	-
Latvia	1- up to 71 depending on hazardousness of waste	-
Lithuania	Under discussion	-
Norway	52 – 67 EUR depending on environmental standard of landfill site	41 EUR per tonne CO ₂ plus air emission tax
Sweden	41	Under discussion

1.4.3 New developments in the use of economic instruments in waste policies

Improving waste management policies is high on the political agenda in the EU, not only since the European Commission published the document “Towards a Thematic Strategy on Waste Prevention and Recycling” (COM(2003)301, 27. May 2003). One of the main messages of the strategy is the need to employ a combination of policy measures, including voluntary and economic instruments as well as regulatory command and control measures, to address environmental problems.

Earlier reports published by the Nordic Council illustrated the large number of instruments addressing different types of waste. Instruments

employed range from taxes to deposit-refund schemes and also producer responsibility, which only recently has been given more attention.

Table 1.13 Overview of EIs in waste policy addressing different types of waste

	Tyres	Beverage containers	Packaging	Battery	ELV	WEEE
Denmark	Tax plus subsidy scheme	DRS	Tax	Tax plus subsidy scheme	DRS	Producer responsibility
Estonia	-	-	Tax	-	Producer responsibility	Producer responsibility
Finland	DRS and Producer responsibility	DRS and tax	Producer responsibility	-	Producer responsibility	Producer responsibility
Iceland	Recycling fee	Recycling fee	Recycling fee	Recycling fee	DRS	-
Latvia	Tax	-	Tax	Tax	ELV tax (to come into force October 2005)	WEEE charge is under discussion
Lithuania	Tax	-	Tax	Tax	Producer responsibility	Producer responsibility
Norway	-	Tax plus additional tax on non-refillable containers	Producer responsibility	Producer responsibility	DRS and producer responsibility	Producer responsibility
Sweden	Tax	DRS	Tax	Tax	DRS	Producer responsibility

Note: DRS – deposit refund scheme
1.4.3.1 The Directive on packaging and packaging waste

Some developments in this policy field have taken place at the EU level. The directive on packaging and packaging waste (Directive 2004/12/EC) was finally amended and came into force in 2004. The directive aims to reduce the impact of packaging on the environment. One of the tools to achieve this aim is the setting of quantitative targets for recovery and recycling. The targets have been revised in the amended 2004 directive and the new targets for 2008 have been set as follows: 60 percent as a minimum, by weight, of packaging waste will be recovered or incinerated at waste incineration plants with energy recovery; between 55 percent as a minimum and 80 percent as a maximum by weight of packaging waste will be recycled; and minimum recycling targets for materials contained in packaging waste will be attained by weight for glass (60 percent); for paper and board (60 percent); for metals (50 percent); for plastics (22.5 percent); and for wood (15 percent). Derogations from achieving these targets have been granted to the longer-established EU Member States as well as to new members. In the past, EU Member States, including Nordic as well as Baltic countries, already made widespread use of economic instruments in this policy field, in particular taxes (Nordic Council, 2002). The application of economic instruments is indirectly promoted in the text of the directive, as it is explicitly mentioned that Member States are allowed to adopt policy measures, including economic instruments, according to the polluter pays principle, to fulfil the targets if the European Community fails to adopt such instruments. Reality demonstrates that taxes are appropriate instruments in this policy field, considering that the majority of the countries involved have already implemented them.

Beverage containers represent another field where policy efforts in the Nordic countries have been renewed. For example, in 2005, Sweden announced expansion of their long-standing deposit-refund system to include aluminium cans and PET bottles, with the result that all plastic and metal packaging for ready-to-drink beverages is now covered by the system.

1.4.3.2 The Directive on waste electrical and electronic equipment and the Directive on end-of-life vehicles

The transposition of the Directive on waste electrical and electronic equipment (WEEE Directive 2002/96/EC) and of the Directive on end-of-life vehicles (ELV Directive 2000/53/EC) into national legislation led to the introduction of new instruments. Both directives seek to reduce the amount of waste and to increase the rates of reuse, recovery and recycling of waste. They further establish producer responsibility by setting quantitative targets. Member States must adopt a whole range of measures guaranteeing, for example, the functioning of WEEE and ELV. In addition, the delivery of ELV and WEEE to appropriate treatment facilities has to be undertaken free of charge to the final users.

The Nordic countries have made good progress in transposing the directives and first results demonstrate that the approaches chosen are successful with, for example, Sweden's report of collection levels for WEEE significantly in excess of the required target of 4 kg WEEE per person per year. Their position at the top of the rank with regard to the collection of WEEE is, however, challenged as Norway have published a collection rate of 12.2 kg WEEE per capita per year as compared to the 11 kg reported by Sweden.

1.4.3.3 Other developments with regard to economic instruments used in waste policies

In 2000, the Norwegian government introduced a tax on chlorinated solvents, i.e. on trichloroethene and tetrachloroethene. This tax can be assessed as a success story, considering that consumption of the products dropped dramatically as the National Statistical Office reported in March 2003.

The rates for the relatively high number of taxes levied on individual waste products remained constant in Denmark between 2001 and 2005 as compared to the situation in Norway, where environmental taxes are indexed, i.e. the tax rates are increased in accordance with inflation. However, the Danish deposit-refund scheme was extended to non-refillable containers in 2002, after the newly elected government abolished the ban on sales of this type of container. In 2005, the scheme was extended to cover cider, energy drinks and ready-to-drink beverage containers.

1.5 Economic instruments related to agriculture and natural resources

The Nordic countries are the only EU Member States implementing a number of economic instruments in the agricultural sector. Taxes on pesticides are currently in place in Denmark, Finland, Norway and Sweden, and on fertilizers in Denmark and Sweden. The actual structure of these taxes differs between countries and tax exemptions are basic elements of the national design schemes. For example, Danish farmers are exempt from the fertilizer tax when using more than 2,000 kg of nitrogen fertilisers annually or having a yearly turnover exceeding 20,000 DKK. These rules impair the environmental effectiveness of the tax as, in effect, only households are affected by the tax. The rates of these taxes have, by and large, been kept constant for several years, although the tax schemes have regularly been amended and revised since their introduction. The Norwegian tax system for pesticides underwent revision in 1999 to be differentiated according to health and environmental effects. The tax consists of a control tax and an environmental tax. The purpose of the former is to generate revenues covering the costs of the Norwegian Agricultural Inspection Services.

An innovation can be reported from Denmark, where a tax on mineral phosphorous in animal feeds has been implemented in 2005 aiming to limit the over-enrichment of freshwaters.

Fertiliser or pesticide taxes have not been implemented in the Baltic countries. However, these countries do make extensive use of taxes levied on the extraction of natural resources, i.e. mining taxes. This economic instrument is also employed in Denmark and Sweden, but only a small number of natural resources are subject to the tax here. In the Baltic countries, mining taxes are levied on a very large number of minerals, such as soil, sandy and clay loam, clay, sand, dolomite, gypsum, etc. The purposes of implementing mining taxes are manifold, including the objective of restricting the exploitation of certain natural resources, by reducing the demand for these resources and improving the competitiveness of alternative materials, such as crushed rock and recycled materials.

The European experience with creating new markets based on tradable property rights is very limited, with the exception of the situation in Iceland. Iceland was one of the first nations in the world to introduce individual transferable quotas (ITQs) in fisheries in 1984. The Icelandic fishery sector was over-capitalised at this time and the stocks were over-fished. The result of assessment of the economic impact of the scheme, as a whole, is considered positive. This finding is, in itself, of interest and presents a strong case for the more widespread application of EIs, in light of the recurrent crises in EU fishery policy. In the meantime, ITQs have been introduced in Denmark, on a trial basis until the end of 2007 and only for herring, as well as in Estonia.

1.6 Economic instruments related to transport

The principal economic instruments applied in the transport sector are taxes levied on transport fuels. However, countries do make use of other transport-related taxes in the form of taxes levied on vehicles, including purchase and registration taxes, annual circulation tax, and also charges for the use of infrastructure (i.e. road charging), which are currently attracting the most attention in the political debate.

Environmental considerations in vehicle taxation schemes are of only secondary importance, although this is slowly changing, as can be seen in Norway. The Norwegian purchase tax is now based on criteria such as weight and engine capacity rather than the value of the vehicle, which is still the tax base in Denmark. Such purchase taxes, or registration taxes, are of great significance in terms of their revenue generating potential in Denmark, Finland and Norway, because the tax can as much as double the price of a vehicle – e.g. in the two former countries. Furthermore, Norway revised the annual circulation tax on heavy goods vehicles in 2000, replacing the weight-based tax with an annual tax differentiated according to the emission standards of the vehicles. The situation in the Baltic countries, on the other hand, is quite different as Estonia and Lithuania have repealed taxes levied on private vehicles during recent years, but have maintained taxes levied on heavy goods vehicles. In contrast, in Latvia, private vehicles are subject to a registration tax as well as annual circulation taxes. The design of the former tax is of note as the tax payment depends on the age of the vehicle, from the first date of registration abroad. However, Lithuania levies a charge on pollution from mobile sources (transport). This charge is levied on transport used for commercial purposes and the charge is imposed indirectly, i.e. on fuel used.

The same applies to commercial vehicles as purchase and annual circulation taxes are rarely based on environmental criteria. However, exceptions can be found as is the case with the Swedish annual circulation tax for heavy goods vehicles (HGV), which is partly based on emission levels. Unlike taxes on privately used vehicles, taxes on commercial vehicles over 12 tonnes are regulated at the European level, under the so-called “Eurovignette” Directive (1999/62/EC). The Eurovignette Directive, which replaces the original Directive (1993/89/EEC) which was annulled by the European Court of Justice in 1995, sets common rules on distance-related tolls and time-based user charges for HGV for the use of infrastructure. Several attempts have since been made to revise and update the Eurovignette Directive due to the increased interest in HGV charging schemes, culminating in an agreement on new EU legislation in April 2005. HGV charging schemes of the type described above have recently been introduced in Austria, Germany and Switzerland.

The revision of the Eurovignette Directive is of interest as it determines the rules of how HGV can be charged for using road infrastructure,

indicating that the charges can only recover costs attributed to the construction and maintenance of the infrastructure. This principle must be seen in the context of the 1998 White Paper on charging for transport use and the 2001 White Paper on the Common Transport Policy, both published by the European Commission. These papers recommended and emphasised that the charges should not only cover the costs of infrastructure, but also the external environmental costs caused by its use. This approach would have been in compliance with the polluter pays principle. However, the agreement adopted in early 2005 violates the polluter pays principle as it does not allow Member States to set charges which would internalise the environmental externalities.

Norway has a long tradition in the field of road pricing as the first toll rings were introduced already in the late 1980s and early 1990s. However, this type of policy measure achieved new momentum with the successful implementation of the London congestion charge in 2003. Discussions surrounding similar schemes are now back on the political agenda, for example, it was decided in May 2005 that Stockholm will introduce a road pricing scheme for a trial period of seven months in 2006.

1.7 Economic instruments applied in other environmental areas

Subsidies still play a major role in economic policy, although proposals for subsidy reform are regularly debated at national as well as EU and international level. However, detailed studies and analyses of this type of economic instrument are rarely undertaken due to the surrounding complexities. One of the difficulties arising is that subsidies can either be pro-environmental, in the sense that the environment can benefit from them or, on the contrary, they may be harmful to the environment, i.e. environmentally harmful subsidies. The problem encountered when assessing subsidies is the lack of a common and widely accepted definition of what actually is to be understood as coming under the term “subsidy” (see for example: Chapter 5 of EEA, 2005a and OECD, 2003 and 2005). The definition of an environmentally related tax (as, for example, that put forward by the OECD) does not take into account the motivation for launching the tax, as long as the tax is in some way related to the environment. The OECD, on the other hand, puts the subsidy’s motive to the fore (Statistics Sweden, 2003). This can be seen in the context that “economists usually tend to think of subsidies as similar to taxes [...] and, therefore, subsidies can partly be analysed as negative taxes” (Statistics Sweden, 2003, p.26). The dilemma surrounding establishment of a commonly accepted definition for subsidies is apparent.

The recent OECD report on subsidies tries to provide an overview of subsidies in OECD countries as well as to present a checklist “that will

assist governments and analysts in identifying those subsidies whose removal would benefit the environment (OECD, 2005, p.8)". When discussing the lack of a widely accepted definition, it must be noted that a definition is provided by the World Trade Organization (WTO) in the Agreement on Subsidies and Countervailing Measures (SCM Agreement), which, in OECD (2005, p.17), is described as follows: "[it] is reasonably comprehensive and includes transfers of funds, fiscal incentives and the provisions of goods and services other than general infrastructure". The starting point for the OECD analysis is, however, rather general as a subsidy is classified as "a result of a government action that confers an advantage on consumers or producers, in order to supplement their income or lower their costs (OECD, 2005, p.16)". More detailed sectoral definitions (for agriculture, transport, energy, fisheries, water) in the OECD report are regularly based on the WTO definition. However, these definitions, to a degree, lack consistency. For example, transport subsidies include those which arise "from failing to fully charge for the external costs of private cars, road freight transport and air transport" (OECD, 2005, p.45), but, in the case of energy subsidies, environmental externalities are not included in the OECD analysis.

Apart from not having a widely accepted definition of subsidies, there is also the problem surrounding measurement of subsidies. The two basic approaches are based either on a comprehensive accounting system, such as the System of National Accounts, or on the WTO subsidy notifications (Steenblik, 2003). A detailed analysis of environmentally motivated subsidies applied in Swedish policy was carried out by Statistics Sweden in 2003, and is based on the former approach. The Swedish report also mentions that Denmark is the only country where a similar study has been carried out (Hornum, 2000). However, the results of these studies are hard to compare as different approaches and definitions have been applied. One of the conclusions of the Swedish study, of note, is that the analysis shows that "potentially harmful subsidies are considerably larger than the environmentally motivated (Statistics Sweden, 2003, p.10)". The sum total of subsidies provided by the different spheres of government (national, regional and local) as well as from international bodies, mainly from the European Union, cannot be compiled due to inherent difficulties. This said, a sum total of around 4.2 billion SEK was arrived at for the year 2000 in the report published by Statistics Sweden – amounting to around 0.2 percent of Swedish GDP. This figure, however, must be seen to represent a lower limit as it is based on the narrow definition of a subsidy as used in the national accounting framework. A wider definition would, for example, include subsidies for public transportation and railways, amounting to around 7.8 billion SEK, as these subsidies are, in themselves, almost twice as high as the 4.2 billion SEK reported for 2000.

1.8 General sales charges – VAT

General sales tax in the form of value added tax (VAT) does not fall into the category of environmentally related taxes. They may, however, have the same effect as environmentally related taxes, although the motive for implementing them is primarily directed towards raising revenue. This being said, it is interesting to see an overview of the actual rates in the Nordic and Baltic countries. A uniform VAT coverage was established under the Sixth VAT Directive (77/388/EEC) and, since then, has been amended frequently. The standard VAT rate has to be set within a range between 15 percent and 25 percent and Member States are permitted to apply one or two reduced rates of at least 5 percent. Further exceptions or derogations are possible under the current VAT rules⁸.

The Nordic countries set national standard VAT rates at the higher end of the range and the three Baltic countries have an 18 percent VAT rate. It is interesting to note that all countries generally levy the standard VAT rate on the purchase of energy products. However, differences can be found when assessing other environmental goods and services. For example, water services as well as waste collection services are subject to reduced rates in some of the Nordic and Baltic countries. Rather large variations are observable in the transport sector. In Estonia and Latvia, the standard VAT rates only apply for domestic transport whereas, in the other countries, exceptions or reduced rates are levied. International transport is subject to a zero VAT tax rate in all EU Member States.

⁸ See for an overview of VAT rates applicable in EU Member States:
http://europa.eu.int/comm/taxation_customs/taxation/vat/how_vat_works/rates/index_en.htm

Table 1.14 Overview of VAT applicable in the Nordic and Baltic countries

	Denmark	Estonia	Finland	Iceland	Latvia	Lithuania	Norway	Sweden
Standard Rate	25	18	22	24.5	18	18	25	25
Reduced Rate	-	5	8 / 17		5	5 / 9	7 / 11	6 / 12
Water supplies	25	18	22		5 / 18	18		25
Agricultural inputs	25	18	17 / 22		18	5 / 18 ³⁾		25
Collection of waste, etc	25	18 ¹⁾	22		5	18		25
Energy products	25	18 ²⁾	22	14 (elec.)	18	18 ⁴⁾		25
Motor vehicles	25	18	22		18	18		25
Transport – domestic								
Air	Ex	18	8		18	5		6
Sea	Ex	18	8		18	5		6
Rail	Ex	18	8		18	5		6
Transport – international								
Air	0	0	0		Ex	0		0
Sea	0	0	0		Ex	0		0
Rail	0	0	0		EX	0		0

¹⁾ 5 percent VAT rate is applicable for the treatment of hazardous waste

²⁾ VAT is zero rated for renewable energies

³⁾ a special 6 percent VAT compensation scheme is applicable for farmers, when annual income does not exceed 10,137 EUR; the 5 percent VAT rate applies for ecological products

⁴⁾ heat is subject to a 5 percent VAT rate

Note: Ex - exemption

Source: European Commission, DG Taxation and Customs Union, 2005 and authors

The intention of the VAT system at the EU level is to establish a common origin based VAT system. However, Directive 2003/92/EC, amending the Sixth VAT Directive, modified this approach with regard to the supply of natural gas and electricity, facilitating the further development of the internal market for energy. The new rules established under this directive depart from the basic principle of VAT as the tax base is now consumption instead of supply. These changes, which took effect on January 2005, eliminate problems of double taxation and non-taxation as well as the distortions of competition between traders. As such, they must be seen in the context of the liberalisation of the electricity and natural gas markets (“Directive 2003/54/EC concerning common rules for the internal market in electricity repealing Directive 96/92/EC” and “Directive 1998/30/EC concerning common rules for the internal market in natural gas”).

1.9 Exchange rates

All national tax and charge rates presented in the tables have been converted to EURO throughout the report, apart from national data discussed in the relevant country chapters. This approach was chosen to enable an easy comparison between the different countries. Table 1.15 presents the exchange rates used for the conversion.

Table 1.15 Exchange rates (1 EUR in national currency)

	1985	1990	1996	2000	2002	2004	2005
Denmark	8.02	7.86	7.36	7.45	7.43	7.44	7.44
Estonia ^x					15.65	15.65	15.65
Finland ^{xx}	4.69	4.85	5.83	5.95	5.95	5.95	5.95
Iceland	31.64	74.03	84.66	72.58	86.18	87.14	84.79
Latvia					0.7	0.7	0.7
Lithuania ^{xxx}					3.45	3.45	3.45
Norway	6.51	7.95	8.20	8.11	7.51	8.37	8.18
Sweden	6.52	7.52	8.51	8.45	9.16	9.12	8.99

Note: ^x Exchange rate fixed to the EUR at this rate since January 1st, 1999

^{xx} since January 1st, 2002 the Euro is the national currency in Finland.

^{xxx} Exchange rate fixed to the EUR at this rate since February 1st, 2002.

Source: Eurostat and national country reports

2. Developments in Nordic and Baltic countries: Denmark

2.1 Economic instruments related to energy consumption and air pollution abatement

2.1.1 Introduction

Over the past two decades, Danish energy policy has been strongly influenced by environmental policy objectives. These environmental policy objectives are expressed in the ambitious Kyoto targets where Denmark has made a commitment to reduce greenhouse gas emissions by 21 per cent (2008–2012). At regular intervals, the Danish government prepares and implements national energy plans and legislation in the field of energy supply. Energy Strategy 2025, presented by the Ministry of Energy in June 2005, is the latest example of these national energy plans (Danish Energy Authority, 2005e).

2.1.2 Excise duties on fossil fuels for energy purposes

The Danish excise duties on fossil fuels are divided into three separate tax categories with separate characteristics and distinct historical features.

- First, an energy tax is levied on all fossil fuels. The energy tax on fossil fuels was introduced on 3 October 1977 as a response to the oil crisis in the 1970s. The tax was supposed to provide consumers with a financial incentive to save energy and, thereby, reduce the balance of payments deficit resulting from the import of oil products. However, there were also fiscal grounds for introducing the energy tax (Nordic Council, 1999). The energy tax was initially levied only on oil products, but in 1982 the energy tax scheme was expanded to include coal products. The tax rates are differentiated across the different energy products according to the energy content of each fuel type. The energy tax, when initially introduced, was modest in size (0.07 DKK/l light fuel oil), but the tax rates have gradually been increased. Today, the energy tax constitutes the most significant part of the excise taxes on fossil fuels (Nordic Council, 2002, and Statistics Denmark, 2004). In 1996 the energy tax scheme was expanded further to include natural gas. The energy tax on natural gas differs from the energy tax levied on other energy sources as it does not depend on the energy content of the fuel. The

energy tax scheme is used partly as an economic instrument to promote consumption of natural gas. Until 2001 it was required by law that the consumer price of natural gas was not to exceed the price of fuel oil. The energy tax instrument was used to meet this end. In 2001 a political majority decided to abolish this fixed price scheme. The new and more liberal scheme was introduced partly in order to comply with the EU open competition regulation (Nordic Council, 2002 and Danish Energy Authority, 2001).

- The second element of the excise taxes levied on fossil fuels is the CO₂ tax. In 1991, the Danish Parliament passed the CO₂ tax bill as a reaction to the increased attention on climate change, and the tax came into force in May 1992 (Law no. 888 21/12/1991). The tax on CO₂ was not intended to increase the overall price on energy, but rather was intended to create economic incentives for consumption of less CO₂ intensive energy sources. In order to maintain the overall tax burden and avoid price increases in energy, the basic excise tax (the energy tax) was lowered when the CO₂ tax was introduced (Statistics Denmark, 2004 and Nordic Council, 2002). The CO₂ tax is levied on the various fuel types according to the carbon content and hence the carbon emission from the specific fuel. The underlying principle behind the CO₂ tax scheme in the period from 1992 to 2004 was an intended tax rate of 100 DKK/tonne CO₂ regardless of fuel type (Danish Ministry of Taxation, 2005a). In 2005, a revised CO₂ tax scheme entered into force and the CO₂ tax rate was lowered to 90 DKK/tonne CO₂ emissions. To maintain the overall tax burden, the energy tax has been increased correspondingly.
- The third element of the excise duties on fossil fuels is the sulphur tax. The sulphur tax was introduced in 1996 and since that time has been levied on all fossil fuels with a sulphur content exceeding 0.05 percent (based on weight). However, the sulphur tax was phased in gradually over the period from 1996 to 2000. The tax is levied on fuels according to sulphur content. From 1996 onwards the tax has been set at 20 DKK per kg sulphur in the energy product or 10 DKK per kg SO₂ emissions. These two possibilities give the energy consumer an economic incentive to choose energy products with a low sulphur content and an economic incentive to abate SO₂ emissions by means of the installation of smoke scrubbers (Nordic Council, 2002; IEA, 2004a, and Law no. 421 of 14 June 1995).

Table 2.1 shows the energy and CO₂ tax on various fuel types. The sulphur tax rates are not included in this table. Tax rates expressed in national currencies have not been increased since 2002 with the result that current tax rates in real terms are slightly lower than those four years ago.

Table 2.1 Total tax burden of different energy sources

		1985	1990	1996	2000	2002	2005
Light fuel oil (EURcent/l)	energy tax	4.61	22.4	20.25	23.21	24.63	25
	CO ₂ tax			3.67	3.62	3.63	3.23
	TOTAL TAX	4.61	22.4	23.92	26.83	28.26	28.23
Heavy fuel oil (EURcent/kg)	energy tax	5.11	25.2	22.56	26.16	27.72	28.09
	CO ₂ tax			4.35	4.29	4.31	3.9
	TOTAL TAX	5.11	25.2	26.9	30.45	32.03	31.99
Natural gas (EURcent/nm ³)	energy tax			0.14	21.47	27.19	27.42
	CO ₂ tax			2.99	2.95	2.96	2.69
	TOTAL TAX			3.13	24.42	30.15	30.11
Pit coal (EURcent/kg)	energy tax	1.62	9.8	11.69	17.44	19.25	19.49
	CO ₂ tax			3.26	3.22	3.23	2.96
	TOTAL TAX	1.62	9.8	14.95	20.66	22.47	22.45

Source: IEA, 2004, Danish Ministry of Taxation, 2005b, 2005c, 2005i, and 2005j

2.1.3 Excise duties on fossil fuel consumption in industry

Excise duties on fossil fuel consumption are not levied uniformly across all Danish sectors. A large number of exceptions have been adopted in the Danish excise duty legislation, aiming to ensure that the competitive power of Danish enterprises is not significantly weakened. The magnitude and the characteristics of these exception schemes vary between the three types of excise duties described in the previous section.

The energy tax legislation is the most “enterprise-friendly” of the three types of excise duties. Until 1996 all VAT registered enterprises in Denmark were practically exempt from energy tax (Nordic Council, 1996). The 1996 tax reform, however, introduced a few changes to energy taxes levied on enterprises. VAT registered companies are still able to get the entire energy tax refunded for the energy used for process purposes. However, the energy/ CO₂ tax reform that entered into force in 1996 introduced an energy tax on companies when the energy is used for space heating purposes. The space-heating tax on firms was gradually increased to the level of the household energy taxation. In 1996, 70 percent of the energy tax from space heating energy was refunded and in 1997 35 percent was refunded, but since 1998 enterprises have to pay the full energy tax on energy consumption for space heating purposes (Danish Ministry of Taxation, 2004a).

The CO₂ tax exception scheme is more complex and is designed both to ensure that the industry contributes to fulfilment of the CO₂ reduction targets and to avoid substantial increases in energy taxes levied on the energy-intensive industries. As a result of these two principles, the refund scheme is designed to give the largest CO₂ tax rebates to heavy industrial processes in energy-intensive industries, while energy consumption in light processes are given a smaller tax rebate.

Initially, in 1992 when the CO₂ tax was first introduced, the entire CO₂ tax was refunded to industry. From 1993 to 1995, light processes

(non energy-intensive industries) were charged with CO₂ tax rates equivalent to 50 percent of the overall CO₂ tax. Energy-intensive industries were granted a higher refund than non energy-intensive industries. Energy-intensive enterprises were able to obtain a 95 percent refund of the share of the CO₂ tax that exceeded 3 percent of gross value added. In 1996, CO₂ tax reform came into force, entailing significant changes for industry. First, the 1996 tax reform introduced an agreement scheme. Enterprises entering into an agreement with the Energy Agency are eligible for a tax rebate, but are obliged to undertake certain investments to improve energy efficiency in order to reduce energy consumption. In addition to the agreement scheme, the 1996 tax reform also introduced a gradual decrease in the effect of CO₂ tax refund scheme for enterprises that have not entered an agreement with the energy agency. (Law no.888 of 21/12/1991, Law no.1 of 03/01/1992, LBK no.850 of 13/11/1995, and Danish Ministry of Taxation, 2004b).

Table 2.2 below shows the overall principles in the Danish CO₂ tax rebate scheme. Energy consumption in households and energy used for space heating are charged with a CO₂ tax equivalent of 100 DKK/tonne CO₂ up to 2004, and of 90 DKK/tonne CO₂ since the beginning of 2005. On the other hand, energy consumption in light and heavy processes is charged with a lower, but constant, CO₂ tax rate. When the CO₂ tax rate was reduced to 90 DKK/tonne in 2005, the percentage paid by industrial processes was increased in order to maintain a constant CO₂ tax rate for the industry.

Table 2.2 Overall principles in the Danish CO₂ tax (EURO/tonne CO₂)

		1993	1996	2000	2002	2005
Households and space heating		13.17	13.59	13.42	13.46	12.10
Light process	With agreement		6.79	9.12	9.15	9.15
	Without agreement	6.58	6.79	12.07	12.11	12.11
Heavy process	With agreement		0.41	0.40	0.40	0.40
	Without agreement	0.66	0.68	3.35	3.36	3.36

Note: the agreement scheme was introduced with the tax reform in 1996.

Source: Danish Ministry of Taxation, 2004a

The sulphur tax scheme differs from the two other types of excise duties on fossil fuels. Enterprises in the manufacturing industries are not exempted from paying the sulphur tax. It is, however, possible for industry to avoid paying the sulphur tax as the tax is levied either on the sulphur content of the fuels consumed or on the actual SO₂ emissions from the enterprise. It is, therefore, possible for industrial enterprises to install smoke scrubbers which reduce the SO₂ emissions and, thereby, reduce their SO₂ tax payment (§2.2 in Law nr. 421 of 14/06/1995).

2.1.4 *Excise duty on electricity consumption*

The excise duty on electricity consumption in Denmark was introduced in 1977. The initial tax rate was 0.02 DKK/kWh, but since then the tax rate has gradually increased. The excise duties on electricity are levied on all electricity consumption in Denmark regardless of the origin (produced abroad, produced in combined heat and power plants, autogenerated, produced by use of coal, fuel oil, wind turbines, etc.). Fossil fuels used for the generation of electricity are exempt from the energy and CO₂ tax. In 1986 a lower tax on electricity used for space heating was introduced. This two tax-rate scheme exists since this time. Permanent residences registered as being heated by electricity and with electricity consumption above 4,000 kWh are charged with a lower tax rate for the share of the consumption above the 4,000 kWh. Since 1992, when the CO₂ tax scheme was introduced, electricity consumption has been charged with a CO₂ tax constituting 0.1 DKK/kWh. The CO₂ tax rate on electricity was reduced to 0.09 DKK/kWh in accordance with the general CO₂ tax reduction in 2005. The latest revision of the electricity tax scheme came into force during 1999 and can be seen as an adjustment in response to the liberalisation of the common Nordic electricity market.

The 1999 reform opened the electricity market to international trade and, at the same time, introduced new environmental regulation (Danish Energy Authorities, 1999 and LOV nr.389 of 2/6 1999). As a consequence of these adjustments, a small distribution tax and a small energy savings tax were added to the excise duty on electricity. In 2002–2004 the 0.566 DKK/kWh (7.62 EURcent/kWh) excise duty on electricity used for other purposes could be split into 3 parts. An energy tax (0.52 DKK/kWh), a distribution tax (0.04 DKK/kWh) and an energy saving contribution (0.006 DKK/kWh) (Danish Ministry of Taxation, 2004a). Table 2.3 below lists the various electricity tax rates for the time period in focus. The Danish authorities have also introduced different subsidy schemes that are meant to support the production of electricity from renewable energy sources. These subsidy schemes are described in a separate section on renewable energy sources below (see Section 2.1.7).

In addition to these tax and subsidy schemes, the Danish authorities implemented a green certificate scheme in 1996. The green certificate scheme was adjusted and strengthened with the 1999 electricity reform. According to the green certificate scheme, all electricity consumers are obliged to buy electricity stemming from renewable energy sources. By the end of 2003, electricity consumers are obliged to buy green certificates (VE-beviser) representing at least 20 percent of their electricity consumption (Law no. 486 of 12/6 1996, and Danish Energy Authority, 1999).

Table 2.3 Excise duties on electricity (EURcent/kWh)

	1985	1990	1996	2000	2002	2005
Energy tax						
Electricity: heating purposes ¹		3.75	4.42	6.32	6.74	6.87
Electricity: other purposes	1.93	4.20	4.89	7.19	7.62	7.74
CO ₂ tax			1.36	1.34	1.35	1.21
TOTAL tax on electricity						
Electricity: heating purposes		3.75	5.78	7.66	8.09	8.08
Electricity: other purposes	1.93	4.20	6.25	8.53	8.97	8.95
Percentages of CO ₂ tax refunded to the industry			50	10	10	40
Energy tax – enterprises ²				0.13	0.13	0.13
Effective electricity tax levied on the industry			0.82	1.34	1.35	0.86

Note: ¹Energy tax on electricity consumption exceeding 4,000kWh (only permanent residence heated with electricity).

²Only the first 15 million kWh in each enterprise is liable to the energy tax. This energy tax (0.01 DKK/kWh) was introduced with the 1999 revision of the electricity tax

Source: IEA, 2004a, pp.112–120 IEA, 2005, p.119–120 and Danish Ministry of Taxation, 2004c: section F3

2.1.4 Excise duties on electricity consumption in the manufacturing industry

Similar to the situation regarding excise taxes on fossil fuels, several exemptions have been adopted in the Danish excise duty legislation to ensure that the competitive power of Danish enterprises is not significantly weakened. First of all electricity consumption for process purposes are almost entirely exempt from the energy tax levied on electricity. Enterprises only pay a 0.01 DKK/kWh energy tax for the first 15 million kWh consumed each year (15 million kWh in each VAT registered enterprise). Electricity consumption exceeding 15 million kWh is not liable to any energy duty. The 0.01 DKK energy tax was introduced with the electricity tax revision in 1999 (Law no.389 of 2/6 1999). However, electricity consumption for space heating purposes in enterprises is charged with the normal electricity energy tax. On top of the reduced energy tax, the CO₂ tax for electricity consumption in the manufacturing industry is also significantly reduced compared with the household sector. Table 2.3 above shows the share of the CO₂ tax refunded to the manufacturing industry.

2.1.5 Excise duties on transportation fuels

Environmental taxes on transportation can be divided into two independent subcategories. Transportation fuels are subject to the energy and the CO₂ tax and, in addition, the acquisition and use of motor vehicles are charged with various vehicle taxes (see Section 2.4).

There is a long-standing tradition in Denmark for levying taxes on fuels intended for transportation. The first tax on transport fuels was already introduced in 1917 and the rates have been increased since (Statistics Denmark, 2004). Until the late 1980s, there were basically two objectives behind the taxes on transportation fuel. The taxes were meant to create revenue and they were also seen as an instrument to control im-

ports of oil. The excise duties on transportation fuels have, however, also been used as a deliberate means to regulate the environmentally harmful effects arising from the consumption of transportation fuel. High transport fuel prices, caused partly by excise taxes, can be expected to reduce the demand for transportation fuel, thereby, reducing exhaust emissions and noise, and consequently the impact on the environment (Nordic Council, 2002). In the late 1980s, the harmful effect of lead in petrol was realised and the transportation fuel tax scheme was used as a means to serve environmental objectives. Unleaded petrol was simply given a tax rebate in relation to leaded petrol, thereby giving consumers an economic incentive to choose unleaded petrol. Excise duties have also been used to secure the best environmental technology at petrol stations. Since 1995 a 0.03 DKK/l tax rebate has been granted to gasoline sold from petrol stations with a vapour recovery system (Statistics Denmark, 2004 and IEA, 2004).

The 2005 revision of the CO₂ tax legislation introduced a CO₂ tax on petrol in order to achieve consistency in the taxation of the different mineral oils. However, the introduction of the CO₂ tax was not intended to increase the overall tax burden on petrol and, therefore, the basic excise charge has been lowered to maintain the level of the overall rate (Danish Ministry of Taxation, 2005b and 2005c). Table 2.4 illustrates the development of the tax rates for the most common fuel types used for transportation, again showing that the total tax burden remained constant since 2002.

It is interesting to compare excise tax rates levied on transport fuels (Table 2.4) with the rates levied on energy products used for heating purposes or for commercial/industrial purposes (Table 2.1). During the second part of the 1980s excise duties have increased considerably, with the exception of the taxes levied on petrol. During the 1990s the nominal tax rates have been raised further, but the increases were very much less dramatic. Nevertheless, tax rates for petrol and diesel increased by around 70 to 80 percent over this period. However, since 2002, the total tax burden on transport fuels, and on energy products used for industrial and commercial purposes as well as for heating purposes, has not been raised.

Table 2.4 Excise duties on transportation fuels (EURcent/l)

	1985	1990	1996	2000	2002	2005
Petrol						
Basic excise charge	28.31	36.91	53.27	60.64	63.52	60.49
unleaded rebate		8.27	8.83	8.72	8.75	8.74
CO ₂ tax on gasoline						2.96
TOTAL TAX – unleaded	28.31	28.64	44.44	51.92	54.77	54.71
Petrol stations with vapour recovery – rebate			0.4	0.4	0.4	0.4
Diesel						
Basic excise charge	4.49	22.4	27.45	34.61	37.14	37.5
light diesel rebate			1.36	1.34	1.35	1.34
CO ₂ tax on diesel			3.67	3.62	3.63	3.23
TOTAL TAX	4.49	22.4	29.76	36.89	39.42	39.39

Source: IEA, 2004a, Danish Ministry of Taxation, 2005b and 2005c

The consumption of transportation fuel by VAT-registered enterprises is not exempt from energy taxes, unlike other types of fuel consumption in VAT-registered enterprises. Only fuel used for public transportation (bus, train, etc.) receives a 100 percent tax refund.

2.1.6 Emission trading

The Danish government is obliged to reduce Danish greenhouse gas emissions by 21 percent during the first commitment period (2008–2012) of the Kyoto protocol. This obligation is both a commitment to the Kyoto protocol and the EU, as this obligation has been formalised in the Council Decision 2002/358/EC. Under the Kyoto protocol framework the Danish government has taken on a considerable emission reduction burden. The “National Allocation Plans” required to be written by all national governments under the EU Emission Trading Scheme (ETS – Directive 2003/87/EC) are intended to reflect the national commitments to the Kyoto protocol and how the total emission allowances are allocated to the economic sectors taking part in the ETS.

The Danish Government set up ambitious emissions targets for the first trading period (2005–2007) under the ETS. The goal for the 357 installations in Denmark covered by the ETS is to reduce the CO₂ emissions by 15 percent compared to the “business as usual” projection of the ETS sectors. ETS sectors are responsible for 45.1 percent of total emissions in 2002 and the sectors are projected to account for 46.2 percent of the total Danish emission in the target period 2005–2007. The emission allowances allocated in the ETS sectors represent a 7.4 percent reduction in the total Danish CO₂ emission. The Danish national allocation plan can, therefore, be seen as a challenging first step toward fulfilling the Kyoto climate objective of the 2008 to 2012 commitment period (21% reduction).

The majority of the emission allowances in Denmark are allocated via the “grandfathering” principle. However, five percent of the total amount of allowances is auctioned off as not all of the emission allowances are distributed in the initial phase of the ETS. A pool of emission allowances is set aside for new installations entering the ETS sectors or increased output in the existing sectors. Parallel with the introduction of the ETS the Danish authorities are revoking the CO₂ taxes on fuels in the ETS covered sectors (Ministry of Environment, 2004).

The Danish energy authorities have already gained some experience with emission quotas. In 1999, the CO₂ Quota Act (Law no. 376, 27/12/1999) for CO₂ emissions from electricity production was introduced. In the period from 2000 to 2003 the electricity generation sector has been granted a smaller emission quota each year. The CO₂ emission quotas have been reduced by 1 million tonnes each year from 23 million tonnes in 2000 to 20 million tonnes in 2003. When exceeding the granted

quota, the power plants have been charged with a 40 DKK/tonnes CO₂ penalty (Law no. 376, 27/12/1999, and Danish Energy Authority, 2005a).

2.1.7 Renewable energy sources and economic instruments

In addition to the to the excise tax scheme, various support schemes have been used by the Danish authorities to regulate emissions from electricity production and to promote renewable energy sources. First of all, several subsidy schemes have been used to encourage the building of power generators which use renewable energy sources. During recent years investment support schemes were revised and currently the construction of windmills no longer receives this financial support. Biogas plants, solar heat installations, heat pumps and bio fuel boilers, however, still receive a significant construction subsidy. The subsidy constitutes up to 30 percent of the construction costs (BEK. no.180, 05/03 1997, and Electrowatt-Ekono, 2002).

The Danish authorities are also granting a subsidy directly for the production of green electricity. In 1991 the Danish Parliament passed a subsidy act granting 0.1 DKK/kWh (the so-called CO₂-dime) to producers of electricity where the electricity from natural gas, biofuels and wind turbines. Electricity produced from biofuels and wind turbines was granted an additional 0.17 DKK/kWh under this act. The subsidy act entered into force in May 1992 (Law no.944, 1991). The subsidy scheme and the rates have been revised several times since 1992 and in 1999 the subsidy scheme underwent a thorough revision. The scheme was changed from a direct subsidy scheme (i.e. feed-in tariffs) to a price agreement scheme linking the subsidy or extra charge for producers of green electricity to the electricity price paid by the consumers. The production subsidy received by electricity producers is no longer financed over the state budget. Instead, the production subsidy is financed directly by the electricity consumers. The overall direction of the subsidy scheme is, however, that the authorities are working towards phasing out the subsidy schemes. In 2005, the production subsidy or extra price on electricity produced by windmills can be divided into 4 categories depending on the period in which the windmill was constructed.

The most generous subsidies are granted to windmills constructed before the year 2000. For the first 10 years of operation, the owners are secured a minimum price of 0.6 DKK per kWh. The energy authorities will grant the differences between the market price and the 0.6 DKK/kWh minimum price. Windmills which are in operation for more than ten years are eligible for a production subsidy constituting 0.1 DKK/kWh for the subsequent 10 years (i.e. until the windmill has been in operation for twenty years) by the authorities. However, the subsidy will be capped if the market price plus the financial support of 0.1 DKK/kWh exceeds 0.36 DKK/kWh. Windmills erected in 2005 constitute the fourth

subsidy category. The windmills in this category are granted a flat rate constituting 0.1 DKK/kWh for the entire 20 year subsidy period (Danish Energy Authority, 2005b, and Danish Environmental Protection Agency, 2004a).

In 2005 combined heat and power plants (CHP) using natural gas are granted a price supplement constituting, on average, a surcharge of 0.3–0.4 DKK/kWh. Older CHP using renewable energy sources (not wind) are granted a price supplement that will secure a minimum price of 0.6 DKK/kWh until 2019. New CHP are only secured a minimum price constituting 0.6 DKK/kWh for the first 10 years after the CHP has been taken into use. For the next 10 years the production of electricity is only secured a minimum price of 0.4 DKK/kWh (Danish Energy Authority, 2005c). In addition to these price supplements, electricity production based on biogas, natural gas and waste are still (in line with the 1991 legislation) granted a production subsidy constituting up to 0.1 DKK/kWh (LBK. nr. 490, 13/06 2003).

In addition to the different subsidy schemes focusing on the production of energy from renewable sources, the Danish authorities also grant funds for research and development. In 2005, 292 million DKK were granted for R&D directed at more efficient energy consumption and improvement of energy sources with reduced environmental impact (Danish Energy Authority, 2005d).

2.2 Economic instruments used in water policy

2.2.1 Introduction

From 1993 to 2002, household water consumption fell by 21 percent and consumption in institutions by 29 percent, whereas commercial consumption experienced a slight rise (DANVA, 2003).

Full-cost recovery in relation to the provision of wastewater services has been a legal requirement since 1992, and the principle also applies in relation to water supply.

2.2.2 User charges for water supply and wastewater services

Municipal drinking water and wastewater services are paid in a single charge made up of a fixed part and a part which varies according to consumption, including the taxation on drinking water and wastewater, discussed below. Where private water supply companies operate, the water supply component is evidently charged separately. The price of combined water services to the consumer varies greatly according to water supply area, ranging from 26.2 DKK to 74.6 DKK in 2003 (DANVA, 2003).

The average cubic meter price for collective water services, as experienced by the consumer, including purchase tax (25 percent) and the taxation on drinking water and wastewater, increased from 18.5 DKK in 1993 to 39.4 DKK in 2003. This doubling in the price of water and sewerage has been due to increased financial contributions to the wastewater area, purchase tax increases and introduction of the taxes on water supply and wastewater services and (DANVA, 2003).

2.2.3 Tax on water supply

A green tax on the supply of water (VOMS) was phased in from 1994, reaching its full rate in 1998, since when the rate has remained stable. The tax is directed at reducing household water consumption (agriculture and industry are not required to pay the tax). The tax is not recycled to the consumer, in the form of e.g. subsidies, or to environmental protection. In 2003, the tax accounted for approximately 13 percent of the average cubic meter price of combined water services (DANVA, 2003).

Table 2.5 Water supply tax (1994 – 2005)

DKK/m ³ (EUR)	1994	1995	1996	1997	1998 – 2005
Water supply tax	1 (0.13)	2 (0.27)	3 (0.41)	4 (0.53)	5 (0.67)

Source: DANVA, 2003

The Danish EPA, in comparing the significant increase in the price of water with the significant reductions in household water consumption from 1993–2003, draw the conclusion that green taxes represent an effective tool in encouraging Danes to save water (Danish EPA, 2003). The Danish Water and Wastewater Association also implicate the taxation (among other factors such as increased environmental awareness among consumers) in the decreased household water consumption experienced in Denmark (DANVA, 2003).

2.2.4 Wastewater tax

A wastewater tax levied on direct dischargers (e.g. industry, municipal wastewater treatment plants) and water received at wastewater treatment plants (e.g. the majority of households) came into effect at the full rates in 1998. Half-rates applied in 1997. Direct dischargers pay the tax directly and households pay via water bills for combined water services. The charges are proportional to the pollution loads. The tax applies to BOD (11 DKK/kg), nitrogen (20 DKK/kg) and phosphorous (100 DKK/kg) or, in cases where treatment plants receive more than 85 percent industrial as opposed to household wastewater, to volume according to treatment type (0.5–3.8 DKK/m³). Reduced rates apply to certain volume consumers. The actual rates of the wastewater tax have remained constant since im-

plementation of the full rates, i.e. from 1998 to 2005 (see, for more detailed discussions, Nordic Council, 2002). The revenue is not directly recycled to the consumer or to environmental protection (Danish EPA, 2005).

The relative importance of the wastewater tax in the average cubic meter price (including VAT) for combined water services, as experienced by the consumer, is presented in the table below. It ranges from approximately 4 percent in the year of introduction, to 1.5 to 2 percent in the following years (DANVA, 2003).

Table 2.6 Wastewater tax component of the average water prices (1998 – 2002)

DKK/m ³ (EUR)	1998	1999	2000	2001	2002
Consumer experienced average water price	30.15 (4.02)	30.34 (4.08)	32.06 (4.30)	33.83 (4.54)	34.67 (4.67)
Wastewater tax component	1.24 (0.17)	0.66 (0.09)	0.60 (0.08)	0.55 (0.07)	0.59 (0.08)

Source: DANVA, 2003

An analysis of the wastewater tax estimates that, overall, nitrogen has been reduced annually by 5 percent, phosphorus by 17 percent and organic matter by 3 percent in the first four years of operation (1997–2000 inclusive). The report also reveals, however, that few actors had yet reacted to the tax, but that substantial savings and pollution reductions had accrued to many of those who had. It may evidently take more time, e.g. for water treatment plants, to implement the necessary process changes (Danish EPA, 2004).

2.3 Economic instruments in the waste area – taxes and charges

3.3.1 Introduction

The Government's current waste strategy (2005–2008) (Danish EPA, 2003a) puts increased focus on the use of economic instruments and the use of environmental and socioeconomic analysis in waste policy planning. The central tenets are reductions in resource loss and adverse environmental impact from waste, the decoupling of growth in waste production from economic growth, as well as improved economic efficiency in waste management processes and the sector as a whole.

From January 1997, a ban has been in operation with regard to the landfill of waste suitable for incineration. This has been instrumental in part of the 66 percent decrease in landfill over the last decade. Recycling has remained the most important treatment method, currently accounting for approximately two-thirds of the total of waste treated, while incineration has remained relatively stable.

Table 2.7 Development in treatment of waste (1994 – 2003 plus 2008 target)

Percent	1994	1998	2003	2008 (target)
Recycling	56	62	66	65
Incineration	20	22	26	26
Landfill	24	15	8	9
Special treatment	1	1	0	0
Storage	0	0	1	0
Total	100	100	100	100

Source: Danish EPA, 2003a

2.3.2 Municipal waste charges

The full cost principle, i.e. that the costs associated with operating the service should be balanced by the revenues accruing to the system over a number of years, has tacitly applied for some time and was legally enforced in the 2001 Environmental Protection Law. The polluter pays principle and an equity principle are called for via legislation, the latter implying that it should be visible that waste producers receiving the same services pay the same charges and that everyone has equal opportunities to inform themselves with regard to waste management.

Differentiation of municipal waste charges according to the pressure on the service has been encouraged by the national government such that a significant number of municipalities differentiate charges according to, for example, weight, volume or service frequency to promote local authority recycling schemes. Charges may also be differentiated in relation to use of home-composting schemes. This differentiation may evidently be a key factor in that user charges for municipal waste services vary considerably from one municipality to another (Table 2.8 below). According to Christensen (2001), in 1997, in the quarter of the municipalities included in the study⁹ where the charges were lowest, average charges for a private household averaged at 750 DKK. In the quarter where the highest charges were levied, the average was 1,240 DKK. In 2001, these figures rose to 851 DKK and 1,428 DKK (1997 prices), respectively.

Table 2.8 Development and variation in household waste charges

DKK/ton	1997	2001 (1997 prices)
1st quartile – lowest	750	851
4th quartile – highest	1240	1428

Source: Affaldssektorens politiske organisering, Christensen, 2001

The latest national waste strategy (2005–2008) highlights the need for greater transparency in municipal waste charges to permit, among other things, the differences between and within municipalities to be more fully

⁹ (n=181 out of the 275 municipalities)

explained. This would enable the extent to which the equality and polluter pays principles apply, in practice, to be revealed (Danish EPA, 2004b).

2.3.3 Waste tax

The tax on waste sent to landfill or incineration was introduced in 1987 and the tax rate has remained stable since 2003 (Table 2.9), with higher rates applying to landfill than incineration since 1993. The tax is designed to promote the recycling of waste, first and foremost, but also to promote incineration over landfill. Lower rates applied for incineration with energy recovery than without from 1997, but this differentiation was removed in 2001. The waste tax does not apply to hazardous waste.

Table 2.9 Waste tax rates 1987 – 2005

DKK (EUR) per tonne	1987 (intro'd)	1993	1997	1999	2003–2005
Incineration with energy recovery	40 (5.1)	160 (21.1)	210 (28.1)	280 (37.7)	330 (44.4)
Other incineration			260 (34.7)	330 (44.4)	
Landfill	40 (5.1)	335 (44.1)	335 (44.8)	375 (50.4)	375 (50.5)
Landfill of residual waste (slag and fly ash) ¹				210 (28.4) (intro'd Jan. 1998)	

Source: 1987–2003 figures – Danish EPA, 2004a; and 2005 figures – Danish Ministry of Taxation, 2005h

2.3.4 Hazardous waste charges

Hazardous waste is disposed of at special treatment plants, e.g. the inter-municipal hazardous waste treatment plant “Kommunekemi”. The treatment of hazardous waste is subject to full cost recovery, and is exempt from the waste tax and varies according to the type of hazardous waste (Nordic Council of Ministers, 2002).

2.3.5 Heat from waste tax (*affaldsvarmeafgiften*)

The tax on heat produced for district heating systems via waste incineration has been in force since 1 January 1999. The tax has been introduced to ensure that the incineration of waste is not favoured tax-wise over use of conventional fuels as waste incineration plants are exempt from the CO₂ tax (Waste Centre Denmark, 2004). The rate in 2003 was 12.90 DKK/GJ of heat measured or 110 DKK per tonne of waste if heat is not measured. Other rules apply for plants which combine waste with other fuels to produce heat (Secretariat for Legal Information – http://www.retsinfo.dk/_GETDOC_/ACCN/A19980043730). Incineration companies have handled the heat from waste tax differently in that a number of

plants have had to pass the tax on, either in full or in part, to the waste producers (Danish EPA, 2002).

2.3.6 Weight- and volume-based packaging taxes

Municipalities are responsible for the collection of packaging from households, which is financed by user charges. Packaging taxes, however, have existed in various forms since 1978, while the current weight-based taxes were introduced in 1999.

From 2001, the weight-based packaging tax was revised to take account of the relative environmental impact and weight of the packaging types rather than relative fiscal equality and has since remained stable (see, for a detailed discussion, Nordic Council of Ministers, 2002). Rates have remained stable from 2001–2005.

Since February 2004, the volume-based packaging tax on beverage containers has been differentiated to distinguish between containers for wines and spirits and those for beer and carbonated drinks, with lower rates applying to the latter than previously. Rates for wines and spirits have remained the same since 1999, ranging according to size between 0.15 DKK (card/laminate) and 0.25 DKK per unit (other materials) to 2.00 and 3.20 DKK, respectively (see, for more details, Nordic Council, 2002).

Table 2.10 Volume-based tax rates for beer and carbonated beverage containers 2004–2005 (separated from other beverage containers, e.g. wines and spirits, in February 2004)

DKK	< 10 cl	10–40 cl	40+–60 cl	60+–110 cl	110+–160cl	>160 cl
All material types	0.05	0.10	0.16	0.32	0.48	0.64

Source: Danish Ministry of Taxation, 2004d

2.3.7 Tax rates for carrier bags

The tax on carrier bags came into effect in 1994 and has increased only very slightly over the past decade, remaining stable since 2001. PVC film used in food packaging has also remained the same, at 20.35 DKK/kg since 2001.

Table 2.11 Tax rates for carrier bags

DKK/kg (EUR/kg)	1996 – 1997	2001 – 2005
Paper bags	9.00 (1.2)	10.00 (1.3)
Plastic bags	20.00 (2.7)	22.00 (2.7)

Source: Danish Ministry of Taxation, 2004d and Danish EPA, 2004a

2.3.8 Tax on disposable tableware

The tax was introduced in 1982 and was based on value (i.e. 50 percent of the wholesale price). In 2001, the tax came to be based on weight and the rate of 19.20 DKK/kg remains unchanged to date.

2.3.9 Charges and subsidies on batteries

The tax on nickel-cadmium batteries was introduced in April 1996. The tax applies to loose batteries and those sealed inside products. Rates have remained stable at 6 DKK per single battery or 36 DKK per pack for round cells joined in a unit (see, for a detailed discussion, Nordic Council, 2002).

A system of charges has also been in place since 1996 for lead accumulators. The rates since 1996 have been as follows:

Table 2.12 Charges on lead accumulators (1996 – 2005)

DKK (EUR) each	1996 – 2000	2001 – 2005
Under 100 Ah (to start engine)	12 (1.6)	6 (0.8)
Over 100 Ah (to start engine)	24 (3.3)	12 (1.6)
Other types	18 (2.4)	9 (1.2)

Source: Told og Skat - <http://www.erhverv.toldskat.dk/ToldSkat.aspx?oID=110811&viD=200734&i=700&action=close#110811>

The Danish EPA administers a subsidy scheme associated with the collection of nickel-cadmium batteries for recycling. The rate is 120 DKK/kg (excl. purchase tax) to professional collectors (Danish EPA, www.mst.dk). A collection scheme for lead accumulators, on the other hand, is administered by a private operator, “Foreningen til indsamling af blyakkumulatorer i Danmark” (RETURBAT®), and a rate of 0.97 DKK/kg applies. The revenue from the charges on lead accumulators finances the scheme – i.e. covers the costs associated with the collection and recovery of lead from the lead accumulators.

2.3.10 Charges and subsidies on tyres

The Government entered into an agreement with tyre and auto branch organisations, the recycling branch organisation, Genvindingsbrancherådet, and local authority bodies concerning a collection system for scrap tyres in 1995. The charges on new, retreaded and used tyres have been in existence since this time and the rates have remained unchanged, ranging between 8 DKK for a new or used tyre (4 DKK if re-treaded) for smaller passenger vehicles up to 180 DKK per tyre for the largest size category.

In 2001, a system of charges and subsidies on the utilisation of used tyres was introduced. The subsidies apply to scrap tyres for production of rubber granules (or incineration with energy recovery on the island Bornholm) at rates of 1.20 DKK per kg to 1.60 DKK per kg, according to the

size of tyre. The charges are administered by the taxation authorities, while responsibility for the subsidy scheme lies with the Danish EPA. The subsidy scheme is administered by the private operator “Dækbranchens Miljøfond”.

The current waste strategy’s aim for 2008 is that 90 percent of scrap tyres be recycled or re-used, with incineration only in cases where recycling or re-use is not possible (Danish EPA, 2003a).

2.3.11 Tax on PVC and phthalates

The tax was introduced in July 2000 with tax rates based on a product’s PVC or phthalate-content, at a rate of 2 DKK per kg PVC and 7 DKK per kg phthalates. On this basis, rates are calculated for a range of different products, e.g. 0.05 DKK per plastic wallet containing soft PVC (reduced to 0.02 DKK if phthalates have not been used), 3.60 DKK per kg for gloves containing soft PVC (reduced to 1.08 DKK). The rates have remained unchanged to date, however, the tax was removed from rigid PVC in 2004 on the basis that collection and recycling schemes operate for a range of construction products containing hard PVC. Two further products, however, were added, namely plastisol-coated steel-plate and mountings (Ministry of Taxation, 2005h).

2.3.12 Tax on chlorinated solvents

A tax on tetrachloroethylene, trichloroethylene and dichloromethane has been in place since 1996 at rate of 2 DKK per kg (Danish Ministry of Taxation, 2004e) (see, for more detailed discussion, Nordic Council, 2002).

2.3.13 Tax on CFCs and other greenhouse gases

The tax was implemented in 2001 and is levied on chemical substances used in the production and maintenance of CHP-pipes, refrigeration products, spray-cans, etc. Different rates apply for different gases within the categories listed in the table below. The level of the charge relates to the gas’s global warming potential (see Nordic Council, 2002). The maximum rate of 400 DKK/kg has remained the same in the 2004 amendments, however, rates for four gases (all with lower global warming potentials) have decreased and rates for 11 gases (mostly more important greenhouse gases) have increased.

Table 2.13 Tax rates on CFCs and other greenhouse gases

DKK/kg (EUR/kg)	2004 – to 29/2	1/3/2004 – 2005
CFCs	30	30 (4.0)
HFCs	14–400	12–400 (1.6–53.8)
PFCs	177–400	192 – 400 (25.8–53.8)
Halons	30	30 (4.0)
Perfluoro-compounds	400	400 (53.8)
SF ₆	400	400 (53.8)

Source: Danish Ministry of Taxation, 2004f

2.4 Other economic instruments in the waste area

2.4.1 Introduction

An amendment to the Environmental Protection Law in 1993 allowed for establishment of legislation to implement producer responsibility in Denmark, however, producer responsibility in relation to Danish legislation has mainly arisen via voluntary take-back schemes, often supported by regulation on collection and financing, hereunder, state-regulated charges and fees and subsidies. The mineral oil branch has, for example, established a voluntary scheme for the collection of waste oil. Producer responsibility has, however, now been implemented in Danish legislation, e.g. in response to the Directive on ELV (Danish EPA, 2003).

2.4.2 Deposit-refund system for beer and carbonated soft drinks containers

The deposit-refund system for refillable beer and carbonated drinks bottles dates back to the early 1900s. From September 2002, the system also extends to beer and soft drinks in non-refillable bottles, as well as cans, if they are registered with Dansk Retursystem A/S, the branch organisation responsible for operating the system since the year 2000. The sale of beverages in cans was permitted in Denmark for the first time in 2002, and the market-share for cans is estimated to rise to 13 percent in 2005 and 16 percent in 2006. In April 2005, the deposit-refund system was extended further to include cider, energy drinks and Ready-to-Drink beverage containers.

The national government sets the rates for the deposit system, and has recently lowered them by around one-third to reduce the price difference between beverages purchased at home and abroad. The current rates for the deposits/refunds are as follows:

Table 2.14 Deposit-refund rates for refillable and non-refillable beverage containers

DKK (EUR)		From 12/2/2004
Glass – refillable	up to 0.5	1.00 (0.13)
	over 0.5	3.00 (0.40)
Plastic – refillable	under 1	1.00 (0.13)
	exactly 0.5	1.50 (0.20)
	over 1	3.00 (0.40)
Glass, plastic, cans – non-refillable ¹	under 1	1.00 (0.13)
	exactly 0.5 (plastic)	1.50 (0.20)
	over 1	3.00 (0.40)

¹ non-refillable charges introduced in 2002

Source: Dansk Retursystem – [“Pantsatser”](#)

In 2003, return percentages were 99 percent and 80 percent for refillable and non-refillable beverage containers, respectively (Dansk Retursystem, 2005). The return rate for refillable containers evidently fulfils the legal return requirement of 98 percent, however, for non-refillable containers some improvement would have been required to reach the required return rate of 95 percent by 1 January 2005.

2.4.3 End-of-life vehicles (ELV)

Producer responsibility on ELV dates from implementation of the EU ELV Directive in Denmark in 2002. The refund rate for vehicles, de-registered after July 2002, returned to an authorised car breaker, is currently 1,750 DKK. Prior to this, the rate was 1,500 DKK (from July 2000 to July 2002). The vehicle breakers yard subtracts the fee for dismantling the vehicle for recycling out of this sum, generally leaving a residual sum to be paid to the former owner.

2.4.4 Waste electrical and electronic equipment (WEEE)

In response to the EU Directive on WEEE, producer responsibility, whereby waste treatment costs are included in the price of the electrical and electronic products, is expected to come into force in Denmark in April 2006. The costs represented by this new component have been estimated to amount to 0.2 to 3.0 percent of the consumer purchase price (Danish EPA, 2003a). Prior to this, municipal schemes operate to collect these products from households, financed by municipal waste charges (Danish EPA, 2003a).

2.5 Economic instruments related to agriculture and natural resources

Denmark is one of the few EU Member States where economic instruments have been implemented in the field of agriculture. As early as 1986 the Danish Government had implemented a levy on pesticides which was subsequently comprehensively revised in 1996 (Nordic Council, 2002). Since the 1996 revision the *ad-valorem* tax is measured in percent of the wholesale price and is differentiated between types of pesticides ranging from a 3 percent rate for wood preservatives up to a 53 percent rate for insecticides. However, the tax rates are not set in accordance with the scale of the environmental risk of the individual products. The tax revenues are hypothecated and are either channelled back into the agricultural sector or are used for research or pesticides monitoring programmes.

A tax on nitrogen (N-tax) in artificial fertilisers was implemented in 1998 as a follow-up to the second action plan for the aquatic environment. The rate is measured per kilogram nitrogen, but is only levied on artificial fertilisers with a nitrogen content exceeding 2 percent. The rate is set at 5 DKK/kg N and has not been changed since the introduction of the tax. The purpose of the tax is twofold, 1) to give sectors other than agriculture an incentive to reduce the use of nitrogen (as the use of nitrogen in agriculture is regulated by command and control instruments), and 2) to hinder that farmers bought fertiliser not registered in the farmers mandatory fertiliser account (registration in the fertiliser accounts is a condition for exemption from VAT and the N-tax). The third economic instrument, a tax on growth promoters, in the agricultural field was also introduced in 1998. The aim of this tax is to reduce growth promoters, i.e. additives in fodder, by 50 – 70 percent and the tax rates are differentiated according to the different additives used (see Nordic Council, 2002).

The most recent tax in this field was the introduction of a new tax on phosphorous in feed in 2005. The tax is imposed on mineral phosphorous when used in animal feed phosphates, with the exception of pet food. The tax rate is 4 DKK per kg mineral phosphorous and it is planned that all revenues are to be recycled back to the agricultural sector by reducing the land tax for farms, horticultural establishments, nurseries and fruit orchards. Denmark can still be seen as a forerunner with regard to environmental taxation in this area as this tax is the first of this type in Europe.

Since 1990 a tax levied on the extraction of raw materials has been in place in Denmark. However, the tax rate, fixed at 5 DKR per m³ of raw material extracted, has not been revised since its introduction (Nordic Council, 2002).

2.6 Economic instruments related to transport

As mentioned in Section 2.1.5, transport related taxes can be distinguished between taxes levied on transport fuels and taxes levied on vehicles. This chapter deals with the second type of tax.

The taxes levied on motor vehicles are subdivided into a registration tax and an annual circulation tax. The registration tax (or passenger car tax) is a tax on the purchase price of new motor vehicles. In 2005, ordinary passenger cars are charged with a 105 percent tax of the gross value below 62,700 DKK and 180 percent tax of the remaining value of the car. Table 2.15 shows the development of the passenger car tax scheme since 1985.

Motor vehicles used for freight transportation such as delivery vans and heavy-duty trucks are exempt from the passenger car tax. Instead, these types of vehicles are charged with a different and a significantly lower registration tax. In 2005, non-passenger vehicles weighing below two tonnes are charged with a 95 percent duty for the value above 15,100 DKK, while the value below 15,100 DKK is free of a charge. Trucks weighing above two tonnes are charged with a 60 percent tax for the value above 12,100 DKK, while the value below 12,100 DKK is free of a charge (Danish Ministry of Taxation, 2005d).

The high registration tax on passenger cars in Denmark has been debated intensively during the past couple of years. The registration tax is accused of not creating adequate economic incentives for environmental behaviour. Due to the new technology more environmentally-sound passenger cars are often more expensive than similar sized cars without technology designed to reduce environmental impact. The higher price of these “greener” cars causes a higher tax payment on these vehicles making them even more expensive than cars built on conventional technology. In this way, therefore, the registration tax scheme can be seen not support progress towards “greening” the fleet of cars in Denmark. Even though there is an overall political agreement on the distorting environmental effects of the registration tax scheme, it has proven difficult to change. The registration tax creates significant revenue (around 18 billion DKK projected in 2005 – see Table 2.16) and changes in the registration tax therefore have the potential to cause fiscal imbalances in the government budget (Danish Ministry of Taxation, 2005e).

Table 2.15 Registration tax rates for passenger cars (EURO)

	1985	1990	1996	2000	2002	2005
105 percent tax of value below:	2,295	2,342	4,674	7,110	7,725	8,428
180 percent of value above	2,295	2,342	4,674	7,110	7,725	8,428

Source: LBK. nr. 977 of 02/12/2002 Danish Ministry of Taxation, 2005d

Until 1997, the annual vehicles tax was set up as a duty based on weight with light vehicles being charged a lower duty than heavy vehicles. However, this scheme was revised in the past and currently only vehicles registered before 1997 are subject to this scheme. In 2005, owners of a vehicle registered before 1997 weighing below 600 kg are facing an annual vehicle tax amounting to 1,700 DKK while a vehicle weighing between 1,501 and 2,000 kg is charged with a 4,780 DKK tax (Danish Ministry of Taxation, 2005f).

The annual tax on vehicles registered after 1997 is known as “the owners green tax” and is based on fuel economy rather on weight, i.e. the tax is based on the number of kilometres driven per litre of transport fuel. In 2005 the annual tax rates are as low as 520 DKK for petrol driven vehicles driving more than 20 km/l and as high as 18,460 DKK for petrol driven vehicles driving less than 4.5 km/l. For diesel propelled vehicles, the lowest yearly tax rate is 160 DKK for vehicles driving more than 32.1 km/l and the highest tax rate is 25,060 DKK for vehicles driving less than 5.1 km/l (Danish Ministry of Taxation, 2005g).

In addition to the national vehicle tax legislation, the Danish Government is participating in the Eurovignette system, i.e. a common system of user charges for heavy goods vehicles above 12 tonnes which was introduced in 1994. The Eurovignette is a cooperation between Germany, the Netherlands, Belgium, Luxemburg, Sweden and Denmark. However, Germany left the Eurovignette system in 2003. The intention of the Eurovignette was to create equal economic opportunities for companies transporting goods across the Eurovignette area (Danish EPA, 2004b). The system fixes the maximum level for user charges which are set in accordance with the environmental performance of the vehicle.

2.7 Economic instruments implemented in other areas and revenues from environmental areas

During recent years Denmark has made use of the flexible mechanism for buying emissions quotas and credits abroad as a mean to achieve the required GHG emission reduction agreed under the Kyoto Protocol. Agreements for such projects have already been signed by the Danish Government with their counterparts in Bulgaria, Estonia, Latvia, Moldova, Romania, and Ukraine.

Currently the commercial aviation sector does not face any transport related taxes in EU Member States although discussions with regard to taxation of aviation fuels or the implementation of emission trading quotas in this sector are ongoing. Other forms of economic instruments are however in place in this sector (see Nordic Council, 1999 and 2002). Denmark introduced a duty on certain flights in 1998. The tax rate is set at 75 DKK per passenger and all passengers starting a flight from a Dan-

ish airport are liable to the tax, with the exception of passengers flying to Greenland and the Faroe Islands. As the tax is levied on a passenger basis it cannot be classified as a form of environmental taxation as compared to landing charges, as introduced in the neighbouring countries, which are differentiated according to noise or emission levels (Nordic Council, 2002).

Environmental tax revenues measured as a share of GDP are of significance in Denmark, in particular when compared to the situation in other EU Member States (Eurostat, 2004) as reported in Table 2.16. The share of GDP increased from 3.3 percent to 4.6 percent in 2002 and has reduced slightly since. This reduction can partly be attributed to the fact that the main revenue-generating taxes, i.e. those levied on energy products, have been kept constant since 2002.

Revenues generated from energy taxes account for the largest share of all environmental taxes in Denmark (around 55 percent of total environmental tax revenues in 2005) as illustrated in Table 2.16. However, the share of transport related taxes is very large (39 percent), in particular when compared with the situation in other EU Member States where the share amounts to around 20–22 percent (Eurostat, 2004 and EEA, 2005a). The share of revenues generated by pollution and resource taxes is slightly higher in Denmark, on average, than in other EU Member States (6 percent as compared to less than 5 percent).

Table 2.16 Revenue from environmental taxes and charges in selected year (million DKR)

	1990	1995	2000	2002	2005 ¹
ENERGY TAXES					
Tax on coal	851	602	1,317	1,508	1,600
Tax on electricity	4,380	4,482	7,820	8,241	8,575
Tax on gas	39	50	-	-	-
Tax on natural gas	-	-	2,647	3,794	3,850
Tax on certain petroleum products	3,136	5,411	6,642	7,141	7,775
Tax on petrol	5,744	7,387	10,074	10,432	9,825
CO ₂ tax	-	3,210	4,819	4,728	5,124
TOTAL ENERGY TAXES	14,151	21,142	33,319	35,844	36,749
TRANSPORT RELATED TAXES					
Weight duty	4,363	4,404	6,930	7,943	8,320
Registration tax	8,007	14,967	14,122	14,487	17,740
TOTAL TRANSPORT TAXES	12,370	19,371	21,052	22,430	26,060
POLLUTION AND RESOURCE TAXES					
Sulphur tax	-	-	198	119	135
Tax on disposable tableware	74	61	65	-	-
Packaging tax	399	479	772	971	870
Tax on CFC	27	2	0	58	55
Tax on chlorinated solvents	-	-	2	1	1
Tax on pesticides	12	11	375	371	379
Tax on specific growth stimulants	-	-	0	0	0
Tax on waste	404	619	999	1,090	983
Tax on raw materials	129	135	182	157	155
Tax on waste water	-	-	276	265	180
Tax on pipe water	-	654	1,555	1,432	1,420
Tax on nickel/cadmium batteries	-	-	23	21	15
Tax on PVC and Phthalates	-	-	26	60	45
Tax on nitrogen (fertilisers)	-	-	29	27	25
TOTAL POLLUTION AND RE-SOURCE TAXES	1,046	1,961	4,502	4,572	4,263
TOTAL ENVIRONMENTAL TAXES	27,567	42,474	58,873	62,846	67,072
GDP	825,300	1,009,800	1,280,800	1,360,700	1,525,886
Environmental tax revenues as a percentage of GDP	3.3	4.2	4.6	4.6	4.4

Note: ¹ forecast

Source: Ministry of Taxation (different years)

3 Estonia

3.1 Economic instruments related to energy consumption and air pollution abatement

3.1.1 General introduction

Power and heat production based on the combustion of fossil fuels (oil shale, heavy fuel oil, natural gas) and imported motor fuels represents the main source of national greenhouse gas emissions, as well as sulphur dioxide and particulate emissions, in Estonia. A characteristic of the Estonian energy sector is its heavy dependence on oil shale, especially in relation to electricity production. In 2003, the share represented by oil shale in primary energy supply was 64.7 percent, representing an increase of 4.8 percent compared with the previous year. The shares of other local fuels – wood and peat – diminished slightly, accounting for 9.7 percent and 1.1 percent, respectively. In 2003, local energy resources, therefore, accounted for 75.5 percent of primary energy consumption (Ministry of Economic Affairs and Communications, 2003).

Electricity production was 10,159 GWh in 2003, representing an increase of 19.1 percent over the previous year. Domestic consumption also increased considerably (to 6,013 GWh, or 5.8 percent). It is, moreover, of note that electricity export – net export – increased by a factor of 2.7 to 1,896 GWh. The increase in electricity production was based mainly on electricity produced from oil shale, which rose to 92.5 percent in 2003. The share of gas in electricity production decreased to 5 percent as compared with 6.1 percent in 2002.

One remarkable development has been the growth in hydropower and wind energy production from 7 GWh in 2002 to 19 GWh in 2003, although production capacities remain relatively small.

3.1.2 Excise duties on fossil fuels

Estonia has already implemented the requirements of the Energy Products Taxation Directive (2003/96/EC) by amendment of the Mineral Oils Excise Duty Act which entered into force on 1 January 2005 and on 1 May 2005. Changes in 2005 included a 12.5 percent increase in the excise duty on gas oil for specific purposes (agriculture, fishery, forestry, heating). From 1 May 2005, an energy tax was imposed on shale oil and on energy products such as coal, coke and lignite. Taxation of electricity is required under the Energy Products Taxation Directive. However, Estonia has a

transition period until 2010, at which time this form of energy taxation must be introduced.

In 2005, Estonia received permission from European Commission to exempt biofuels from excise taxes. The permission had to be applied for, as it is considered as a state aid.

The Commission decided that Estonia has the right to fully exempt from excises following items:

- non-synthetic biodiesel;
- vegetable oils produced from biomass;
- bioethanol produced from agricultural or vegetable-based products.
- In case biofuel is mixed with fossil fuel (e.g. rape fuel mixed with fossil diesel fuel), the tax exemption is only applied for the share of biofuel in the mix.

Based on Directive 2004/74/EC (amending Directive 2003/96/EC as regards the possibility for certain Member States to apply, in respect of energy products and electricity, temporary exemptions or reductions in the levels of taxation), transitional periods for various energy products apply in the case of Estonia. The most important transitional periods are:

- Estonia may apply a transitional period until 1 January 2010 to adjust the national level of taxation on gas oil and unleaded petrol used as propellant to the minimum levels stipulated in the Energy Taxation Directive.
- Estonia is allowed to apply a total exemption to taxation of oil shale until 1 January 2009. Until 1 January 2013, furthermore, Estonia may apply a reduced rate in the level of taxation of oil shale, provided that it does not result in taxation at below 50 percent of the relevant Community minimum rate from 1 January 2011.
- In addition, Estonia may apply a transitional period until 1 January 2010 to adjust the national level of taxation on shale oil used for district heating purposes to the minimum level of taxation. The same period also applies to conversion of the Estonian current input electricity taxation system into a system based on outputs. However, in-depth discussions have yet to take place with regard to the design of the new system.

Table 3.1 Excise rates on mineral oil products, coal and electricity

Energy Product	2004	2005
Light fuel oil (EUR/1000 litres)	26.8	44
Heavy fuel oil (EUR/ton)	12.7	15
Kerosene (EUR/1000 litres)	245.4	302
Coal and coke (EUR/ GJ gross calorific value)	0	0.3
Electricity	0	0

Source: Ministry of Finance, Estonia.

All revenues from excise taxes are allocated to the state budget and are used for general purposes. Air-related pollution charges also go directly to the state budget, but will be distributed for environmental purposes (see for further discussion: Section 3.8 Environmental Funds – EIC).

3.1.3 Excise taxes on transportation fuels

All motor fuels are subject to excise taxes as shown in Table 3.2.

Table 3.2 Excise rates on motor fuels in Estonia (EUR/1000 litres)

Energy Product	2004	2005
Petrol unleaded	287	287
Petrol leaded	337	421
Aviation petrol	72	72
Gas oil / diesel	245	245
Gas oil for specific purposes	26.8	44
		62 from January 1, 2006
Liquid petroleum gas	100	100
Kerosene	245	302

Source: Ministry of Finance.

Some exceptions concerning excise taxes on transport fuels as well as on energy products used for other purposes exist. The main exemptions are:

- fuels used in commercial aviation;
- shale oil used for district heating;
- fuels used in commercial ships inside EU borders and in fisheries outside EU borders;
- fuels that are used by professional users of chemicals (who are registered in the Business Registry) in their business activities for uses other than as motor or heating fuel.

3.1.4 Financial incentives for renewables

The Estonian Electricity Market Act establishes the rules of the purchasing obligation which relates to electricity produced from renewable sources. A network operator must purchase electricity generated from renewable energy sources from a producer connected to the network in an amount which does not exceed the network losses of the network operator during the trading period. The network operator must purchase the electricity at the price of 5.18 EURcents per kWh set by the Electricity Market Act.

As of June 2005, how state support for renewables will develop in the future is not clear. The Ministry of Economic Affairs and Communication is planning to amend the Electricity Market Act, fixing the current purchasing price of 5.18 EURcents per kWh for the next ten years. However, the state would cancel this support when the total capacity of renewables will reaches to 100 MW. The current situation is that the state supports 59

percent of the current purchasing price, amounting to around 3.07 EUR-cents per kWh. The reason for having introduced the 100 MW ceiling is based on government claims that projected investments in the wind energy market are too high. However, the RES-E producers claim that such developments contradict Estonia's goal of promoting renewable energy.

3.1.5 Emission trading scheme (ETS)

According to the EU-ETS every combustion installation with a capacity over 20 MW is requested to have an allocation of a specific amount of emission allowances. The emission allowances have been confirmed in the Estonian National Allocation Plan (NAP) for the years 2005–2007, which has been approved by the European Commission. The allocation plan, the list of companies and other information about ETS implementation in Estonia is available on the web-site of the Estonian Ministry of the Environment at <http://www.envir.ee>.

Grandfathering is the only method of allocating emission allowances to companies under the Estonian National Allocation Plan by taking into account the production technologies employed now and in the future. The National Allocation Plan is quite flexible and rather favourable for Estonian companies, providing sufficient opportunities for introduction of energy saving measures and, therefore, selling CO₂ allowances.

In Estonia, the emission trading scheme covers 43 installations (including groups with several combustion installations), all of which being included in the scheme on a mandatory basis. The state allocated 56.3 million tonnes of CO₂ equivalents to the installations covered by allocation during the three year period, which adds up on average to 18.9 million tonnes per year. This amount also includes a 1 percent reserve for new entrants (i.e. around 568,590 thousand tonnes). The total, therefore, amounts to 56.859 million tonnes. The state has decided to allocate the allowances for the installations free of charge, so no auction will take place.

The sectors covered by the scheme in Estonia are; energy activities (36 installations), mineral industry (5 installations), and pulp and paper (2 installations). The Estonian energy monopolist, Eesti Energia AS, has approximately 48,733 thousand tonnes of emission allowances, which represents approximately 85.8 percent of total Estonian allowances. The adjacent companies Nordic Cement AS and the heat producer, Dalkia, have been allocated 2,330 thousand tonnes and 1,410 thousand tonnes of emission allowances, respectively, indicating that around 93 percent of all allowances are allocated to only three companies.

3.1.6 Air pollution charges

Various air pollution charges have been established in Estonia. The obligation to pay pollution charges can be replaced with an obligation to fi-

nance environmental protection measures, if a company decreases pollution or waste by at least by 25 percent. It is planned to decrease that share to 15 percent in the new Pollution Charge Act. The reason for this policy is linked to the fact that companies' environmental performance, in general, is improving and therefore further environmental improvement will be more expensive. The target should be set lower, therefore, to motivate further investments.

The development in the rates of various air pollution charges are presented in Table 3.3. The Estonian Ministry of the Environment is working according to the self-imposed rule that the rates should be fixed for numerous years in advance, so that the companies can take these expenses into account when making decisions on planning and investment.

As it can be seen, the charges for the majority of the pollutants have increased by around 20 percent per annum during the period 1999–2005. The only considerable exception is the carbon dioxide charge. This charge was only implemented in 2000 and the government decided not to increase the charge during the first years of introduction to allow companies to become accustomed to the charge. After introduction of the charge in the year 2000, the rate was increased by 50 percent in the following year, but kept constant thereafter until 2004. In 2005, however, the rate was again increased by 50 percent to 0.72 EUR per ton CO₂.

Table 3.3 Air pollution charge rates (EUR per ton of pollutant)

Pollutant	1999	2000	2001	2002	2003	2004	2005
Sulphur dioxide (SO ₂)	2.95	3.54	4.24	5.06	6.09	7.31	8.78
Carbon monoxide (CO)	0.42	0.51	0.61	0.71	0.90	1.03	1.28
Nitrogen oxides (NO _x)	6.76	8.10	9.72	11.67	13.97	16.79	20.19
Carbon dioxide (CO ₂)		0.32	0.48	0.48	0.48	0.48	0.72
Particulates	2.95	3.54	4.24	5.06	6.09	7.31	8.78
Volatile organic compounds(except for mercaptans)	2.74	3.30	3.97	11.67	13.97	16.79	20.19
Mercaptans	7,298	8,717	10,541	11,595	12,754	15,433	16,976
Heavy metals and their compounds	107.1	127.9	154.7	185.6	222.8	267.4	320.8

Source: Pollution Charge Act and Act Amending Pollution Charge Act.

The rates presented in Table 3.3 are subject to multipliers, the size of which depending on the location of the pollution source. The rates will be increased as follows:

- 1.2 times for stationary pollution sources situated in municipalities bordering the Narva river, in the case where pollution is emitted higher than 100 meters from the ground;
- 1.5 times for stationary pollution sources situated in the following Estonian cities: Jõhvi, Kiviõli, Kohtla-Järve, Narva, Sillamäe and Tartu;

- 2 times for stationary pollution sources situated in the Estonian capital city Tallinn;
- 2.5 times for stationary pollution sources situated in the following Estonian cities: Haapsalu, Kuressaare, Narva-Jõesuu, and Pärnu.

Also, further increases to charges apply, regularly called non-compliance fees, if a company emits pollutants without permission or if the emissions are higher than the limits established in the permits. The rates increase as follows:

- 5 times for CO and particulates;
- 10 times for SO₂, NO_x, volatile organic compounds and mercaptans;
- 100 times for heavy metals and their compounds.

As mentioned above, the carbon dioxide (CO₂) charge was introduced in Estonia in the year 2000. This charge is paid by energy companies with combustion installations with a rated thermal input exceeding 50 MW. For this reason, large energy enterprises and the Ministry of Economic Affairs and Communications objected to the current criteria for charging on CO₂ emissions arguing that the pollution charge decreases the competitiveness of big energy companies and provides unreasonable advantages to smaller producers, who, in total, do not pollute less. As an alternative, a proposal for introducing an energy tax paid by consumers and levied on all fuels and electricity has been put forward. Furthermore, the implementation of the carbon tax (CO₂-tax) with a broad tax-base and high charge rates affecting all sectors of the economy would be justified if the aim and the use of the revenues generated from the tax is communicated to the wider society. Revenues should be used for investments into best available energy saving and environmental technologies and measures.

In the proposal of the new Pollution Charge Act, it is planned to widen the base of the CO₂ charge so that all energy producers are liable to the charge, eliminating the current unfair advantage to small energy producers and encouraging them to utilise alternative energy sources. Incineration of biomass and peat is not subject to the CO₂ charge and the generation of energy from waste is also exempt from the charge.

3.2 Economic instruments used in water policy

3.2.1 Introduction

The policy of protection and use of Estonian water resources aims at achieving sustainable use and good ecological status for water. In general, over the period 1994–2000 the ecological status of water bodies has improved in Estonia. However, there are still a number of challenges

which require more widespread use of economic instruments, such as eutrophication and shortfalls in the number and quality of wastewater treatment facilities.

Economic instruments have been introduced by the Water Law and various regulations on the special use of water. Some obligations have been delegated to municipalities, especially all issues related to municipal water systems. Implementation of the requirements and principles laid down in the Water Framework Directive will also influence Estonian water policy in the coming years.

3.2.2 Economic instruments on water pollutants

Estonia introduced a comprehensive scheme of water pollution charges and the development in the rates is presented in Table 3.4. The Estonian Ministry of the Environment also sets the rates giving consideration to a multi-year planning period, as with air pollution charges. As can be seen from the table, the rates also increased, in most cases by around 20 per cent per year, except in the case of sulphates.

Table 3.4 Charge rates for discharges to water bodies, underground water or soil (EUR per ton of pollutant)

Pollutant	1999	2000	2001	2002	2003	2004	2005
BOD7	121	145	174	208	250	300	360
Nitrogen (Ntot)	105	131	164	197	236	283	340
Phosphorus (Ptot)	182	218	262	314	377	452	543
Suspended solids	61	73	88	105	126	152	182
Sulphates	1.4	1.7	2.0	2.1	2.2	2.4	2.6
Monohydric phenols	809	971	1,165	1,398	1,678	2,013	2,416
Oil products	212	231	277	333	399	479	575

Sources: Pollution Charge Act and Act Amending Pollution Charge Act.

Again, some special arrangements are in place allowing the rates to be increased further in certain cases and regions. For example, the rate is increased by a factor of 1.2 if the substances are discharged into soil with unprotected underground water. Also, the rate is increased by 1.5 times if the substances are discharged to waters of cities, towns or beaches used for swimming.

3.2.3 Charge on water consumption

A charge on the special use of waters has been implemented in Estonia and the charge levels are set by governmental regulations. The system for calculating the charges is established by regulations of the Ministry of the Environment. The charge for special use of water is not required for:

- irrigation of agricultural land;

- water use for fishing ponds;
- building dams;
- taking water for private household from underground water resources or water bodies belonging to private households; and
- energy generation activities based on water.

However, private households are not allowed to sell groundwater from their land without paying the charge for special use referred to in Table 3.5.

Table 3.5 Charges for the abstraction of water (EURcents/m³)

	1999	2000	2001	2002	2003	2004	2005
Underground water							
1. Most upper ground level	1.3	1.6	1.9	2.1	2.3	2.6	2.8
2. Lowest ground level	2.2	2.6	2.9	3.2	3.5	3.9	4.2
3. Extracted from mines and quarries	0.19	0.26	0.32	0.35	0.38	0.42	0.45
Surface water							
1. From Tallinn catchment area	1.3	1.6	1.9	1.9	1.9	2.1	2.1
2. From Tallinn catchment area for cooling purposes	0.16	0.19	0.22	0.26	0.26	0.32	0.32
3. From other areas	0.64	0.77	0.90	0.96	1.1	1.2	1.3
4. From other areas for cooling at the Narva Power Plant	0.13	0.13	0.16	0.16	0.16	0.16	0.16

Source: Charge Rates for Special Use of Water in the Case of Water Extraction from Water Bodies or Groundwater Aquifers

The revenues from the special use of water of inland water bodies and groundwater are divided equally between state and the respective local municipalities. It is foreseen that, based on an agreement between the Ministry of Finance and local municipalities, revenues allocated to the budget of local municipalities are used for water protection measures. The charges for the special use of water bodies bordering national boundaries go to the state budget.

3.2.4 User charges for water supply and wastewater services

Water supply and wastewater services are provided by water utility companies in Estonia. Water utility companies are established by municipal councils based on the requirements of the Estonian Competition Law. These companies have the right to collect a connection fee for joining the common water supply and wastewater system. However, municipal councils determine the conditions for establishing the connection fee and exercise the right to a set maximum limit. The connection fee guarantees:

- the development of water services;
- the compliance of all facilities with existing requirements;
- ensuring the requirements of environmental protection, and;
- a certain degree of profitability.

The rules for the regulation of water supply and wastewater service charges are determined by the local municipal council. The municipality

sets the user charges in advance, at least three months before they enter into force. The tariffs are comprised of a subscription fee, a charge for water consumption and a charge for wastewater services. It is not obligatory to ask for the subscription fee and, for example, the two largest cities in Estonia, Tallinn and Tartu, do not. The charges for the services are set so that the income for the service provider can cover:

- production costs;
- fulfilment of quality and safety requirements;
- fulfilment of environmental requirements, and;
- provision of an acceptable and justifiable profit to the water utility company.

The charges must not discriminate between different consumers or groups of consumers and they are based on the amount of water consumed. For example, in the Estonian capital city Tallinn the user charge for water consumption for private users amounts to 75 EURcents/m³, including VAT. The wastewater service charge for private users is set at 60 EURcents/m³. In the second biggest city Tartu the user charge for water consumption is 59 EURcents/m³, including VAT, and the wastewater service tariff for private users amount to 72 EURcents/m³.

3.3 Economic instruments addressing waste issues and the different types of waste

3.3.1 Waste policy in general

In Estonia, the major waste generator is the oil shale based energy generation sector. Around 75 percent of the waste generated in Estonia occurs due to the mining or associated treatment activities of oil shale. The oil shale industry generated 13.4 million tonnes of waste in 2003 (out of which 7.2 tonnes was classified as hazardous).

Currently in Estonia, most of the waste is still disposed of to landfill sites which do not comply with the EU's environmental requirements. As of June 2005, only four landfills comply with requirements of the Landfill Directive. Unfortunately, the landfills which do not comply enjoy a strong competitive advantage as their fees are up to 10 times lower. This situation will probably persist until 16 July 2009, when disposal at this type of landfill will be prohibited. Meanwhile, there is a plan to raise disposal fees via the new Pollution Charge Act in relation to non-compliant sites to discourage disposal by this route.

3.3.2 Waste charge

Waste charges have been implemented in Estonian waste policy. The rates are differentiated according to the degree of hazard associated with the waste. The scheme resembles the system of air and water pollution charges, in particular, the rates are fixed in advance providing stability in relation to planning for companies. A sharp increase in the rates took place at the beginning of 2005. This increase was in accordance with the state's priorities raising the charge rate for municipal waste by more than 700 percent (see Table 3.6). Charge rates for other wastes were also raised, although the increase experiences were smaller.

Table 3.6 Waste pollution charges (EUR per tonne of waste)

	1999	2000	2001	2002	2003	2004	2005
Non-hazardous waste, inc. municipal waste	0.10	0.12	0.15	0.18	0.21	0.26	1.92
Mining waste	0.04	0.06	0.08	0.10	0.12	0.13	0.19
Hazardous waste general	0.31	0.37	0.45	0.54	0.65	0.77	0.96
Hazardous waste containing:							
oil, oil products, paint, varnishes, hospital and medical waste	0.84	1.01	1.21	1.45	1.73	2.05	2.50
wood preservatives; waste containing inorganic pesticides, lead, asbestos	8.45	10.1	12.2	14.6	17.5	21.0	25.3
mercury, cadmium, PCB, PCT	84.5	101	122	146	175	210	252
oil shale ash	0.12	0.19	0.27	0.28	0.29	0.31	0.33
oil shale semi-coke handled with water	0.00	0.00	0.00	0.86	1.03	1.22	1.47

Sources: Pollution Charge Act and Act Amending Pollution Charge Act.

A number of types of waste are exempt from waste pollution charges. Firstly, waste which is re-used as defined in the Waste Act (e.g. in road construction, or using oil shale ash and cement dust as a fertilizer) is exempt from the charge. Secondly, waste treated in biological composting plants is exempt. Thirdly, to avoid double-charging, waste which goes to incineration is also exempt from the waste charge as the air pollution charge is already levied on the final products emitted during the incineration process. Fourthly, wastes which undergo treatment, e.g. in mechanical-chemical treatment facilities, or which are stored temporarily are also exempt from the waste charge.

Waste charges accrue to the state budget. Revenues from the municipal waste charge, i.e. user charges on waste, are shared; 75 percent is allocated to the respective local budget and 25 percent to the state budget. All pollution charge revenues relating to the non-compliance of landfills and accidents go to the state budget.

3.3.3 User charges on waste

According to the Waste Law, local municipalities have the duty to organise the collection of municipal waste. Waste management companies selected for that purpose by public tender undertake these obligations. The local municipal councils, however, set the conditions for collection of municipal waste including the level of user charges.

User charges have to be sufficient to cover the transportation costs of the waste as well as the costs associated with operation and closure of waste treatment centres. The exact rate of the user charge is determined by the type, quantity and properties of the waste collected. Also, service frequency and other factors which influence the costs of waste treatment are taken into account.

3.3.4 Waste product taxes

3.3.4.1 Economic instruments on packaging

Packaging is regulated by the Packaging Excise Duty Act which came into effect on 1 March, 1997. The packaging tax is imposed on packaging which is filled in Estonia, acquired from another EU Member State or imported into Estonia. The revenues from the tax accrue to the state budget.

The tax is administered by the Tax and Customs Board and paid by the importer, the user or the person acquiring the packaging from another Member State. Some packaging material is exempt from the tax:

- alcohol or non-alcoholic beverages packaging and packaging with a deposit imposed under packaging law, of which at least 60 percent is recovered;
- beverage packaging from metal of which at least 40 percent is recovered; and
- other packaging of which at least 15 percent is recovered.

Table 3.7 Excise tax rates on packaging

Taxable packaging	Excise tax rate in EUR per kilogram
Glass and ceramics	0.64
Plastic	2.56
Metal	2.56
Paper	1.28
Other	1.28

Source: Ministry of Finance

3.3.4.2 End of Life Vehicles (ELV)

The management of ELV as an important waste stream is a new issue for Estonia. However, the requirements of the EC Directive on ELV have been transposed into national legislation. Most importantly, the principle

of producer responsibility is established regarding collection and recycling of ELVs. The producers have to take back ELVs for free. To date, no additional economic instruments have been set to support the fulfilment of the regulations laid down in the Directive.

3.3.4.3 Waste electrical and electronic equipment (WEEE)

The principle of producer responsibility has been implemented in national legislation. The consumers can return their items of WEEE without paying any additional charge. However, to date there are no additional economic instruments in place to guarantee that the objectives of the EC Directive on WEEE are achieved.

3.4 Economic instruments related to agriculture and natural resources

Agricultural input taxes, such as pesticide or fertiliser taxes, have not been implemented in Estonia.

A far-reaching system of taxes on extraction of natural resources is in place in Estonia as can be seen in Table 3.8.

Table 3.8 Tax rates on natural resources in Estonia (EUR)

Natural resource/raw material	Unit	Tax rate
Dolomite	m ³	1.92
Phosphorite	ton	0.32
Crystalline rocks for construction	m ³	0.96
Gravel	m ³	0.77
Sand	m ³	0.64
Limestone	m ³	1.03
Oil shale	ton	0.45
Clay	m ³	0.51
Peat	ton	0.38

Source: Earth Act. <https://www.riigiteataja.ee/ert/act.jsp?id=873617>

Revenues generated from mining taxes are distributed between national and local budgets. In cases where mining takes place from a mine of national importance, 30 percent of the revenue is transferred to the state budget and 70 percent to the budget of the respective local municipality. However, in future, the revenues will be divided equally between the state and the local municipal budget. If the mine is of local importance, all revenues are allocated to the local municipality.

3.5 Economic instruments related to transport

The Heavy Goods Vehicle Tax Act, entering into force on 1 January 2004, introduced a heavy goods vehicle (HGV) tax in Estonia. At the same time the general excise tax on all motor vehicles was repealed. No other state tax exists for motor vehicles. There is a state duty on vehicle

registration, which is sometimes considered as an economic instrument when calculating the general tax burden on motor vehicles. According to the Act on Local Taxes, the introduction of local taxes for motor vehicles is permitted, however, as of June 2005 no municipality has initiated taxes of this kind.

The heavy goods vehicle tax is paid for the following classes of vehicles which are intended for the carriage of goods: (1) lorries with a maximum authorised weight or gross laden weight of not less than 12 tonnes; (2) road trains composed of trucks and trailers with a maximum authorised weight or gross laden weight of not less than 12 tonnes.

Lorries and road trains are taxed pursuant to the tax rate set out in the Appendix to the Heavy Vehicle Tax Act according to: (1) the maximum authorised weight or gross laden weight, number of axles and the type of suspension of the driving axle of the lorry or truck, (2) the maximum authorised weight or gross laden weight of a road train on the basis of the characteristics concerning lorries and trucks, the number of axles of a trailer used in the composition of the road train and the maximum weight of the trailer.

Exemptions from the tax apply to HGV belonging to national defence forces, the national guard, border guard forces, police force, and emergency forces belonging to state and local authorities.

The heavy goods vehicle tax is paid into the state budget.

3.6 Deposit-refund systems

The Packaging Law has set up a deposit-refund system for beverage containers, which applies to glass, metal and plastic containers for beer, alcoholic drinks with low ethanol content (less than 6 percent) and all soft drinks. The system was implemented on 1 May 2005. The transition period was set until 1 August 2005 – until when it is possible to sell beverage containers both with and without a refund label. The Packaging Law foresees that the Regulation of the Ministry of the Environment sets the deposit rates and the deposit rate cannot be less than 3.2 EURcents per package.

Most of the colourless glass that cannot be reused is recycled in Estonia, whereas coloured glass is mostly recycled in Latvia. Metal and plastic is mostly exported.

Table 3.9 Deposit rates according to types of package (EURcent per package)

Type of package	Volume	Deposit rate
Reusable glass package	All volumes	6.4
Non-reusable glass package	All volumes	6.4
Non-reusable metal package	All volumes	3.2
Non-reusable plastic package	Up to 0.5 litre	3.2
Non-reusable plastic package	Over 0.5 litre	6.4

Source: Ministry of the Environment

3.7 Eco-labelling

The rules for labelling “greener” products in Estonia were established already in 1997. In Estonia, there are various eco-labels in use, but none of them is widely used. Some of them are still in the process of implementation, while some of them would need more financing for them to really start working. More successful examples include “Green Energy” (indicating that energy generated from renewable sources was used in producing the product) and “Green Key” (an international diploma awarded to companies within tourism).

Concerning the implementation of the European Union Eco-label (the Flower), it is the Estonian Ministry of the Environment who has been designated as the competent body. For implementation of the scheme a co-ordination committee has been established, comprising experts from the Estonian Ministry of the Environment and the Environmental Information Centre.

A total of 6–7 companies from textile, household chemicals, pulp and paper branches are currently interested in the EU eco-label award.

3.8 Environmental funds

The Environmental Investment Centre (EIC) administers the funds which are transferred from the state budget for use for environmental purposes. During the period 2000–2003, the total budget of the EIC amounted to 347.8 million EEK (22.2 million EUR). The EIC is under the governance area of the Ministry of Finance and it was established in 2000 as a non-profit organisation.

The main activities of the EIC are as follows:

- allocating the funds gained from the usage of the environment to the development of national environmental projects;
- acting as the national implementing agency for the European Regional Development Fund project;
- acting as the national implementing agency for the European Union Cohesion Fund projects; and
- offering long-term loans to environmental projects.

Estonia has drafted the National Development Plan for the Implementation of the EU Structural Funds (http://www.strukturifondid.ee/failid/Programme_Complement27.04.pdf) (as the strategic basis for using EU assistance programmes. The Environmental Investment Centre (EIC) acts as an implementing agency for the Plan’s environmental measures channelling 150 million EEK (9.6 million EUR) to the development of environmental infrastructure projects during the period 2004–2006.

4. Finland

4.1 Economic instruments related to energy consumption and air pollution abatement

4.1.1 Introduction

Finnish energy policy strives to pursue three goals simultaneously – energy security, economic development and environmental sustainability. The first Finnish national climate strategy, published in 2001, pointed out that considerable efforts have to be undertaken to prevent Finland's greenhouse gas emissions exceeding the country's Kyoto target. The strategy made it clear that actions are required in different fields ranging from the production and consumption of energy and transport to further research & development (R&D) activities and economic policy instruments.¹⁰

A new nuclear plant is under construction, which is the first for quite some time within the EU, and is scheduled to come into operation in 2009. In addition, the Finnish authorities make widespread use of various economic instruments in order to regulate energy consumption in Finland (IEA, 2004b). In 1990 Finland was the first country ever to introduce CO₂-based energy taxation. The Finnish government has since, to varying degrees, taken political action to regulate increasing energy consumption and growing greenhouse gas emissions. During the first years of the new millennium Finland has not, however, introduced any new environmentally related taxes. The major change as regards economic instruments has been the introduction of the European emissions trading scheme from the beginning of 2005.

4.1.2 Excise duties on fossil fuels for energy purposes

The Finnish excise duties on fossil fuels comprise four elements. However, some of these elements have only been in force for a limited number of years.

- The first two taxes to be levied on fossil fuels were the precautionary stock fee and the oil pollution fee levied on mineral oils. The two taxes were introduced in 1974 and are still levied on fossil fuels today. These two taxes were introduced for fiscal and trade balance reasons only. Despite gradual increases in the two taxes, they have only

¹⁰ A revised climate strategy was presented to the parliament at the end of 2005.

constituted a minor share of the total tax burden on fossil fuels since the introduction of CO₂ tax in 1990. From 1997 and onwards, a precautionary stock fee has been levied on natural gas, coal and electricity in addition to mineral oils (IEA, 2004a and Nordic Council, 1999).

- In 1990 Finland introduced a carbon-based tax on energy consumption as the first country in the world. The CO₂ tax was initially introduced as a tax with carbon dioxide as the sole base for calculating the tax rates. Therefore, the OECD/IEA has labelled this initial tax as an environmental damage tax. The initial CO₂ tax was levied on oil products, other fossil fuels and electricity. The initial rate was low (7.1 FIM/tonne CO₂ or 1.2 EUR/tonne CO₂) and the tax rate and base has been increased several times since then. In order to create incentives for wider use of natural gas, the CO₂ tax rate for natural gas was reduced by 50 percent as compared to the general CO₂ tax level (Malaska et al., 1997) and this still applies today. Table 4.1 illustrates how the tax rate per tonne CO₂ has developed since its introduction in 1990.

Table 4.1 Development of the CO₂ tax rate (EUR per tonne CO₂)

1990	1992	1993	1994	1995	1997	1998	2003	2005
1.19	1.26	2.35	3.72	6.44	11.77	17.16	18.05	18.05

Source: Vehmas, 2004; IEA, 2004a and IEA, 2005

When the CO₂ tax was introduced in 1990 it was based solely on the carbon content of the energy product. In 1994, the CO₂ tax scheme was changed to a CO₂/energy tax. As a result of this amendment, all primary energy sources were taxed according to both the energy content and the carbon content (75 percent of the tax determined by the carbon content and 25 percent determined by the energy content). In 1997 the CO₂ tax became again a 100 percent carbon tax, but this time applying only to heat generation. Peat has not been charged with the full CO₂ component of the excise duties as the Finnish authorities regard peat as a renewable energy source. In July 2005 the CO₂ tax on peat was entirely abolished (IEA, 2004 and Malaska et al., 1997).

- The fifth tax on fossil fuel consumption in Finland is a basic excise tax levied on mineral oils. This tax was introduced in 1993 but since 1997 this tax has only been levied on light fuel oil.

Table 4.2 below compares the development within and between the different excise duties on fossil fuels. The table shows that, today, the CO₂ tax is the most dominant of the various duties on fossil fuel consumption in Finland, constituting more than half of the total taxation on fossil fuel consumption. Since 1997 the CO₂ tax system has remained unchanged

except for some small adjustments. The overall tax burden on fossil fuel consumption has increased slightly during this period.

Table 4.2 Energy tax and CO₂ tax levied on fossil fuel consumption

		1985	1990	1996	2000	2002	2005
Light fuel oil (EUR-cent/l)	CO ₂ tax			2.30	4.54	4.54	4.78
	excise tax			0.72	1.83	1.83	1.93
	damage tax		0.34				
	other ¹ taxes	0.42	0.42	0.42	0.39	0.39	0.39
	TOTAL TAX	0.42	0.76	3.44	6.76	6.76	7.10
Heavy fuel oil (EUR-cent/kg)	CO ₂ tax			2.69	5.40	5.40	5.68
	excise tax			0.43			
	damage tax		0.34				
	other taxes	0.35	0.36	0.36	0.29	0.29	0.29
	TOTAL TAX	0.35	0.69	3.48	5.69	5.69	5.97
Natural gas (EUR-cent/m ³)	CO ₂ tax			0.90	1.70	1.70	1.80
	damage tax		0.20				
	other taxes				0.10	0.10	0.10
	TOTAL TAX		0.20	0.90	1.80	1.80	1.90
Coal (EUR-cent/kg)	CO ₂ tax			1.95	4.14	4.14	4.35
	damage tax		0.27				
	other taxes				0.12	0.12	0.12
	TOTAL Tax		0.27	1.95	4.26	4.26	4.47
Peat (EUR/M Wh)	excise tax		0.34	0.59	1.51	1.51	1.59
	TOTAL TAX		0.34	0.59	1.51	1.51	1.59

Note: ¹The category labelled *other* includes a precautionary stock fee and an oil pollution fee.

Source: IEA, 2004a and IEA, 2005

4.1.3 Exception to the excise duties on fossil fuels

The Finnish excise duty schemes on fossil fuels can be characterised as the most homogeneous in the Nordic countries in terms of special exemption schemes. Except for the pre-1997 treatment of electricity production (see Section 4.3.1), the scheme does not include any general tax exemptions for specific actors. Until 1998, Finland had no exemptions from taxes on fossil fuels, no reduced tax levels (apart from the special CO₂ tax scheme levied on natural gas and peat) and no tax refund schemes for any energy consuming industrial sector. However, the revised energy tax legislation in 1998 introduced a refund scheme for special energy-intensive industries. The refund scheme is only applicable to companies when the total burden of excise duties on energy exceeds 3.7 percent of the value added in the given company. The company is then entitled to a refund of the taxes paid and it can apply for a refund of up to 85 percent of the taxes paid exceeding 50,000 EURO. These strict demands for granting tax refunds effectively mean that only a very limited number of industrial facilities can, in fact, claim a tax refund. Basically, tax exemptions are restricted to around 10–12 companies, primarily in the paper and pulp sector (Nordic Council, 2002).

4.1.4 Excise duties on electricity consumption

In 1997 the tax scheme relating to electricity was thoroughly revised. Before 1997, excise duties were levied on electricity depending on the production method (input taxation scheme) – i.e. electricity taxes were levied according to the production/supply method and not directly on the consumption of electricity. From 1993 to 1996 the excise duties on electricity varied between 0.0005 EUR/kWh and 0.004 EUR/kWh depending on the origin (hydropower, nuclear, imported, etc.) of the electricity (Data received from Jarmo Vehmas, 2004). In accordance with this tax scheme, fossil fuels used for electricity production were levied with the same energy and CO₂ taxes as those levied on industry. In 1997 the electricity tax scheme was revised in Finland. All production taxes were removed and a consumption tax on electricity was introduced to replace the production tax, i.e. a shift from an input taxation scheme to an output-based scheme. The primary reasons behind this tax reform were, firstly, the opening-up of the Nordic electricity markets and the resultant increase in cross-border trade of electricity. The European Court of Justice ruling, according to which the Finnish electricity tax system contained tax discriminatory elements, represents a further reason. It was clear that the exceptional electricity taxation scheme in Finland posed a serious threat to the competitiveness of electricity production in the new Nordic electricity markets and, therefore, the tax scheme needed to be changed (Vehmas, 2005 and Prime Minister's Office, 2000).

The 1997 amendment in the tax scheme also included differentiation between the tax rates levied on the consumption of electricity by households/service sector and industry respectively. The differentiation in the electricity tax is similar to the differentiation in the taxation of fossil fuel. The differentiation was introduced to safeguard the competitiveness of the industrial sector (Prime Minister's Office, 2000). Table 4.3 below shows the development in the electricity tax since the 1997 amendments in the tax scheme.

Table 4.3 Excise duty on electricity consumption after the 1997 amendments in the electricity tax scheme (Eurocent/kWh)

	1997	1999	2000	2002	2005
Household	0.57	0.70	0.70	0.70	0.74
Industry	0.25	0.43	0.43	0.43	0.45

Source: IEA., 2004, and IEA, 2005

The Finnish electricity tax scheme, which was in place prior to 1997, provided an advantage to electricity production based on renewable energy sources as renewable energy sources were exempted from energy and CO₂ taxes. The new tax scheme, based on the consumption of electricity, changed the economic balance between renewable energy sources and fossil fuels for electricity production, leaving electricity produced

from renewable energy sources in a difficult competitive situation. To improve the competitive situation for electricity from renewable energy sources, a tax subsidy scheme has been introduced which grants subsidies to energy production from renewable sources (Prime Minister's Office, 2000). The subsidy scheme was initially granted to wind power plants, small-scale hydro power plants and small power plants using biomass and peat. The subsidy was equivalent to the electricity tax charged on industrial consumption of electricity. In 1998 the subsidy scheme was amended. The subsidy on electricity produced from wind power was increased to make it equivalent to the electricity tax charged on household consumption of electricity. Additionally, the support scheme was extended to include electricity generated from metallurgical process waste gases and electricity generated from chemical process reaction heat. The subsidy for electricity generated in this way was set to be equivalent to the low industrial electricity tax. In 2003, the direct connection between the size of the subsidy and the size of the electricity tax rates has been abolished. The subsidy rate has, since 2003, been set independently of the electricity tax rate (Vehmas, 2005).

4.1.5 Excise duties on transportation fuels

Just as in the other Nordic countries, environmental taxes on transportation can be divided into two sub-subcategories. Transportation fuels are charged with several different energy related taxes and, secondly, motor vehicles are charged with both a registration fee and an annual tax (see Section 4.5).

The taxation of transport fuels has a long tradition in Finland as is the case in other Nordic countries. However, environmental reasoning did not enter into the justification of excise duties on transport fuels until 1987. In 1987, the Finnish authorities introduced differentiated tax rates on petrol according to the lead content. The tax was introduced in order to establish an economic incentive to choose a more environmentally sound fuel type. However, the tax rates were not differentiated according to lead content in the period from 1990–1994. In 1995, differentiated duties on diesel oil according to the sulphur content were introduced. This differentiation was specifically introduced to promote environmental protection. At the present time, the differentiation in excise tax rates according to the sulphur content of the fuel has been extended to petrol. The increase in the tax rates levied on transport fuels has slowed since 2000 as shown in Table 4.4. The total tax burden levied on transport fuels doubled between 1990 and 2000, but has only increased by around 5 percent since 2000.

Table 4.4 Tax rates on transportation fuels (EURcent/l)

		1985	1990	1996	2000	2002	2005
Unleaded petrol	excise tax		21.5	49.8	51.2	51.2	53.9
	CO ₂ tax		4.5	2.1	4	4	4.2
	other tax ¹	0.7	0.7	0.7	0.7	0.7	0.7
	TOTAL TAX	0.7	26.7	52.6	55.9	55.9	58.8
Leaded petrol	excise tax		21.5	57.4	58.8	58.8	61.8
	CO ₂ tax		4.5	2.1	4	4	4.2
	other tax ¹	0.7	0.7	0.7	0.7	0.7	0.7
	TOTAL TAX	0.7	26.7	60.2	63.5	63.5	66.7
Diesel Class 1	excise tax		12.3	25.2	25.5	25.5	26.8
	CO ₂ tax		4.5	2.3	4.5	4.5	4.8
	other tax ¹	0.4	0.4	0.4	0.4	0.4	0.4
	TOTAL TAX	0.4	17.2	27.9	30.4	30.4	32
Diesel Class 2	excise tax		12.3	27.8	28	28	29.5
	CO ₂ tax		4.5	2.3	4.5	4.5	4.8
	other tax ¹	0.4	0.4	0.4	0.4	0.4	0.4
	TOTAL TAX	0.4	4.9	30.5	32.9	32.9	34.7

Note: ¹Precautionary stock fee

Diesel fuels are differentiated accordingly to environmental standards such as sulphur content.

Source: IEA, 2004a and 2005

4.1.6 Renewable energy sources and economic instruments

Finnish renewable energy policy is a result of a conscious strategy outlined in the “Action Plan for Renewable Energy Sources 2003–2006” published by the Ministry of Trade and Industry in 2002. The Finnish renewable energy strategy can, basically, be divided according to three separate regulatory instruments; a tax instrument, investment subsidies and research subsidies (IEA, 2004b).

Energy taxation is emphasised as an important regulatory instrument in the action plan for renewable energy sources (see also Section 4.1.4): The production of heat is subject to the CO₂ tax and in addition electricity produced from green fuels and green energy technologies is granted a tax refund. The tax rebate was between 4.2 EUR/MWh and 6.9 EUR/MWh in 2003. It is estimated that the tax rebate scheme, de facto, is granting approximately 50 million EUR to producers of electricity from renewable sources (IEA, 2004b). The support scheme for renewable energy sources provided by the Finnish government also includes investment aid or subsidies for capital costs. In 2002, the Finnish government spent 33.2 million EUR on subsidies for investment in green energy technologies. The main part of these grants was given to investments in wood-fired energy generation plants (55 percent) and investments in wind power facilities (22 percent) (IEA, 2004b). In addition to the tax scheme and the subsidy scheme, the Finnish government also grants funds for research and development (R&D) into renewable energy technologies. Approximately 10 million EUR were granted for R&D in 2003, however, the 2002 action plan calls for increased funding for research on renewable energy (IEA, 2004b, p.56).

4.1.7 Emission trading

As a participant in the Kyoto protocol (ratified in the EU with council decision 2002/358/EC), the Finnish government has accepted an obligation to maintain the same greenhouse gas emission level in the Kyoto target period (2008–2012) as in the reference year (1990). The EU emissions trading scheme plays an important role in Finland's strategy to achieve the emission target for the so-called Kyoto period. According to the Finnish "National Allocation Plan", more than 500 installations are included in the ETS. These installations cover 59 percent (2002) of the total Finnish CO₂ emissions or 50 percent of total greenhouse gas emissions. According to the national allocation plan, the Finnish government has allocated a total of 136.5 million tonnes of CO₂ emission allowances, or an average of 45.5 million tonnes per year, in the first trading period. These emission allowances constitute an emission level which is status-quo, but around 3 percent lower than the projected emission level in a "business as usual" scenario.

Despite the legislative possibility of auctioning up to 5 percent of the total emission allowances, the Finnish authorities have chosen to grandfather all the emission allowances. A small pool of the emission allowances – a total of 2.5 million tonnes CO₂ emissions – is held as a reserve for new entrants. The remaining emission allowances have been distributed to the ETS installations, based mainly on the level of their emissions in the period from 1998 to 2002 (Ministry of Trade and Industry, 2004).

4.2 Economic instruments used in water policy

4.2.1 Introduction

Water supply and wastewater treatment services are provided by the municipalities and financed by charges to the user based on the full-cost principle, although in individual cases state subsidies for water management may prevent the full recovery of costs. All water usage is metered. Industry often abstracts its water directly from either surface waters or groundwater and, in these cases, is responsible for treatment of the wastewater produced.

4.2.2 User charges for water supply and wastewater services

The charges for water supply and wastewater service both vary from one municipality to another, however, the average cost in 2004 was 1.37 EUR per m³ for *water supply* and 1.68 EUR per m³ for *wastewater treatment* (Ministry of the Environment, 2005). The tables, below, present the development in average municipal water charges from 1996 to 2002. Municipal *water supply* charges experienced a slight decrease from 1996 to

1999, but have increased quite dramatically since 2000, i.e. by approximately 78 percent. *Wastewater charges* increased by 5 percent from 1996 to 2000, however more recently, from 2001 to 2004, they increased more rapidly, by 24 percent.

Table 4.5 Municipal water supply charges 1996–2004

	1996	2000	2001 ¹	2004 ²
Water supply charge (EUR/m ³)	0.96	0.77	0.86	1.37

¹Preliminary figures for 2001

Source: Hiltunen, 2004 and ² from Ministry of the Environment, Finland, 2005

Table 4.6 Municipal wastewater charges 1996–2004

	1996	2000	2001 ¹	2004 ²
Wastewater charges (EUR/m ³)	1.30	1.36	1.36	1.68

¹Preliminary figures for 2001

Source: Hiltunen, 2004 and ² from Ministry of the Environment, Finland, 2005

The system of water protection charges on industry and fish farms, whereby owners of waters and commercial fishermen were compensated for loss of the value of a water area, were removed under the year 2000 Environmental Protection Act. Where old permits apply, however, the charges will continue until all pollution permits are reviewed in 2005–2006.

4.3 Economic instruments in the waste area – taxes and charges

The 2003 Government Programme announces an ecological tax reform aimed at reducing use of non-renewable natural resources and the prevention damage to the environmental. Recycling, improved ecological efficiency of products, consumption and energy use will be promoted, and the cutting of subsidies detrimental to the environment will be explored. Further aims include:

- Use of economic and technical incentives to reduce the volume of waste;
- Increased used of waste as a raw material and as a source of energy;
- An environmental guidance system based on excise tax for beverage packaging;
- Minimisation of the adverse effects on the environment of the final disposal of non-recyclable waste; and
- Extension of the polluter-pays principle to further product groups, and the responsibility of the trade sector for packaging waste will be increased (Government of Finland, 2003 and Ministry of the Environment, Finland, 2004).

This government programme echoes the need to strengthen waste management policies highlighted in the 2002 revisions to the 1998–2005 National Waste Plan (Ministry of the Environment, Finland, 2002). Previous waste management policies have seen results in the recovery of waste, whereas reductions in waste at source lag behind. During the 1990s, municipal and industrial waste production increased by 10 percent and 20 percent, respectively, whereas hazardous waste production remained stable.

4.3.1 Municipal waste charges

Under the 2002 amendments to the National Waste Plan, the municipal authorities and waste management plants are charged with increasing the incentive effect of municipal waste charges by using:

- Waste charges which encourage waste prevention and waste recovery in all municipalities – 2003, and;
- Waste charges which cover the full cost of disposal – 2002 (a small number of landfills receive subsidies through tax revenues (Hiltunen, 2004)).

Municipal waste charges grew relatively rapidly in the late 1990s, largely due to introduction of the waste tax. The development in costs/charges between 2000 and 2002 is presented below. The average municipal cost for treatment in 2005 is estimated to be 100 EUR per tonne for treatment, with a slightly lower level for collection (Ministry of the Environment, Finland, 2005).

Table 4.7 Municipal waste charges¹ 1996 to 2002 (EUR per tonne)

Waste type	1996 ¹ FIM (EUR)	2000	2002
Municipal waste – class 1	152 (26.1)	49	57
Municipal waste – class 2	163 (28.0)	48	59
Municipal waste – class 3	129 (22.1)	45	60
Municipal waste – class 4	163 (28.0)	51	59
Biowaste	86 (14.8)	26	36
Special waste	321 (55.1)	68	88
Septic tank sludge	-	-	37

Source: Hiltunen, 2004

¹Source (1996 figures): Nordic Council of Ministers, 2002

Waste costs increased by 16–38 percent in the two years 2001–2002, and the subsequent doubling of the waste tax (see Section 4.3.2 below) is likely to have brought about further increases since.

In addition to waste charges levied per tonne of waste, in 2002, approximately 140 municipalities out of approximately 450 had introduced an “eco-charge” (ekoavgift) which applies to households (Itä-Uudenmaan Jätehuolto, 2005) at an average of 33 EUR per year per household. The purpose of the charge is to promote waste sorting by covering costs asso-

ciated with a network of recycling and collection stations where households can deliver card and paper, glass, metal, untreated wood and electronic waste and batteries free of charge. The extent to which this charge exists today is not clear.

4.3.2 Landfill tax

The waste tax was introduced at a rate of 15 EUR per tonne in 1996 and remained stable until 2002. The tax applies only to waste received at public landfill (e.g. municipal landfill) and does not apply to incineration. The landfill operator is subject to the tax and passes the tax on to the waste producer via municipal waste charges. In order to promote recovery of waste, the tax does not apply to waste which is recycled or composted. The waste tax doubled from the 2002 level of 15 EUR to 30 EUR per tonne by 2005 (via a level of 23 EUR in 2003 and 2004) as a result of the 2002 amendment of the Waste Tax Act. The aim was to improve the incentive effect of the tax, in response to pressures within the field of waste policy. The revenue from the landfill tax is not ear-marked. The Ministry of the Environment carried out an ex-post survey on the effectiveness of the landfill tax in 2005. According to the survey the landfill tax has contributed to beneficial development with regard to the landfill of waste.

Table 4.8 Waste tax rates from 1996 to 2005

	1996	2002	2005
Waste delivered to landfill sites (EUR per tonne)	15	15	30

4.3.3 Tax on non-refillable beverage containers

Taxation on *non-refillable* beverage containers has been in place since 1993 and complements the *deposit-return system* for *refillable* and *non-refillable* beverage containers (described below in Section 4.4.2). The taxes were in the form of individual packaging-related surtaxes on alcohol and soft drinks, respectively, and have been replaced by a new tax levied on certain beverage containers which came into force at the beginning of 2005.

For beverage packaging which does not enter a functional return system approved by the government, the charge from 1 January 2005 is 0.51 EUR per litre. For beverage packaging which is recycled and enters a functional return system approved by the government, the charge falls to 0.085 EUR per litre until 2007, when the charge will be removed from this category (Ministry of the Environment, Finland, 2005a). *Refillable* drinks packaging which is part of a deposit-refund scheme continues not to be subject to the tax.

4.4 Other economic instruments in the waste area

4.4.1 Introduction

EU packaging regulations were implemented in Finland in 1997 and 1998, placing the obligation for the recovery of packaging on every packaging company or importer of packed goods with a turnover of over 841,000 EUR as well as duties with regard to information dissemination and the reporting of results. Producer responsibility also extends to tyres, end-of-life vehicles (ELV) and waste electrical and electronic equipment (WEEE). Batteries have not come under producer responsibility to date (Ministry of the Environment, Finland, 2005b), however, plans in this regard were listed in the 2002 revisions to the national waste plan. Taxes and deposit-refund systems in relation to beverage containers also operate in several of the areas listed (Ministry of the Environment, Finland, 2002).

4.4.2 Deposit-refund system for beverage containers

Returning bottles for re-use dates back to the beginning of the 19th Century in Finland. The current deposit-refund scheme applies to both *refillable* and *non-refillable* beverage containers for reuse and recycling, respectively. The majority of glass beverage containers (0.33, 0.5, 1 litre) are part of a deposit-refund system, as are aluminium cans which accounted for approximately 4 percent of production (Ministry of the Environment, Finland, *not dated*).

The current rate of return of glass bottles for beer and soft drinks has been at between 98 and 99 percent for a number of years (Ministry of the Environment, Finland, *not dated*). However, the collection rate for beverage cans with deposit was approximately 82 percent in 2004 (Palpa, www.palpa.fi), which will require improvement to reach the target for cans stipulated in the legislation surrounding the current scheme (Palpa, 2004).

From April 2004, a new association, Ekopullo, took over administration of the return system in relation to glass and plastic beverage containers as well as the required reporting on recycling rates to the Ministry of the Environment. For the scheme operating for aluminium beverage cans, the association is called Palpa. In 2004, the refund on an aluminium beverage can was 0.15 EUR per can (Palpa, www.palpa.fi) and the rates for glass and plastic containers are presented below. The Ministry of the Environment determines the level of the deposits.

Table 4.9 Deposit rates for glass and PET beverage containers and crates

Containers	EUR per unit
Glass – 0.33, 0.35, 0.5 litre	0.10
Glass – 1.0 litre	0.40
PET – 0.5 litre	0.20
PET – 1.0, 1.5 litre	0.40
Crates – 24 x 0.33 litre	2.20

Source: Ekopullo (www.ekopullo.fi) – Pullojen ja juomakorien pantit)

4.4.3 Scrap tyres

National legislation applying producer responsibility to tyres was implemented in 1995 giving rise to the first systematic tyre recycling scheme in Finland. The scheme is financed by a recycling charge paid by the consumer on purchase of a new tyre. The proceeds are transferred by the retailer to the producer or the importer, who, in turn, passes the funds on to Finsk Däckåtervinning Ab to cover the associated treatment and disposal costs.

Since 1996, improved logistics within the system has permitted charges to be lowered, however in recent years the charges have remained stable, except for the largest machinery and forest tyres.

Table 4.10 Tyre recycling fees for different types of tyre

Products (EUR per unit inclusive 22 % VAT)	2002 ¹	2004
Moped and motorcycle tyres	1.85	1.85
Car tyres	1.85	1.85
Delivery van or lorry tyres < 17.5"	1.85	1.85
Lorry > 17.5"	8.30	8.30
Industrial and tractor tyres < 20.0"	2.45	2.45
Agricultural machine tyres < 24.0"	4.20	4.20
Agricultural machine tyres > 24.0"	8.30	8.30
Machinery and forest tyres < 300 kg	12.60	12.60
Machinery and forest tyres > 300 kg	50.50	61.10
Retreaded lorry tyres > 17.5"	2.45	2.45

Source: Finsk Däckåtervinning Ab - Finansieringen

¹Ekroos 2004

The target for collection in 2003 was approximately 90 percent and the target for 2005 is 100 percent. In 2004, of the 37,240 tonnes of tyres collected, the vast majority underwent material recovery, a small proportion were retreaded. No tyres were incinerated with energy recovery (Finsk Däckåtervinning Ab, 2005).

4.4.4 End-of-life vehicles (ELV)

National legislation implementing producer responsibility and the EU ELV Directive came into force in September 2004, such that owners can return ELVs without charge to authorised collection points. Finnish Car

Recycling Ltd (<http://www.autokierratys.fi/default.asp>) has been set up by car importers to coordinate the collection, treatment and recycling of end-of life vehicles according to the requirements laid directive. Moreover, Finnish legislation already in place applies to cars and vans sold before 1 July 2002.

4.4.5 Waste Electrical and Electronic Equipment (WEEE)

National legislation implementing producer responsibility and the EU WEEE Directive came into force in August 2005 in amendments to the 1994 Waste Act. Prior to this some voluntary schemes applied.

4.5 Economic instruments related to agriculture and natural resources

In the 1970s, Finland launched a fertiliser tax aiming to restrict the use of pesticides. The tax was initially levied per kg nitrogen and the scheme was extended in 1990 when a tax on phosphorous fertilisers was introduced. The two taxes were combined in 1992 and the tax rate was substantially raised. However, this tax was abolished in 1994 (Nordic Council, 1999).

Rather special forms of economic instrument are used in Finland to control the use of pesticides. A fixed payment of around 800 EUR has to be paid by manufacturers for registering new pesticides and aims only to cover the costs for registration. In addition, a pesticide charge exists in Finland and has to be paid by manufacturers and importers when pesticides are traded. The fee is based on the value of the product and the rate is currently 2.5 percent. This charge is neither a pure tax on pesticides nor is it not paid by the users of pesticides. However, the tax can have some cost implications when the increase in costs is passed on to the consumer.

4.6 Economic instruments related to transport

Motor vehicles in Finland are charged with both a one-time registration tax and an annual ownership tax. The registration tax (also called car tax) is levied on passenger cars, delivery vans and motorcycles when the vehicles are registered for the first time in Finland. This tax was introduced in the 1950s to raise state revenue. Today the registration tax is 28 percent of the taxable value (the general retail sale value, including taxes in the Finnish market) of the vehicle. The tax is reduced by 450 EUR in the case that the car is powered by diesel fuel and reduced by 650 EUR if fuels other than petrol or diesel power the vehicle. Delivery vans are charged with a lower rate. Passenger cars imported from a non-EU coun-

try are charged with an additional 10 percent toll (Customs Authority, 2005).

Besides the registration taxation, motor vehicles in Finland are also subject to an annual circulation tax (i.e. the motor vehicle tax). In 2004, the principle behind the annual circulation taxes was changed to make the taxation scheme more transparent. The vehicle tax and the vehicle diesel tax were united in one tax scheme and thereby reduced the complexity of the legislation. Since 2004 passenger cars and delivery vans weighing below 3,500 kg are subject to a tax amounting to 0.35 EUR per day or 94.9 EUR per year. Vehicles registered before 1994 are charged with a lower tax rate. Diesel powered vehicles are charged with an additional annual tax to compensate for the lower tax rate on diesel fuel, i.e. passenger cars powered by diesel are charged with an additional 0.067 EUR per day for each 100 kg weight of the car. In this way, a diesel powered car weighing 1,000 kg will be charged with an additional annual tax of 245 EUR (Finnish Vehicle Administration, 2005). The annual tax rates (per unit of weight) are lower for heavy goods vehicles (HGV) than the rates for diesel powered passenger cars and delivery vans. However, the tax is charged per day for each 100 kg weight of the HGV. The tax rate for a HGV with three axles and a total weight of 20,000 kg registered for pulling a trailer is 2.3 EUR cent per 100kg per day. A truck of this size will, therefore, pay an annual motor vehicle tax of 1,679 EUR (Finnish Vehicle Administration, 2005b).

4.7 Economic instruments applied in other environmental areas

Finnish government expenditure on environmental protection has increased continuously since 2001, amounting to 934 million EUR in 2005 as shown in Table 4.11. The major share of the government expenditure is earmarked for environmental subsidies for agriculture (322 million EUR in 2005) and includes EU funding on agriculture. Subsidies in the energy field have also increased during recent years, in particular as a consequence of the launch of programme “support for energy-saving housing improvements” in 2003.

Table 4.11 Finnish government expenditure on environmental protection 2001–2005 (million EUR)

	2001	2002	2003	2004 ¹	2005 ²
Environmental administration	98	102	110	112	114
Development co-operation	95	116	106	117	117
Regional co-operation	10	13	10	10	2
Nordic Environment Finance Corporation	1	1	1	1	1
Research and development ¹	156	175	176	180	183
Environmental NGOs	1	1	1	1	1
Environmental protection	37	40	54	59	37
Nature conservation	63	59	57	69	86
Promotion of energy-saving measures	6	6	7	10	10
Support for investments in renewable energy	19	28	27	24	24
Support for energy-saving housing improvements	-	-	15	17	17
Traffic-related environmental protection ¹	39	26	12	12	11
Support for investments in manure storage	5	2	2	3	3
Environmental subsidies for agriculture	281	284	306	312	322
Promoting ecological forest management	4	4	4	6	6
Total	816	857	886	932	934

Note: ¹ = estimate, ² = forecast, - = not applicable

The income from environmentally related taxes is planned to increase to 4.9 billion EUR in 2005. Although this 30 percent increase – compared with the situation in 2000 – is rather impressive, the share of all environmental taxes as a percentage of GDP in 2005 is still lower than it was in 1998 (see Table 4.12). Revenues from energy related taxes are by far the largest contributor (61.2 percent) followed by transport related taxes (37.2 percent). All other environmental taxes are negligible in terms of their revenue generating potential.

Table 4.12 Fiscal income from environmentally related taxes in Finland (million EUR)

	1998	2000	2002	2004	2005
	A	A	A	B	BP
Alcoholic beverage surtax	10	12	20	20	-
Soft drinks surtax	2	1	2	2	-
Drinks packaging tax	-	-	-	-	13
Pesticide fee	2	2	2	2	2
Energy taxes	2,572	2,268	2,756	2,990	3,010
Oil waste tax	3	3	4	3	3
Motor vehicle tax	884	1,058	1,023	1,020	1,294
Oil pollution control fee	6	5	6	9	9
Vehicle licence tax	201	219	446	513	536
Diesel tax	175	181	-	-	-
Waste tax	31	33	32	49	53
Total	3,886	3,784	4,291	4,608	4,920
GDP	115,596	130,145	139,803	147,713	153,762
Environmental tax revenues as a percentage of GDP	3.4	2.9	3.1	3.1	3.2

Note: A = Final accounts, B = Budget, BP = Budget proposal

Source: Statistic Finland <http://www.stat.fi/tup/tiedotteet/v2004/198ympe.html>

5 Iceland

5.1 Economic instruments related to energy consumption and air pollution abatement

5.1.1 Introduction

The environmental tax scheme which relates to energy consumption and air pollution in Iceland differs significantly from those implemented in other Nordic countries. In Iceland, there are no excise duties charged on energy consumption, either in the household sector or the industrial sector. This rather unusual situation can be explained with reference to the special energy supply situation in Iceland. Electricity and heat supply from hydropower and geothermal energy sources dominate the energy supply to both the household sector and the industrial sector (Nordic Council, 2004 and IEA, 2003). This special energy supply situation has led to a low level of consumption of fossil fuels and, as a result, the CO₂ abatement debate has not attracted as much attention in Iceland as in the other Nordic countries. However, the transport sector has not been able to draw benefit from the easy access to renewable energy sources. The transport sector relies almost exclusively on oil products (IEA, 2003). Just as in other Nordic countries, the transport sector has therefore been subject to taxation schemes levied on transport fuels (see Section 5.1.2) as well as on vehicles (see Section 5.4), and these schemes have been regularly revised and amended.

Taxation in the transport sector has primarily been introduced for fiscal purposes (Nordic Council, 2002). However, the tax schemes in the transportation sector have indirectly affected the emission levels of a number of pollutants while at the same serving fiscal aims.

5.1.2 Excise duties on fossil fuels for transport purposes

The Icelandic government has a long tradition in, and experience with, charging excise duties on petrol, however, diesel oil for transportation purposes has not been subject to excise duties until 2005. Instead of charging a tax on diesel oil for transportation purposes, as is generally the case, the Icelandic authorities has charged a higher annual tax on diesel powered vehicles than on petrol powered vehicles (see Section 5.4.2 for a detailed discussion).

The excise duty on petrol is composed of two separate tax components – a general excise tax and a special excise tax. Until 1998 the general

excise tax was charged as a percentage of the ex-tax price on petrol (an *ad valorem* tax). From 1999 onwards the general excise tax has been levied on petrol as a fixed tax per litre (an *ad quantum* tax).

The size of the special excise tax rates depends on the lead content of the petrol. Leaded petrol is charged with a higher tax rate than unleaded petrol and the special excise duty can, therefore, be characterised as a tax with a specific environmental purpose. Table 5.1 below shows the taxation scheme applied on petrol from 1985 to 2005.

Table 5.1 Tax rates on transportation fuels

	1985	1990	1996	2000	2002	2004	2005 ¹
Unleaded petrol							
general excise tax (% of price)	50%	50%	97%				
general excise tax (EURcent/litre)				14.47	12.18	13.01	13.39 / 10.96
special excise tax (EURcent/litre)			30.13	39.40	33.19	35.45	36.44 / 38.87
TOTAL TAX	-	-	-	53.87	45.37	48.46	49.83 / 49.83
Petrol containing lead							
general excise tax (% of price)	50%	50%	97%				
general excise tax (EURcent/litre)				14.47	12.18	13.01	13.34 / 10.96
special excise tax (EURcent/litre)			32.02	41.93	35.31	37.71	41.18 / 41.18
TOTAL TAX	-	-	-	56.39	47.49	50.72	54.57 / 52.14

¹There are two values for 2005. The first value represents the tax situation in first half of the year, and the second value represents the situation in the remainder of the year. The two values are due to the change in the tax system in 2005. This change was made in connection with the change in the taxation of diesel fuel for vehicles.

Source: Icelandic Ministry of Finance

When studying the development of the petrol tax rates since 2000, it is apparent that the tax rates were initially reduced, but increased again at a later date. The 10 percent fall in the tax rates between 2000 and 2004, as presented in Table 5.1, is exclusively the result of changes in the exchange rate as the tax rates – expressed in the national currency – have in fact increased by around 8 percent during this period.

5.2 Economic instruments used in water policy

Municipal charges for water services may not exceed the costs associated with their supply. Calculation of municipal water charges varies from municipality to municipality and is based on a fixed charge according to the area of the property (per m²) or a percentage of the rateable value of the property. In the majority of cases the charge is also made up of part which varies according to the actual volume of water used (per m³). The charges for the capital city Reykjavik, where the majority of the population live, are as presented in the table below.

Table 5.2 Water service charges in the city of Reykjavik 2002–2004

ISK (EUR)	2001	2004
Area of property (per m ²)	94 (1.0)	102 (1.2)
Volume charge (per m ³)	16.03 (0.18)	18.85 (0.22)

Source: The Association of Local Authorities in Iceland, 2001; 2004

Municipal water charging does not always apply, for example, in some rural areas (Nordic Council, 2002). Industrial users, for example, fish processing usually pay according to the volume of water used. Other economic instruments, such as water abstraction taxes or trade effluent taxes or sewage taxes, have not been implemented in Iceland.

5.3 Economic instruments addressing waste issues and the different types of waste

5.3.1 Introduction

Per capita waste production increased from 1.4 to 1.6 kg per capita per day between 1995 and 2003. Preliminary figures for 2003 estimate that 73 percent of waste will be deposited as landfill, 24 percent will be recycled, 2 percent will be incinerated and less than 1 percent will be composted (Statistics Iceland, *not dated*). The landfill route has remained relatively stable between 1995 and 2003, however, unlicensed landfill practices have all but been eradicated in recent years.

Table 5.3 Development in waste treatment (1995 – 2003¹) in percent

Waste management options	1995	2000	2003 ¹
Landfill	81.1	76.9	72.9
with permit	71.4	76.4	72.7
dumpsites without permit	9.7	0.5	0.2
Incineration	3.4	3.0	2.3
with energy recovery	0.5	1.4	1.7
without energy recovery	2.9	1.6	0.6
Recycling (excl. composting)	12.3	19.7	24.2
Composting	0.5	0.5	0.6
Other	2.6	0.0	0.0
Total	100	100.	100

¹ preliminary figures

Source: Statistics Iceland (*not dated*)

In 2003, regulations on waste treatment, landfill sites and waste incineration, respectively, were issued, implementing Iceland's first general waste legislation (Waste Management Law 55/2003). Targets contained in EU Directives, by which Iceland is bound, are addressed, e.g. those in relation to reducing the landfill of household waste and re-use and recovery in relation to packaging waste, end-of-life vehicles (ELV) and electronic and electronic equipment (WEEE). In addition, however, bans on the landfill of scrap metals including ELV, liquid wastes, hazardous waste, contagious and radioactive medical waste and tyres are prescribed in the regulations. Landfill operators must comply with the landfill regulation by July 2009, or cease operation (Nordic Council of Ministers – www.nordic-waste.info). The regulation on the incineration of waste calls, in particular, for the recovery of heat (ENDS, 2003).

The legislation, above, has also resulted in Iceland's first National Waste Management Plan (2004–2016) in which targets are set in relation to the new regulations. The central tenets of the plan include creation of the most cost-effective conditions possible with regard to recycling and an obligation on local authorities to produce waste statistics (Nordic Council of Ministers, www.nordic-waste.info). Similarly, municipalities are required to produce regional or local waste management plans in relation to the national strategy's objectives. National and regional plans will be reviewed every 3 years.

As the costs of waste management could be expected to increase in response to the new waste law and regulations, a special Coordination Committee on the Implementation of Laws has been set up, among other reasons, to assess the cost-effectiveness of the management plan and, if necessary, ensure future funding for the plan. The Committee will also monitor the fulfilment of the targets contained in the plan (Nordic Council of Ministers, www.nordic-waste.info).

5.3.2 *Municipal waste charges*

As a whole, the new regulations call for increased expenditure from municipalities, especially with regard to the regulation of landfill sites, e.g. stricter monitoring requirements (Nordic Council of Ministers, www.nordic-waste.info).

The 2003 regulation on the treatment of waste makes municipalities responsible for collection, handling and treatment of municipal waste. Full-cost pricing applies, however, subsidies may occur where investment projects in waste management are under implementation. Charges vary considerably from one local authority area to another. Waste charges are set at rates proportional to the rateable value of the property and do not, therefore, relate directly to the burden on the service. For the city of Reykjavik, waste charges are presented in the following table.

Table 5.2 Waste collection charges in the city of Reykjavik 2001–2004

ISK (EUR)	2001	2004
Households	6,500 (74)	7,478 (86)
Companies	8,600 (98)	11,374 (130)

Source: The Association of Local Authorities in Iceland, 2001 and 2004

5.3.3 Municipal waste fees at recycling or waste treatment facilities

In the capital area (serving 62 percent of the population), for example, households and smaller enterprises can bring materials covered by recycling schemes free-of-charge to recycling centres, however, other items, e.g. garden waste, building waste, etc. are accepted against payment. Larger operators can take bulky waste directly to the waste sorting facilities against a gate fee, however, waste which has been separated and is subject to the recycling fee is accepted without payment. These gate fees vary according to site, however, for the Reykjavik area, the rates are as follows.

Table 5.4 Gate fees for industrial waste for the Reykjavik area (from July 2004 in ISK per kg (EUR))

Waste products	from July 2004
Sorted corrugated cardboard	5.80 (0.07)
Newspapers and magazines	5.80 (0.07)
Graphic paper	4.66 (0.05)
Mixed waste	8.48 (0.1)

Source: Nordic Council of Ministers – *Waste Management in Iceland* – www.nordic-waste.info/

5.3.4 Recycling fees

The Icelandic Government has opted not to introduce taxes on landfill and incineration at the present time and has instead implemented a system of recycling fees through legislation passed in 2002 (Law 162/2002). The underlying rationale for this decision is the position that landfill and incineration taxes may increase overall costs in the management of waste without achieving the targets of improved waste reduction, re-use, recycling and recovery in Iceland (Nordic Council of Ministers, www.nordic-waste.info/). The 2002 Law on recycling fees replaces the 1996 law on hazardous waste fees and has been revised several times with additions to the list of products to which recycling fees apply. Further amendments are expected, for example, a recycling fee on single-use plastic bags as well as paper and cardboard packaging is to be introduced in 2006 (see Table 5.5 below).

The recycling fees are levied on the products itemised in the law in order to finance their collection, transport, recycling, recovery or disposal. Products include the majority of those treated earlier under the hazardous waste charge, but also other products such as vehicles (with

refund – see 5.3.5), composite packaging (drinks cartons), plastic film used in agriculture and tyres. The Recycling Fund of Iceland was set up in 2003 to collect and administer the recycling fees. The development in fees from 2003 to 2006 is presented in Table 5.5, below. Many rates have remained stable since 2003, however, recycling fees for most batteries, as well as beverage cartons, have been reduced by 50 percent over the period; with similar, though slightly smaller, reductions for vehicles and tyres. The fee for printing ink, on the other hand, has risen 50 percent since 2003.

Table 5.5 Recycling Fees in ISK (EUR) per kg unless otherwise stated

Waste products (ISK per kg unless otherwise stated)	2003	2005	2006 (expected rates)
Plastic film for hay	-	25.00 (0.3)	25.00 (0.3)
Composite paper beverage cartons	22.23	10.00 (0.12)	10.00 (0.12)
Oil compounds other than fuels	11.50	14.50 (0.17)	14.50 (0.17)
Organic solvents	3.00 (0.04)	3.00 (0.04)	3.00 (0.04)
Halogenated derivatives of hydrocarbons	105.00	130.00 (1.5)	130.00 (1.5)
Isocyanides and polyurethanes	1.30	1.50 (0.02)	1.50 (0.02)
Oil-based paint	17.00	20.00 (0.24)	20.00 (0.24)
Printing ink	20.00	34.00 (0.4)	34.00 (0.4)
Chemical preparations for photographic use	basic fee 36.75 (up to 294.00)	basic fee 68.00 (0.8)	basic fee 68.00 (0.8)
Mercury compounds	900 (10.6)	900 (10.6)	900 (10.6)
Insecticides, herbicides and more	3.00 (0.04)	3.00 (0.04)	3.00 (0.04)
Refrigeration fluids	2.50 (0.03)	2.50 (0.03)	2.50 (0.03)
Tyres	36.02	30.00 (0.35)	20.00 (0.23)
Vehicles (see also 6.3.5 below)	1,040.00 each/ year	700 each/ year (8.3)	700 each / year (8.3)
Batteries:			
Manganese dioxide and nickel-metal hybrid	91.00	45.50 (0.54)	45.50 (0.54)
Lithium batteries	171.00	85.50 (1.0)	85.50 (1.0)
Nickel-Cadmium batteries	202.00	101.00 (1.2)	101.00 (1.2)
Mercury dioxide, silver oxide, and zinc air batteries	559.00	279.50 (3.3)	279.50 (3.3)
Button batteries	5.00 each	2.50 each (0.03)	2.50 each (0.03)
Lead-acid batteries	basic fee 19.00 (0.2)	basic fee 19.00 (0.2)	basic fee 19.00 (0.2)
Fishing nets	-	-	0.00
Paper and cardboard packaging	-	-	10.00
Plastic packaging	-	-	10.00

Source: Recycling Fund of Iceland (pers. comm.) – <http://www.urvinnslusjodur.is/>

The table below presents the development in the earlier hazardous waste fees which were also levied on products. The successive revisions in the levels of hazardous waste fees reflect the requirement of the law on the hazardous waste charge that the revenues should fully reflect the costs associated with each individual hazardous waste category. For example, substantial deficits which existed in the respective solvent-based paint and printing ink funds in 2000 led to the charge for these two categories being increased by 60 percent and 233 percent, respectively, from 2000 (Table 5.6) to 2003 (Table 5.5).

**Table 5.6 Development in hazardous waste charges
1997–2002 (in ISK per kg unless otherwise stated)**

Products	1997	1998	1999	2000	2001	2002
Chemical products for photographic and printing industry	33.25–258.00			29.25–234.00		
Other chemical products for photography						
Oil-based paint	2.00	6.00		10.50	13.50	16.00
Printing inks	2.00	6.00				16.00
Protective chemicals – ozone depleting	3.00					
Protective chemicals – decay prevention	3.00					
Isocyanides	1.00					
Halogen chemical compounds		22.00		75.00	90.00	105.00
Solvent-based products other than combustion oil			10.00			9.50
Crude oil			98.00			
Cooling agents				900.00		
Mercury-based products						
Organic solvents	0.50	1.50		3.00		
Batteries:						
Batteries containing mercury	186.00			200.00	13.00 each	
Batteries containing nickel cadmium	186.00			200.00	13.00 each	
Lithium batteries						
Manganese dioxide batteries						
Alkalide button batteries				9.00	13.00 each	
Car batteries with acid	26.00			21.00	19.00	
Car batteries w/out acid	36.40			29.40	26.60	
Automotive batteries from machinery (each)	143.00–2288.00			115.50–1848.00	104.50–1672.00	
Batteries for electrical adaptors	26.00			21.00	19.00	

Source: Icelandic Committee on Hazardous Waste, Annual Report 2002 (Recycling Fund of Iceland – http://www.urvinnslusjodur.is/Starfsemi/spilliefnaneftnd_2002.pdf#search=rafhl%C3%B6%C3%B0ur%20hazardous%20waste) Latest figures: Recycling Fund of Iceland (pers. comm.)

5.3.5 Recycling fee and refund system on end-of-life vehicles (ELV)

As mentioned above, recycling fees have been extended to further categories, including vehicles. An annual recycling fee has been introduced for all vehicles registered in Iceland. The fee is not levied on vehicles which are not subject to the registration tax and the fee no longer applies when vehicles reach 25 years of age and when the fee has been paid for a full 15 years. The current fee is 700 ISK per year. A refund of 15,000 ISK is paid on deregistration of the vehicle and its return to an authorised dismantler (Iceland Recycling Fund, 2005).

5.3.6 Deposit-refund system for refillable and non-refillable beverage containers

Since 2002, the deposits on refillable and non-refillable beverage containers have been as listed in Table 5.7. A refund equivalent to the stan-

standard charge (9 ISK including VAT) applies to all containers regardless of type (Endurvinnslan hf. web-site).

Table 5.7 Deposit rates for beverage containers 2000–2005 (in ISK per container)

Chargeable product	2000		2002 – 2005	
Standard charge per container (excl. value added tax)	6.43		7.23	
Plus:				
Aluminium cans	1		0.00	7.23
Steel cans	3.00	= 9.43	3.40	= 10.63
Glass bottles > 500 ml	2.20	= 8.63	2.50	= 9.73
Glass bottles < 500 ml	1.60	= 8.03	1.80	= 9.03
Plastic bottles – coloured	1.60	= 8.03	1.80	= 9.03
Plastic bottles – not coloured	0.30	= 6.73	0.76	= 7.99

Source: Internal Revenue, Iceland, 2004; Endurvinnslan hf, 2002

The deposit-refund system on refillable and non-refillable aluminium, steel, plastic and glass packaging has been in place in Iceland since 1989 and has achieved a return rate of over 80 percent for refillable and non-refillable beverage containers, including cans. The legislation introducing recycling fees in 2002, described above, prescribes recycling charges on non-refillable aluminium, steel, plastic and glass packaging which are to come in to force on 1 January 2008. At this point, the deposit-refund system will no longer apply to these types of container. The Recycling Fund may reach agreement with Endurvinnsla hf, the organisation which operates the deposit system, before this time about replacing the deposit-refund system with the recycling fee (Nordic Council of Ministers (www.nordic-waste.info) and Icelandic Parliament, 2002).

5.4 Economic instruments related to transport

5.4.1 Registration tax on motor vehicles

The registration tax on private cars was introduced in Iceland in the beginning of the 1990s and has undergone two revisions since, although the tax base remains as the value of the motor vehicle. When the tax was originally introduced, new registered vehicles were charged a tax between 30 and 75 percent of the customs value of the imported vehicle. The exact rate depends on the engine capacity of the vehicle. Motor vehicles with an engine capacity not exceeding 1,400 cm³ were only charged with a 30 percent tax while motor vehicles with an engine capacity exceeding 2,500 cm³ were charged with a 75 percent tax. This policy of differentiating the tax base can be characterised as of benefit to the environment as it provides an economic incentive to choose smaller, and therefore often less environmentally damaging, vehicles. Nevertheless the

rationale and purpose of this form of taxation is clearly a fiscal one, i.e. to raise revenues for the national budget.

In 1995–1996 the registration tax was reformed by introducing special tax categories for diesel powered motor vehicles. The registration tax was originally introduced in 1993 with a uniform tax on the motor vehicles irrespective of fuel type. It should be noted that the two tax reforms favoured motor vehicles with a high engine capacity as the tax rate dropped from 75 percent to 45 percent in 2000. Vehicles with a weight exceeding 5 tonnes, as well as buses with a seat capacity of 18 or higher, are completely exempt from the excise duty as opposed to vehicles with a weight not exceeding 5 tonnes, which are partially exempt from the excise tax. Furthermore, partial exemptions from the excise duty are also available for tractors, motorcycles and other vehicles, such as snow-mobiles. The following table illustrates the development in the Icelandic registration tax.

Table 5.8 Registration tax on motor vehicles (in percent of the vehicle's value)

	1993	1995	1996	1999	2000	2005
Petrol, engine capacity (cm ³)						
0–1,400	30%	30%				
0–1,600			30%	30%		
1,401–2,000	45%	40%				
1,601–2,500			40%	40%		
2,001–2,500	60%	60%				
> 2,500	75%	75%	40%	40%		
Diesel, engine capacity (cm ³)						
0–1,900		30%				
0–2,100			30%	30%		
1,901–2,500		40%				
2,101–3,000			40%	40%		
2,501–3,000		60%				
>3,000		75%	65%	65%		
Engine capacity (cm ³)						
0–2,000					30%	30%
>2,000					45%	45%

Note: the tax rate can be lowered or completely waived for taxis and rental cars. For cars that are specially made to run on methane or electricity, the tax is lowered by ISK 240.000. The tax is lower for special purpose vehicles among them pick-up trucks.

Source: Icelandic Ministry of Finance, 2004

5.4.2 Annual duties on motor vehicles

The last component of the Icelandic transportation tax scheme is the annual tax on motor vehicles. The annual tax on motor vehicles is made up

of a general weight tax for all motor vehicles, regardless of fuel source, and a special weight-distance tax for diesel powered vehicles. In order to understand the overall picture of the Icelandic transportation tax scheme, it is necessary to evaluate the annual taxes on motor vehicles in the light of the non-existence of taxation on diesel fuel. The special taxes on diesel fuelled vehicles can be seen, in some way, to offset the taxes levied on petrol.

The general weight tax on all motor vehicles was introduced in 1988 and is levied on the vehicle owners on a biannual basis. The duty is levied on the vehicle according to the vehicle's weight. However, there is both a maximum and a minimum level of the biannual weight tax as presented in Table 5.9.

Table 5.9 Biannual general weight tax on motor vehicles

	1990	1996	2000	2002	2005
<1,000 kg (EURcent/kg)	5.28	6.92	8.27	7.66	8.06
1,000–3,000 kg (EURcent/kg)	7.93	11.41	11.16	10.33	10.86
>3,000 kg (EURO/tonne)			27.56	25.53	26.85
Minimum and maximum taxation for each taxation period					
Minimum (EURO)	27.01	35.35	41.33	38.29	40.29
Maximum (EURO)	155.34	223.43	498.76	461.82	485.82

Source: Icelandic Ministry of Finance, 2004.

The tax rates have been gradually raised and only the conversion to EUR distorts the actual development. Taxis, buses as well as delivery lorries pay a 25 percent surcharge on the rates shown in Table 5.9. This policy is, in itself, interesting as these vehicles are partly exempt from the registration tax, as discussed above.

As mentioned above, the taxation scheme of diesel fuelled vehicles underwent a major revision in 2005. The reform entered into force in July 2005. Although the old scheme is therefore superseded, the specific features of it are still discussed. In addition to the general weight tax, owners of diesel vehicles have to pay a special annual tax, i.e. the weight distance tax. The special weight-distance tax was introduced in Iceland in 1996. The tax differentiates between vehicles that weigh less than 4 tonnes and vehicles weighing more than 4 tonnes. The owners of diesel vehicles of the former category, i.e. less than 4 tonnes, have the option either to pay the weight distance tax for each kilometre driven, amounting to 6.91 ISK per km (0.08 EUR/km), or the special annual weight tax for diesel vehicles below 4 tonnes as shown in Table 5.10.

Table 5.10 Special annual weight tax for diesel powered vehicles (EUR)

	1996	2000	2002	2004	2005 ¹¹
0–999 kg	1,114	1,299	1,094	1,168	1201
1,000–1,499 kg	1,337	1,559	1,313	1,403	1441
1,500–1,999 kg	1,560	1,883	1,586	1,694	1741
Duty for every additional 200 kg up to 4,000 kg (EURO/kg).	89	108	91	97	100

Source: Icelandic Ministry of Finance, 2004

Owners of diesel powered vehicles weighing more than 4 tonnes and trailers weighing more than 6 tonnes are subject to a special weight-distance tax. The weight-distance tax is calculated on the basis of the weight of the vehicle and the number of kilometres driven. In 2004, the special weight distance tax ranged from 6.91 ISK/km (0.08 EUR/km) for vehicles weighing between 4 and 4.9 tonnes and up to 31.05 ISK/km (0.36 EUR/km) for vehicles with a weight exceeding 31 tonnes.

Table 5.11 Special weight-distance tax

	1993	1996	2000	2002	2005
Diesel fuelled motor vehicles weighing 4–4.9 tons (EURCent/km)	8.38	9.03	7.32	7.39	8.38
Diesel fuelled motor vehicles weighing >31 tons (EURCent/km)	40.85	32.46	32.89	33.18	40.85

Source: Icelandic Ministry of Finance, 2004

In 2005 the special tax scheme on diesel fuelled vehicles changed with the new scheme entered into force in July 2005. The consequence of the reform is that the special annual weight-distance taxes on diesel powered vehicles have been replaced by a 45 ISK/l (0.5 EUR/l) diesel fuel excise duty. However, the diesel tax rate is temporarily lowered by 4 ISK/l (0.05 EUR/l) in order to promote a shift from petrol to diesel fuelled vehicles. In addition, there is a tax per kilometre for vehicles weighing more than 10 tons from ISK 0.29 /km for a 10 tonne vehicle to 12.89 ISK/km for a 31 tonne vehicle. This tax also applies to tandem wagons. Public transport vehicles are exempt from 80 percent of this tax. This development is rather interesting and must be seen in the context of the political debate concerning the introduction of road pricing regimes in Europe.

5.5 Economic instruments in other environmental areas

Iceland was one of the earliest nations to introduce individual transferable quotas (ITQs) in fishery. The ITQ system was implemented in 1984 and was supported by the fishing industry as this system was seen as a necessary and temporary remedy to overcome the deep crisis prevailing at the

¹¹ This applies only to first half of the year. The system was changed on 1 July 2005.

time. The fishery fleet was overcapitalised and the stocks were overfished (EEA, 2005a). The ITQ system had a positive economic impact, but also some distributional consequences as the number of ITQ holders fell from around 1,100 in 1991 to 700 in 1997. Furthermore, more than half of all quotas are held by just 22 quota holders due to the quotas being tradeable between holders.

6. Latvia

6.1 Economic instruments related to energy consumption and air pollution abatement

6.1.1 General introduction

Energy consumption has increased slowly but continuously over the past years, reaching 5,706 million kWh in 2003 as compared to 4,963 million kWh in 1995. Latvia uses a comparatively high percentage of renewable energy sources; 28.6 percent wood and 5.6 percent hydropower and wind energy in 2001 (Baltic Environmental Forum, 2003).

The main aim of the excise duties is fiscal, i.e. to generate revenue for the state budget by imposing a tax in addition to the value added tax. A further aim is to restrict the consumption of goods which are harmful to the environment and human health. Excise duties in Latvia have been increasing constantly since 2001; the rates are fixed by the Law on Excise Duties and are increased by amendments approximately every year.

In Latvia, excise duties are imposed on mineral oil products used as transport or heating fuels. Mineral oil products supplied to and used for the generation of electricity, the combined generation of electricity and heat (CHP) as well as in chemical treatment processes are all exempt from the duty.

Table 6.1 Excise duties on fossil fuels in Latvia (2001–2005)

	2001	2002	2003	2004	2005
Light fuel oil (EUR/1000 l)	142.9	142.9	185.7 18.6 ¹	211.4 18.6 ¹	234.3 20 ¹
Heavy fuel oil (EUR/ton)	7.1	8.6	10	12.9	14.3
Kerosene (EUR/1000 l)	142.9 18.6 ¹	142.9 18.6 ¹	185.7 18.6 ¹	211.4 18.6 ¹	234.3 20 ¹
Petroleum gases and other gaseous hydrocarbons (EUR/ton)	71.4	71.4	71.4	108.6	118.6

Note: ¹if respective petroleum products are labelled (marked) and are used as heating fuel for the production of heat or energy

Source: for the years 2001–2003: Law on Excise Duties for Petroleum Products with amendments, for the years 2004–2005: Law on Excise Duties with amendments

For biodiesel fuel acquired entirely from rapeseed oil, a zero excise tax rate is applied. A zero rate is also applicable to petroleum products which are not used as heating fuels in gas furnaces and other equipment. Enterprises using mineral oil products for production of heat and provision of hot water receive a refund of the duty paid.

A rate of 0.14 EUR per thousand cubic metres is levied on natural gas extracted in according to the procedures specified by the Cabinet of Min-

isters. However, this tax on natural gas is actually considered as a natural resource tax and not an excise tax. It is paid by all legal entities who have received a licence for extracting natural gas in the territory of Latvia (or its continental shelf).

Latvia has received a transitional period until 1 January 2010 for adjusting the tax on heavy fuel oil, established under the Energy Products Tax Directive (2003/96/EC) and laid down in Directive (COM/2004/42), used for heating and the provision of hot water to households. However, the tax rate cannot be less than 50 percent of the Community minimum rate as from 1 January 2007. There is currently no tax levied on the use of coal and coke, and Latvia is required to introduce taxes on these solid fuels during the coming years. This transitional arrangement ends at the close of 2008 at the latest.

6.1.2 Excise duties on electricity consumption

Electricity is currently not subject to an excise duty in Latvia. Latvia has been granted a transitional period until 1 January 2010 to adjust its national level of taxation on electricity to the relevant minimum levels of taxation. However, the effective tax rates applied to electricity cannot be less than 50 percent of the relevant Community minimum rates as from 1 January 2007.

6.1.3 Excise duties on transportation fuels

Although Latvia has increased the tax rates levied on transport fuels during recent years, the current tax rates for mineral oil products used as propellant do not meet the minimum rates as set by the 2003 Energy Products Tax Directive (see Table 6.2). The government reported that immediate transposition of the tax rates according to the directive would lead to drastic increases in the tax rates compared with the 2004 Latvian rates, in the range of 5 to 97 percent.

Table 6.2 Excise duties on transportation fuels in Latvia (2001–2005)

	2001	2002	2003	2004	2005
Unleaded petrol (EUR/1000 l)	222.6 214.3 ¹	222.6 185.7 ¹	222.6 185.7 ¹	248.6 235.7 ¹	274.3 260 ¹
Leaded petrol (EUR/ 1000 l)	300 285.7 ¹	300 257.1 ¹	300 257.1 ¹	364.3	401.4
Diesel fuel (gas oil) (EUR/1000 l)	142.9	142.9	185.7	211.4 201.4 ²	234.3 211.4 ²
Kerosene (EUR/ton)	142.9	142.9	185.7	148.6 ³ 211.4	162.9 ³ 234.3

Note: ¹if the following products are added: (1) ethyl alcohol which is acquired from agricultural raw materials and which has been dehydrated (with alcohol content of at least 99.5 % by volume) and which has been denatured from 4.5 to 5.0 % by volume of the total amount of petroleum products; (2) ethyl alcohol derivative ETBE (separately or together with ethyl alcohol) — up to 12 % by volume of the total amount of petroleum products;

²if biodiesel fuel acquired from rapeseed oil is added to diesel fuel or gas oil and biodiesel fuel constitutes from 5 to 30 % (not inclusive) by volume of the total amount of petroleum products;

³if biodiesel fuel acquired from rapeseed oil is added to diesel fuel or gas oil and if biodiesel fuel constitutes at least 30 % by volume of the total amount of petroleum products.

Source: for the years 2001–2003: Law on Excise Duties for Petroleum Products with amendments, for the years 2004–2005: Law on Excise Duties with amendments

Petroleum products are exempt from the tax if they are supplied to and used in aircrafts and ships not used for private recreation and entertainment. A producer of agricultural products receives a duty refund for 100 litres of diesel fuel (gas oil) per hectare per calendar year if it is used for the cultivation of utilised agricultural areas. If the producer of agricultural products has tax, fee or any other state-specified mandatory payment debts, the refundable amount is first transferred to cover such debts.

Latvia has received the following transitional periods for adjusting the national level of taxation. These transition periods are granted to Latvia by the European Commission as immediate implementation would lead to significant price increases and threaten the macroeconomic stability of the country:

- for gas oil and kerosene: EUR 302 per 1,000 litres until 1 January 2011 and EUR 330 until January 2013 (however, the tax rate cannot be less than EUR 274 per 1,000 litres from 1 January 2008);
- for unleaded petrol: EUR 359 per 1,000 litres until 1 January 2011 (however, the tax rate cannot be less than EUR 323 per 1,000 litres from 1 January 2008);
- for coal and coke: a transitional period until 1 January 2009 (however, tax rates for coal and coke cannot be less than 50 percent of the relevant Community minimum rates from 1 January 2007).

Latvia does not have transitional periods for natural gas to reach the EU excise minimum taxes.

6.1.4 Emission trading scheme (ETS)

The emission trading scheme is obligatory for combustion installations with a nominal thermal input exceeding 20 MW, as well as for glass manufacturing, metal processing, production of bricks, concrete and cement installations producing at levels higher than those defined by the Law on Pollution. The Latvian emission trading scheme covers 96 installations, of which 72 participate mandatory (60 combustion installations and 12 industrial enterprises). Allowances amounting 13.73 million tonnes are allocated for the period 2005–2007, of which 1.57 million tonnes are reserved for new installations. The emission trading scheme covers 38 percent of the total greenhouse gas emission of the country. Based on a concept elaborated by the Ministry of Economy on implementation of energy efficiency measures, the potential for CO₂ emission reductions for combustion installations was estimated at a 1 percent reduction in 2005 (compared with the base year), a 3 percent reduction in 2006 (compared with 2005) and a 5 percent reduction in 2007 (compared with 2006)¹². The potential to reduce CO₂ emissions in industrial enterprises operating under the emission trading scheme is not assessed.

Latvia is not planning to use the flexible mechanisms available under the Kyoto Protocol as an investing country.

6.1.5 Air pollution charges

Latvia introduced a CO₂ emission charge in 2004. This new charge is part of the comprehensive scheme on air pollution charges as shown in Table 6.3. However, companies participating in the emissions trading scheme are exempt from this charge. This aspect is significant as companies participating in an ETS in other countries are not automatically exempt from paying CO₂ taxes.

¹² Latvian National Allocation Plan 2005–2007

Table 6.3 Charge rates for air pollution

Classification of emission	Rate (EUR/ton)	Comments (period of application)
Carbon dioxide (CO ₂) emissions from incinerators ¹	0.14 0.43	01.07.2005– 30.06.2008 Beginning from 01.07.2008
Solid particles (dust not containing heavy metals)	5.71	
Carbon monoxide (CO)	7.86	Till 30.06.2005
Carbon monoxide (CO), except for boiler room emissions	7.86	Beginning from 01.07.2005
Ammonia (NH ₃) and other non-organic compounds	18.57	
Sulphur dioxide (SO ₂), nitrogen oxide (NO _x – nitrogen oxide sum, recalculated to NO ₂), volatile organic compounds and other hydrocarbons (CnHm)	18.57 42.86 85.71	01.05.2004– 30.06.2005 01.07.2005– 30.06.2008 Beginning from 01.07.2008
Heavy metals (Cd, Ni, Sn, Hg, Pb, Zn, Cr, As, Se, Cu) and their compounds, recalculated to the relevant metal, and vanadium pentoxide recalculated to vanadium	1142.86 1171.43	01.05.2004– 30.06.2005 Beginning from 01.07.2005
Volume of emitted greenhouse gases by installations which is not included in the amount of transferred greenhouse gas emission quota	40 100	01.01.2005– 31.12.2007 Beginning from 01.01.2008

Note: ¹except incinerators which utilise renewable energy resources (wood, straw) and local fossil fuel (peat) as heating fuel

Source: Law on Natural Resources Tax, Annex 4

Rates for air pollution emissions have not been modified since 1995 with the exception of a minor increase in 2000.

As is the case in the other Baltic countries, non-compliance fees are applied in Latvia for emissions exceeding predefined limits. The emission charge is then calculated as the sum of the basic rate (i.e. the rates presented in Table 6.3) and an additional rate amounting to three times the basic rate for the particular pollutant. For illegal and unreported emissions, the emission charge is calculated as the sum of the basic rate and an additional rate amounting to twelve times the basic rate for the pollutant.

Polluters who implement projects to reduce air pollution or decrease the consumption of natural resources at their own expense may be granted a charge allowance covering part or all of the costs of implementing such projects.

6.2 Economic instruments related to water pollution

6.2.1 Introduction

Economic instruments related to the efficient use of water resources and the reduction of water pollution have been introduced by the Law on the Natural Resource Tax in 1996.

Latvia is rich in waters and does not face any shortages with regard to surface-water supply or, to a large extent, with regard to groundwater resources, however, a tax has been imposed on the abstraction of water resources. The main reason for implementing the tax was to encourage water supply companies to improve their networks, reducing the significant losses through leakages identified at the beginning of 1990s. Since then much has been achieved with regard to reducing these losses and, therefore, the necessity of maintaining the tax can be questioned.

In contrast to the good situation with regard to water supply, conditions with regard to water quality are poor due to the lack of adequate wastewater treatment facilities. Many surface waters still do not reach levels of sufficiently good quality. The Latvian Environmental Policy Plan recognises eutrophication (pollution with phosphorus and nitrogen) as one of the key environmental issues requiring action. Pollution with hazardous substances has also been raised as a key environmental issue. One of the main reasons, therefore, for introducing the water pollution tax was to charge polluters for damage caused to the environment. However, current tax rates are not based on water pollution mitigation costs.

Similar to all EU Member States, Latvia has transposed the requirements of the Water Framework Directive into national legislation. In spring 2005, a characterisation report was published including an assessment of whether the cost recovery principle had been achieved in the country. The detailed assessment was carried out for the two cities Liepaja and Riga concluding that 62 percent and 73 percent, respectively, of the financial costs of the water services had been covered. On the basis of a survey based on a questionnaire, the Latvian Water Basin Board concluded that on average 90 percent of the maintenance, administration and depreciation costs with regard to water supply and wastewater treatment are covered in the country.

6.2.2 Economic instruments on water pollutants

The charge on water pollution is imposed according to the degree of hazard of the polluting substance. Charge rates for water pollution have not changed since 1996, meaning that the real value of these taxes has been reduced quite considerably.

Table 6.4 Charge rates for water pollution (year 2004)

Classification of polluting substances according to the category of hazardousness	Rate (EUR/ton)
Non-hazardous substances (e.g., Biological Oxygen Demand)	4.3
Suspended substances (non-hazardous)	14.3
Moderately-hazardous substances (total-N, total-P, COD)	42.9
Hazardous substances (Zn, Cu, Ni)	11,429
Especially hazardous substances (Pb, mercury)	71,429

Source: Law on Natural Resource Tax, Annex 5

The same rules apply for discharges of pollutants to water as for air pollutants. The non-compliance fee paid for discharges exceeding the permitted level is calculated as the sum of the basic rate and an additional rate which amounts to three times the basic rate for the particular pollutant. For illegal and unreported discharges, the fee is calculated as the sum of the basic rate and an additional rate amounting to twelve times the basic rate for the particular pollutant.

Similar to the situation for air emission charges, polluters who finance projects to decrease water pollution may be granted an allowance up to the amount necessary for the implementation of such projects. Again the Ministry of the Environment has to assess such projects in advance before the allowance can be granted.

6.2.3 Tax on water consumption

Latvia imposes a tax on water extraction which is levied according to the type of water and the actual amount extracted. One of the underlying reasons for having this economic instrument in water management policy is to encourage the efficient use of water resources (i.e. minimise water losses). Tax rates for water extraction have not been subject to major changes during recent years with the exception of an increase in the tax rates for mineral waters in 2000 (from 0.21 to 0.29 EUR/m³)

Table 6.5 Tax rates for the extraction of water (year 2004)

Source or type of water extraction	Rate (EUR/m ³)
Surface water	0.003
Underground water, including fresh water:	
drinking water	0.014
technical water	0.007
Mineral waters, including:	
mineral water	0.29
medicinal mineral water	0.14
thermal water	0.07

Source: Law on Natural Resource Tax, Annex 2

The following types of water use are exempt from the tax:

- use of water (flow) in hydro-technical and fishery operations, also hydroelectric power stations, reservoirs, fish farms and pond farms, except for those volumes of water, which are specified in the use of water permit for consumption for manufacturing, and economic and household needs;
- volumes of thermal and technical water, which after utilisation are pumped back into the water acquisition horizon without changing the chemical composition of the water;
- water utilised for manufacturing needs if utilised again after purification.

Therefore, it can be seen that the water extraction charge motivates the reuse of water as well as supports certain economic activities e.g. fish farming.

6.2.4 User charges for water supply and wastewater services

Charges for water supply and wastewater services are set by the water utilities and approved by the municipal regulator of communal services. The regulator is an independent regulatory body established by one or several municipalities. There are currently 17 regulatory bodies in Latvia. The methodology for calculating tariffs is predetermined by rules set by the Cabinet of Ministers. However, application of the methodology can vary. The charges are set in such a way that the payments by users cover the costs of water supply and wastewater services. Water supply and wastewater service users also pay the natural resource tax (water abstraction and water pollution) indirectly, as it is included in the charges.

As water supply and wastewater services fall under the responsibility of municipalities, around 500 entities in Latvia deal with water supply and wastewater services. Therefore, charges vary significantly according to municipality. It is currently impossible to collect detailed information on these charges as the relevant statistical information is not gathered.

In 2004, the Latvian Environment, Geology and Meteorology Agency carried out a survey of around 100 water utilities. The response showed that most of the municipal enterprises apply one-level tariffs which can be differentiated according to consumer group. Only few water utilities (3 respondents) apply differentiated charges consisting of a fixed subscription fee and a variable fee depending on the volume consumed.

Table 6.6 Water supply and wastewater service charges according to consumer group EUR/m³ (year 2004)

Consumer group	Water supply charges			Wastewater service charges		
	Average	Minimal	maximal	average	Minimal	Maximal
Households	0.31	0.09	0.59	0.40	0.10	0.79
Institutions	0.40	0.19	0.80	0.57	0.17	1.59
Enterprises	0.46	0.19	1.29	0.66	0.17	1.84

Note: ¹calculated from data from 44 enterprises, including those municipalities that have unified tariffs

Source: Latvian Characterisation report 2005

The Latvian tariff structure, as presented in Table 6.6, is interesting as it shows that enterprises face the highest user charges for water supply and wastewater services and households the lowest. This is in contrast with the situation in many OECD countries where it is households who face the highest user charges for water services (see for example OECD, 1999).

6.3 Economic instruments related to waste

6.3.1 Waste policy in general

With accession to the EU, Latvia has to achieve different targets set for the waste management sector, as is the case for all EU Member States. These relate to recovery and recycling for different waste streams laid down in the relevant EU environmental legislation. To achieve the targets within a given period of time, an economic incentive has been installed in the form of a product charge on products generating relevant waste.

The first product groups were packaging and packaging materials and various hazardous wastes which are problematic to recover (waste oils, tyres, car batteries, etc.). Later, a new waste stream, end-of-life vehicles (ELV), was introduced. The new Latvian Law on the Tax on Natural Resources, currently under development, will also introduce a charge on electric and electronic waste (WEEE).

The aim of introducing the charge is to force the producer of the particular product group to take responsibility for waste management by developing and implementing a waste management system which guarantees the achievement of the set target. If that is achieved, then a producer is free from the product charge.

6.3.2 Waste tax

The landfill of waste is considered as one of the main polluting activities in Latvia, and a tax, therefore, has been installed since 1996. The landfill tax is actually paid to the state by the operator of a landfill site, who then passes the tax on via the total landfill charge.

Each waste producer, including households, pays a user charge on waste management to a waste collecting company which delivers waste either to landfill or a recovery facility. The user charge includes all costs related to management of the waste.

The landfill tax differs according to the degree of hazard associated with a particular waste. The landfill tax for municipal wastes has not increased since 1996. The only increase has been for hazardous waste. Starting from 2002, the charging system for municipal waste has been partly revised so that the user charge can also be levied also according to the weight of the waste.

Table 6.7 Waste tax rates in Latvia (2005 in EUR/t)

Category of waste	1996	Since 01.07.2002
Municipal waste, other non-hazardous waste (having weight bridges)	-	1.07
Municipal waste, other non-hazardous waste (without weight bridges), (in EUR per m ³)	0.36	0.34
Hazardous waste	2.14	14.29
Highly hazardous waste	71.43	71.43

Source: Law on Natural Resource Tax, Annex 3

In 2003 Latvia planned to introduce a tax on hazardous waste to be incinerated due to the construction of the first hazardous waste incinerator in the country. The new tax was meant to compensate, to an extent, for the potential damage to the local environment and at the same time to raise revenues for the local municipality. The revenue is earmarked for the implementation of various environmental protection measures. The charge rate is around 17 EUR per tonne of hazardous waste, however, due to the fact that the incineration facility has not been launched, the tax has not yet been applied.

6.3.3 User charges on waste

The charge for municipal waste management is set based on governmental regulations no.281 on the calculation methodology for public services in sectors regulated by local authorities (1.07.2001).

The charge is calculated by the municipal waste management companies and is approved by a regulator established by the local authority. The charge covers the costs associated with collection, transport, storage, loading and landfill of waste.

In practice, the charge on waste management differs across the country, varying in 2005 from around 4.4 to 8 EUR per m³, excluding VAT.

6.3.4 Waste product taxes

6.3.4.1 Packaging tax

The tax on packaging material was introduced in 1996 to encourage waste recovery operations and, thereby, minimise environmental pollution arising from waste. The packaging tax scheme has been amended over time. The latest modifications were introduced to support implementation of the requirements of the EU Packaging Directive (EC/96/64).

Table 6.8 Tax on packaging material and disposable tableware (EUR per ton)

Type of packaging	1997–2000 ¹	2000–2005
Paper/cardboard and wood or other materials of natural fibre	14	17
Paper/cardboard and other laminated materials with polymer and metal components	86	86
Plastic, except PET	107	129
PET	107	150
Metal	71	86
Glass	35.7	57

Note: ¹There were several methods for calculation of the tax. For comparability the rates of the same approach was chosen.

Source: Law on Natural Resource Tax, Annex 8

Tax exemptions are granted if recovery or recycling of packaging waste is undertaken. Companies implementing voluntary programmes for packaging waste management are entitled to receive tax exemption of up to 80 percent of the total tax payments, and will be completely exempt from the tax under regulations set out in a new law concerning packaging waste. The voluntary programme involves an agreement between the Ministry of Environment and the taxpayer on measures aimed at the recovery of packaging waste at higher levels than government specified norms. Taxpayers can implement the voluntary programme either by contracting a waste management company or by joining a packaging waste recovery organisation, of which there are two in operation at the present, to organise packaging recovery on behalf of their clients. Companies that place less than 300 kg of packaging on the domestic market annually are not requested to establish a management scheme for the packaging waste, although they are still required to pay the tax.

Introduction of the tax on packaging waste has initiated new management responsibilities and structures in the waste sector. Instead of a direct link between the waste generator and the waste disposal company, product producers or so-called producer support organisations and waste management companies have set up a voluntary cooperation system to achieve the given recycling goals.

6.3.4.2 End-of-Life Vehicles (ELV)

To enforce producers' responsibilities in achieving recovery targets laid down in Directive 2000/53/EC, Latvia has established the so-called ELV

charge to be paid when a motor vehicle is first registered in Latvia. The new charge will come into force on 1 October 2005. The charge rate will be around 34 EUR. Manufacturers of vehicles (or their authorised representatives) establishing an ELV management system can receive an exemption if a set of requirements are met. An exemption for a period of up to 5 years is possible if all key requirements are followed and a plan for development and implementation of an ELV management system for 5 years is submitted and a contract with a waste collection and recovery company is established.

Subsidies for waste management enterprises for establishing a collection and recovery system are available until 31 December 2006 (Article 10 of the Law on ELV).

6.3.4.3 Waste electric and electronic equipment (WEEE)

The introduction of a charge on electric and electronic waste is currently being discussed, however, no decision has been made to date.

6.3.4.4 Charges on other products harmful to environment

Charges on other products, such as batteries, mercury light bulbs, oil waste, etc., and others had already been introduced in 1996 to encourage waste recovery operations in the country and, thereby, minimise environmental pollution arising from waste. The main purpose of these product charges is to stimulate the collection and recycling of certain problematic waste streams financially, as well as to encourage a reduction in the consumption of these products by increasing their sales price.

Under current legislation, it is not possible for taxpayers to avoid the charges. The state has introduced a so-called “state charge-recycling subsidy scheme”. Companies (even if they do not pay the charge themselves) that organise waste collection and recovery (recycling) of chargeable products according to the environmental criteria required can apply to the Environmental Protection Fund for a subsidy. The subsidy is in the range of 60–90 percent of the charge to be paid. In future, the system will be changed by eliminating subsidy schemes and transferring the full responsibility to producers.

Table 6.9 Charge rates on products harmful to the environment

Type of goods or products	Taxable Unit	1997–2000	2001–2005
Lubricant oils	Ton	28.6	42.9
Lead containing electric power batteries and chemical batteries (depending on capacity)	Per item	2.1–8.6	2.1–8.6
Other electric power batteries and chemical batteries	Value in LVL	15%	15%
Mercury luminescent bulbs	Per item	0.14	0.14
Tyres	Ton	71.4	85.7
Filters (oil, fuel, intake air)	Per item	0.14	0.14

Source: Law on Natural Resource Tax, Annex 7

Table 6.9 illustrates that the majority of the charge rates have been kept constant since they were introduced. The exceptions are the charges levied on tyres and lubricant oils, which both increased considerably in 2001.

6.4 Economic instruments on the use of natural resources

6.4.1 *Taxation of natural resources*

The objective of this taxation scheme was to limit mismanagement in the use of natural resources as well as to accumulate resources for financing environmental protection measures.

The natural resource tax has been implemented for almost all types of natural resources. The charge is applicable to legal entities which, according to legislation, are required to obtain permits for the extraction of natural resources.

In general, the tax rate may have an impact on the product price, which can easily influence user/consumer market demand patterns as reflected in decreased consumption or can cause a shift to another similar type of resource. However, the current resource tax rate is generally low. Moreover, it has not been increased since 1996.

As taxes are levied on the amount of the natural resource extracted rather than on the amount actually used, resource users are motivated to utilise each unit of extracted material economically during the entire production/utilisation cycle and to minimise losses (for example, by reducing leakages in water distribution system – see Section 6.2.3).

For extraction of natural resources over the amounts specified by the limits (or licence) – the basic tax rate plus an additional tax equal to the basic rate multiplied by a factor of 3 applies. Fines for undeclared (not recorded) or unlawful (without licence) extraction of natural resources can be as much as 12 times the basic tax rate for all amounts extracted.

Table 6.10 Tax rates on natural resources in the Latvia

Natural resource/raw material	Unit	EUR
Soil	m ³	0.29
Sandy loam and clay loam	m ³	0.014
Quartz sand	m ³	0.29
Sand	m ³	0.07
Sand-gravel	m ³	0.14
Clay for production of building materials	m ³	0.14
Dolomite	m ³	0.086
Decorative dolomite	m ³	0.36
Limestone	m ³	0.14
Loose freshwater lime	m ³	0.14
Decorative travertine	m ³	1.43
Gypsum	m ³	0.31
Boulders from gravel pits for construction	m ³	0.21
Coloured soil for pigments	m ³	0.14
Peat for from peat bogs and transitional mires (40% humidity) degree of decomposition below 20%	ton	0.19
Peat from fens (humidity 40%) degree of decomposition above 20%	ton	0.10
Sapropel	ton	0.14
Mud for medicine	ton	0.71
Sapropel –organogen, containing lime	ton	0.71

Source: Law on Natural Resource Tax, Annex 1

6.5 Economic instruments related to transport

Excise duties on motor vehicles consist of the registration tax and the annual vehicle circulation tax. The registration tax is imposed on cars and motorbikes registered in Latvia that are imported from EU member countries or other countries that are not EU Member States. The registration tax is levied according to the age of the vehicle counting from the first registration date abroad. Cars and motorbikes older than 25 years, electromotor vehicles, as well as vehicles used for special purposes (emergency medical aid, handicapped) are exempt from the registration tax.

Figure 6.1 Registration tax on motorcars and motorbikes in Latvia 2005

Source: Law on Motorcar and Motorbike Tax

The aim of the annual circulation tax for vehicles is to generate revenues for the maintenance of state and municipal roads. Annual tax rates are imposed according to the type of the vehicle (motorbike, motorcar, heavy duty truck) and weight.

Table 6.11 Annual tax for motorcars, buses and heavy good vehicles (year 2004)

Weight of the vehicle (kg)	Annual tax (€)
Up to 1,500	17.1
1,501 – 1,800	34.3
1,801 – 2,100	64.3
2,101 – 2,600	77.1
2,601 – 3,500 kg	102.9
3,501 – 12,000 kg	111.4
>12,000 ¹	145.7

Note: ¹ for heavy duty vehicles weighting more than 12 tonnes, additional parameters such as number of axels and suspension is taken into account.

Source: Law on Annual Vehicle Tax

Vehicles for the disabled, emergency transport (medical aid, fire fighting) and operative transport (armed forces, ministry of internal affairs) are exempt from the tax. Tax relief of 50 percent applies for transport of the armed forces (other than operative transport) the Ministry of Internal Affairs, the police as well as vehicles used in agricultural production.

6.6 Deposit-refund systems

Deposit-refund systems have not been widely used in Latvia. Traditionally they included only particular types of refillable glass containers such as beer and mineral water bottles. Since 2004, however, a new regulation on a deposit system for refillable glass containers (beer and mineral water) was introduced as well as for the crates. It foresees that the manufacturer or importer wishing to participate in the deposit system will have to make an application to the Ministry of the Environment for the particular type of packaging, submitting documents, verifying the packaging conforms with the standard, and specifying the amount of the deposit payment and the amount of packaging involved. The manufacturer or importer using the deposit system should label the packaging with a specific label and inform consumers of the deposit system through mass media as well as in the retail outlets in which the relevant goods are sold. The deposit fee is 0.07 EUR or 0.09 EUR per bottle depending on bottle type, and 2.46 EUR or 2.86 EUR per plastic crate depending on its storage capacity. To date, no manufacturer or importer has shown an interest in implementing the system.

6.7 Environmentally motivated subsidies

Until 2005, subsidies have played a significant role in financing the environmental sector in Latvia.

In general, taxpayers who finance projects aimed at reducing environmental pollution or use of natural resources by carrying out technological improvements or environmental protection measures may receive a tax allowance equal to the amount which is necessary for the implementation of such a project.

Subsidies were equally important for setting up waste management schemes, in particular for goods harmful to the environment and ELV. Companies that collect and recycle specific waste streams such as used tyres, waste oils or batteries may also apply for grants to subsidise their activities. Manufacturers of vehicles (or their authorised representatives) who have entered into a contract with the Ministry of the Environment, implementing an ELV management system which ensures the collection of end-of-life vehicles are exempted from the tax (see Section 6.3.4.2).

Another area of state intervention is the renewable energy sector. This type of support is realised through the electricity tariff system. So far this has only been effective with regard to electricity generated in small-scale hydropower plants and in the wind generator sector. The licensed electricity distribution utility (currently the monopoly “Latvenergo”) is obliged to purchase electricity from small-scale hydropower plants (<2 MW) and wind turbine generators that came into operation before 1 January, 2003. This applies for the first 8 years of operation at a price that corresponds to double the average electricity tariff, whereas, subsequently, the purchase price is to be determined by the regulator. In addition, the electricity distribution utility is required to purchase electricity from energy facilities which utilise household waste or biogas (<7 MW and launched before 1 January, 2008), again for 8 years, and for a price equal to the average tariff. To support companies producing electricity from renewable energy sources, the state established an annual quota system for electricity production from certain types of renewable energy sources. In Latvia, all power plants using renewable energy sources for electricity production have priority access to transmission and distribution systems. For the meantime, current Latvian legislation does not foresee measures relating to the purchase of heat energy produced from renewables. To date, only a few state investments have been earmarked for projects that use biomass (mainly wood-based fuels) in boiler houses. For example, in 2002, within the frame of the state investments program, 19 projects were carried out with total state support of around 1.2 million LVL (2.1 million EUR). In 2003, due to lack of financial resources, state support has been granted only for 13 new projects.

6.7.1 Environmental funds

In Latvia, revenues from the natural resource tax and emission charges (air and water) are earmarked and paid either into the state basic budget or into special municipal budgets for environmental protection (for detailed allocation of revenues see Figure 6.2 below).

Figure 6.2 Allocation of revenue from environmental taxes/charges in Latvia

Until 2004, revenues allocated to the state budget were earmarked (special budget) and administered by the Latvian Environmental Protection Fund (LEPF). Currently LEPF receives a grant from the state basic budget amounting at least to the sum of the Fund's budget for the previous year. Both the Latvian Environmental Protection Fund and the municipal special budgets have to be used to finance measures and projects that contribute to environmental protection. Supported areas range from the preservation of biological diversity, monitoring, strengthening performance of environmental protection institutions, environmental education and communication, waste management (including radioactive) to research or renewal of natural resources. Beneficiaries of these funding mechanisms are municipal enterprises, non-governmental organisations, research institutes and even private businesses. A share of 25 percent of the environmental tax revenues received by LEPF is allocated to the Environmental Investment Fund that provides soft loans to the municipal companies and private businesses for the projects that contain environmental protection measures.

6.8 Revenues

It is almost impossible to provide a detailed overview of revenues from environmental taxes. However, the tax administration system is currently under revision to allow for the analysis of the revenue from taxes and their effectiveness.

Revenues from the natural resource tax have been decreasing over the years. This is due to the modernisation of production processes, introduction of cleaner technologies and the establishment of waste management systems. Therefore, it can be concluded that the natural resource tax is on its way to achieving its goal; the efficient use of natural resources and pollution reduction.

Table 6.12 Revenues from environmental taxes (million EUR)

	2000	2001	2002	2003	2004
Revenue from natural resource tax	14.807	15.053	15.406	14.019	11.707
Excise tax from petroleum products	122.143	122.471	144.771	183.214	

Source: Statistical Yearbook of Latvia, 2004 for natural resource tax, Annual reports of State revenue service for fuel excise tax

A marked increase in revenues generated by excise taxes levied on petroleum products is shown in Table 6.12. In particular, the increase between 2002 and 2003 is substantial.

6.9 Voluntary agreements

Two voluntary agreement schemes operate in the field of waste management in Latvia; one for used packaging and the other for end-of-life vehicles (ELV). Companies which join voluntarily implement management programmes for used packaging and disposable tableware and are entitled to allowances. Manufacturers of vehicles or their authorised representatives can sign a contract with the Ministry of the Environment on establishment and application of an ELV management system. Once the management system is implemented, they are exempted from the tax.

6.9.1 Eco-labels

In 2004, Latvia established a scheme for the EU eco-flower with Latvian Environment, Geology and Meteorology Agency as the competent authority. However, so far no product in Latvia has received this eco-label.

6.10 Future outlook

A new Law on the Natural Resource Tax is under political discussion (autumn 2005). It foresees several significant changes in the use of economic instruments in environmental policy. First of all, full producer responsibility will be realised, which means that subsidies for the collection of goods harmful to the environment such as used tyres, mineral oils, batteries will be gradually withdrawn. Secondly, a scheme for managing waste electric and electronic equipment (WEEE) will be established. And thirdly, tax rates will be increased as, apart from a few minor modifications, they have not been increased since 1996 and do not reflect the true cost of the environmental damage. However, the actual size of the increases is subject to discussion.

7. Lithuania

7.1 Economic instruments related to energy consumption and air pollution abatement

7.1.1 General introduction

In 2004, in Lithuania, electrical energy production was 19.3 TWh, of which 78.2 percent was produced in Ignalina nuclear power station, 17.1 percent in thermal power stations and the remaining 4.7 percent in hydropower plants and the Kruonis pumped storage plant. Electricity production was 0.2 TWh lower than in 2003, although energy consumption increased by 0.1 TWh¹³. Energy consumption has been increasing over past years, and in 2003 it was 11,958 GWh, as compared to 10,088 GWh in 2000¹⁴.

Table 7.1 Electricity balance, TWh

	2003	2004
Production	19.5	19.3
Nuclear power station	15.5	15.1
Thermal power stations	3.0	3.3
Hydropower stations	0.3	0.4
Kruonis Pumped Storage Plant	0.7	0.5
Import	-	0.1
Export	7.5	7.3
Total consumption	12.0	12.1

Source: Lietuvos Respublikos ūkio ekonominės ir socialinės būklės 2004 metais apžvalga, Lietuvos ūkio ministerija, 2005 vasaris (Review of Economic and Social status of the Economy of the Republic of Lithuania, Ministry of Economy, 2004)

The potential of renewable energy resources (RES) in Lithuania has been evaluated during the project "Enhancement of Use of Local and Renewable Energy Sources–Lithuania". The main findings of the study are summarised in Table 7.2.

¹³ Review of Economic and Social Status of the Economy of the Republic of Lithuania, Ministry of Economy, 2004

¹⁴ Department of Statistics of the Government of the Republic of Lithuania (Statistics Lithuania), www.std.lt

Table 7.2 Existing and planned consumption of RES

Sort of RES sources	Consumption, TWh					Potential, TWh/year
	2002	2003	2004	2010 m	2020 m	2020 m
Wood	7.67	7.81	8.09	9.50	9.80	9.80
Straw	0.05	0.05	0.05	0.50	1.50	3.59
Municipal waste	0.00	0.00	0.00	0.00	0.46	0.80
Landfill gas	0.04	0.02	0.02	0.14	0.28	0.10
Biogas						0.30
Geothermal energy	0.11	0.017	0.03	0.11	0.11	0.80
Small HPP	0.35	0.32	0.42	0.46	0.58	0.50
Large HPP						1.00
Solar energy	0.00	0.00	0.00	0.00	0.00	1.30
Wind energy	0.00	0.00	0.001	0.29	0.85	0.85
Biofuel	0.00	0.00	0.00	0.72	0.72	2.25
Total:	8.22	8.22		11.72	14.3	21.29

Note: m – projected

Source: Enhancement of Use of Local and Renewable Energy Sources – Lithuania, Final Report, Danish Energy Management A/S, 2003, www.avei.lt

Currently, the utilisation of renewable and indigenous energy resources amounts to 8–9 percent of the fuel balance. As an integral part of the overall Lithuanian strategy within the energy sector, the utilisation of renewable and local energy resources should be enhanced. The indicative target, as established in the RES-E Directive (2001/77/EC), anticipates that electricity generated from RES will constitute a share of 7 percent in 2010.

Only 3.3 percent of electricity is currently produced from RES, therefore, a concerted effort must be made to promote the use of RES in Lithuania. This, in fact, represents more than a doubling in the amount produced as electricity consumption (and thereby production) is expected to increase by more than 10 percent before 2010.

In the Treaty of Accession to the European Union, Lithuania committed to the closure of Unit 1 of the Ignalina Nuclear Power Plant by 2005 and of Unit 2 by 31 December 2009 at the latest, and to the subsequent decommissioning of these installations. The “Ignalina Programme” has been established to support this action, according to which measures should be adopted to “contribute to the necessary restructuring, environmental upgrading and modernisation of the energy production, transmission and distribution sectors in Lithuania, as well as to enhancing the security of energy supply and improving energy efficiency in Lithuania.”

7.1.2 An introduction to excise duties in Lithuania

The new version of the Law on Excise Taxes entered into force on 1 July 2002 implementing all the main EU requirements related to excise taxes. Some final measures and amendments were adopted on 29 January 2004, including the achievement of minimum EU rates for fuels set in Directive 92/82/EEC). These came into force when Lithuania joined the EU on 1

May 2004, apart from those measures for which transitional periods were granted following the adoption of the Energy Products Tax Directive (2003/96/EC) widening the scope of the EU's minimum tax rate system for energy products, previously limited to mineral oil products.

Transitional periods were granted for taxes levied on electricity, coal, coke and lignite, based on Directive 2004/74/EC, which provides the possibility of applying temporary exemptions or reductions in the levels of taxation for those EU Member States which joined the EU in 2004. Coal, coke and lignite will only be taxed from 2007 and a transition period until 2010 was granted for the implementation of taxes levied on electricity and natural gas. Lithuania may apply a transitional period until 1 January 2011 to adjust the national level of taxation on gas oil and kerosene used as propellant to the new minimum level of 302 EUR per 1,000 litres and until 1 January 2013 to reach 330 EUR per 1,000 litres. However, the effective tax rate applied to gas oil and kerosene cannot be less than 274 EUR per 1,000 litres as from 1 January 2008.

Table 7.3 Excise duties on mineral oil products

	2000	2001	2002	2003	2004	2005
Gas oil, its substitutes (kerosene) and extenders (EUR/1000 l)	136.9	136.9	176.1	210.3	245.0 21 for heat- ing purposes	245.0 21 for heat- ing purposes
Heavy Fuel Oils, their substitutes and extenders (EUR/tonne)	5.79	5.79	13.03 23 for heat- ing purposes	13.03 23 for heat- ing purposes	15.06 25 for heat- ing purposes	15.06 25 for heat- ing purposes

Note: Tax rates for mineral oil products are published per tonne in national legislation and have been converted into per litre volumes for gas oil and its substitutes.

Source: Law on Excise Duty, No I-VIII-556, 1997 12 09, Law on Excise Duty, No IX-569, 2001 10 30, in force from 2002 07 01 and Law on Excise Duty, No IX-569, 2001 10 30, as amended by IX-1987, 2004 01 29

7.1.3 Excise duties on electricity consumption

Lithuania is authorised by the European Commission to exempt electricity from taxation until 1 January 2010, partly due to the commitment to close and decommission the Ignalina Nuclear Power plant, which is the main producer of electricity in Lithuania.

However, an excise duty on electricity was applied until 2002 at a rate of 1 percent of the end-user price.

7.1.4 Excise duties on transportation fuels

The price of transportation fuels has been increasing continuously over the past five years due to increasing oil prices in the global markets and also due to Lithuania's commitment to the European Union to raise the fuel excise. The minimum rates set in EU Directive 92/82/EEC were applied from the date of accession, but a transitional period was granted for reaching the minimum rates set out in the Energy Products Taxation

Directive 2003/96/EC. Lithuania is authorised to apply a transitional period until 1 January 2011 to adjust its national level of taxation on unleaded petrol used as propellant to the new minimum level of EUR 359 per 1,000 litres. However, the effective tax rate applied to unleaded petrol cannot be less than 323 EUR per 1,000 litres as from 1 January 2008.

It was expected that after joining the EU and reducing the custom tax (from 15 percent to the EU level) the fuel import from Russia and the Republic of Belarus would increase, however this is not the case due to high fuel quality requirements required for by the Lithuanian authorities.

To promote the use of biofuels, the excise duty on petrol and mixtures obtained from biological raw materials, produced in accordance with the requirements of the Law on Biofuels, is reduced. These reduced rates for biofuels, used for transport purposes, and for bio-oils are required to be set at a rate which reduces in proportion to the share (percent) of biological raw materials per tonne of the product.

Table 7.4 Excise duties on transportation fuels in Lithuania (2000–2005)

	2000	2001	2002	2003	2004	2005
Petrol (EUR/1000 l)	263.5	263.5	272.2	272.2	287.0 – unleaded 421.1 for leaded. form 2004.05.01 ¹	287.0 – unleaded. 421.1 – leaded
Gas oil (diesel) (EUR/1000 l)	136.9	136.9	176.1	210.3	245.0	245.0
LPG (€/1000 l)	—	49.23	57.92	57.92	66.32	66.32

Note: Tax rates for mineral oil products are published per tonne in national legislation and have been converted into per litre volumes. ¹The tariff rate for leaded petrol was set, even though it is forbidden to sell it on the market since 1 April 2003.

Source: Law on Excise Duty, No I-VIII-556, 1997 12 09, Law on Excise Duty, No I-VIII-556, 1997 12 09, as amended IX-70, 2001 01 26, Law on Excise Duty, No IX-569, 2001 10 30, in force from 2002 07 01, and Law on Excise -Duty, No IX-569, 2001 10 30, as amended by IX-1987, 2004 01 29

7.1.5 Emission trading scheme (ETS)

In ratifying the Kyoto Protocol in November 2002, Lithuania is committed to achieving an 8 percent reduction in greenhouse gas emission by the period 2008–2012 as compared to the greenhouse gas emission levels in 1990. Total greenhouse gas emissions in 1990, expressed as CO₂ equivalent (CO₂e), were 54.35 Mt. Under the Kyoto Protocol Lithuania is committed to reduce its greenhouse gas emissions to 50.03 million tonnes CO₂e by 2008–2012. The data presented in the Second National Communication on Climate Change of the Republic of Lithuania show that total greenhouse gas emissions in 1998, expressed as CO₂ equivalent (CO₂e), were 23.8 million tonnes. As CO₂ emissions were already two times less than the commitment under the Kyoto protocol, the only way to distribute permits was allocation not exceeding the real needs of the companies, taking into consideration the forecasted domestic economic development and pollution reduction potential.

In the first version of the National Allocation Plan (NAP) presented to the Commission in May 2004, it was planned to allocate allowances to

industrial installations according to historical data, and to the energy sector according to the actual amount of energy sold (ex-post allocation method). However, in July 2004, ex-post allocation was not approved by the European Commission as an approach which could be used. The actual approved plan is 5 million tonnes or 12 percent less than Lithuania initially requested.

The projected number of allowances to be distributed among the enterprises participating in the emission trading scheme in the period 2005–2007 is 36.80 million tonnes.

Table 7.5 Distribution of emission permits

Allocation	Amount (tCO ₂)	Percentage
Distributed at no cost to enterprises listed in NAP	34,404,544	93.5%
Allowances to be distributed by auction	551,825	1.5%
Reserved for new entrants	1,839,815	5%
Total	36,796,184	100%

Source: Lithuania's National Allocation Plan for Greenhouse Gas Emission Allowances for the Period 2005 to 2007 approved by MoE order of 2004 12 27, order No. D1-686

The permits are allocated to 93 installations (61 enterprises). Distribution of allowances to the enterprises free of charge is foreseen, according to the following proportions: 40 percent in 2005, 30 percent in 2006 and 30 percent in 2007. The majority of permits are allocated to the energy sector (Table 7.6).

Table 7.6 Number of allowances to be allocated in 2005–2007

Type of installation	Distributed (thousand tonnes CO ₂)
Distributed at no cost to energy enterprises	21,711
Distributed at no cost to cement and lime producers	3,770
Distributed at no cost to glass, brick and ceramic product manufacturers	570
Distributed at no cost to oil processing companies	6,623
Distributed at no cost to other industrial enterprises using fuel in order to generate energy for their own needs and also to paper factories	1,730
Reserve for new entrants	1,840
Distributed by an auction	552
Total	36,796

Source: Lithuania's National Allocation Plan for Greenhouse Gas Emission Allowances for the Period 2005 to 2007 approved by MoE order of 2004 12 27, order No. D1-686

CO₂ emission projections provided by enterprises participating in the emission trading system in 2005–2007 and verified by the Ministry of Economy will account for (including projected CO₂ emitted by new installations):

- 14.03 million tonnes in industrial enterprises, and;
- 22.76 million tonnes in energy enterprises.
- However, some uncertainty exists with regard to new enterprises and, therefore, these figures may be underestimated. It is anticipated that emissions regulated by the ETS will account for 44.9 percent of the total greenhouse gas emission in this period.

7.1.6 Financial incentives for renewables

Based on the Law on Electricity, a procedure for the purchase of electricity from renewable sources and waste has been established. The prices, i.e. feed-in tariffs, for purchase of electricity from hydropower plants and power plants using biomass is 0.20 LTL/kWh (0.058 EUR/kWh) and from wind power plants 0.22 LTL/kWh (0.062 EUR/kWh). These prices are higher than the purchase prices for electricity produced from power plants operating on fossil fuels. The supply and purchase of energy from renewable sources is considered to be a service of public interest. In June 2005, the period of fixed purchase prices was extended until 2020 (instead of 2009) and, from 2021 (instead of 2010), the introduction of "green certificates" is planned. According to the Law on the Thermal Economy (2003), the state and municipalities should promote the purchase of thermal energy produced from renewable energy sources as an activity that serves the public interest.

7.1.7 Air pollution charges

In Lithuania, the air pollution charge is set for pollution from stationary sources (mainly industrial and energy production plants) and mobile sources (cars, buses, lorries, trains, ships, aircraft). Stationary sources are obliged to pay the charge if they have permits for natural resource use or Integrated Pollution Prevention and Control permits. The charge rates are announced two years before the beginning of the period when these charges are to be applied. During the period 2000–2004, the Lithuanian government set relatively high levels of the charge on the two main pollutants (SO₂ and NO_x) and the rates on these pollutants were gradually increased throughout the period to provide an economic incentive for pollution abatement investments. The government, however, has now departed from this line of policy as the rates will largely be kept constant during the period 2005–2009 for stationary sources (Table 7.8) and have actually been reduced between 2004 and 2005 for mobile sources (Table

7.7). However, these charge rates are indexed every quarter according to the consumer price indices announced by the Lithuania Department of Statistics. As the consumer price index is growing very slowly, the index coefficient is low. This policy has been in place since 2000 and also affects natural resource extraction taxes. Indexing coefficients are published quarterly affecting the effective tax payments paid by polluters (see Table 7.16 below).

The charge is paid according to actual emissions emitted during the reporting period for stationary pollution sources and according to fuel consumption for mobile sources (or take-off/landing cycles for aircraft). The charge on pollutants emitted from stationary sources is paid on a quarterly basis if an environmental resources usage permit is required and the amount of tax paid the previous year was 10,000 LTL (2,896 EUR) or more in the previous year, otherwise the charge is paid twice-yearly. Recently (on 31 March 2005), an amendment of the Law on Pollution Charges was adopted, according to which exemption from the charge is granted in the case where the pollution originates from biofuels used in stationary sources. This amendment of the Law on Pollution Charges will come into force from 1 January 2006.

For air pollution from mobile sources, the charge is paid twice-yearly by legal entities polluting the environment from mobile sources used for commercial purposes, i.e. not private car owners. Exemption from the charge is granted in the case of pollution from vehicles that have emission gas neutralising systems and in cases where biofuels complying with specified standards are used. Vehicles used in agricultural activities may also be exempted from the charge.

Table 7.7 Charge on air pollution from mobile sources

Means of Transport	Fuel or cycle	Tariff (EUR per tonne or cycle)					
		2000	2001	2002	2003	2004	2005
1. Motor Vehicles	Petrol	5.2	5.2	5.0	6.1	7	6.1
	Diesel	5.2	5.5	5.5	6.4	7.5	6.4
	Liquid petroleum gas	5.2	5.2	5.2	5.8	6.7	5.8
	Pressurised natural gas	4.1	4.1	4.1	4.6	5.5	4.6
2. Ships	Petrol	11.9	11.9	12.5	14.2	16.8	9.3
	Diesel	9	9	9.6	11.0	13.0	9.9
	Oil, with sulphur content up to 0.5	2.0	2.0	2.0	2.3	2.9	2.3
	oil, with sulphur content from 0.5 to 1.5	3.2	3.2	3.8	4.1	4.6	4.1
	oil, with sulphur content from 1.5 to 2.5	4.3	4.6	5.2	5.8	6.4	5.8
3. Rail Transport	Diesel fuel	8.1	8.1	8.7	10.1	12.2	7.5
4. Aircraft taking-off and landing cycle	Per cycle	1.2	1.2	1.2	1.5	1.7	1.4

Source: Law on Environmental Pollution Charge, 1999 05 13 VIII-1183, in force from 2000 01 01 (VIII-2027, 200 10 12; new revision IX-720, 2002 01 22; amendments IX-1265, 2002 12 10; IX-1547, 2003 04 29; IX-1608, 2003 06 10; IX-1970, 2004 01 22, IX-2139, 2004 04 15, IX-152, 2005 03 31)

Depending on the technical characteristics of the vehicle, the charge rates set according to fuel type could be increased or decreased applying specific coefficients. For example, heavy duty vehicles complying with EU-RO-3 standard are levied a lower charge, by applying the coefficient 0.3 to the set rate. For all types of vehicle older than 20 years, however, the coefficient 1.1 applies.

Table 7.8 Charge on air pollution from stationary sources

	Tariffs (EUR/ton)					
	2000	2001	2002	2003	2004	2005
Pollutants						
SO ₂	59.7	65.2	77.6	83.4	90.1	90.1
NO _x	112	112	117	139	170	170
Vanadium pentoxide	3,326	3,326	3,326	3,326	3,326	3,326
Particulates ¹	53.3	53.3	53.3	53.3	53.3	53.3
Pollutant group						
I	350	350	350	350	350	350
II	165	165	165	165	165	165
III	21.4	21.4	21.4	21.4	21.4	21.4
IV	3.8	3.8	3.8	3.8	3.8	3.8

Source: Law on Environmental Pollution Charge, 1999 05 13 VIII-1183, in force from 2000 01 01 (VIII-2027, 200 10 12; new revision IX-720, 2002 01 22; amendments IX-1265, 2002 12 10; IX-1547, 2003 04 29; IX-1608, 2003 06 10; IX-1970, 2004 01 22, IX-2139, 2004 04 15, IX-152, 2005 03 31)

¹ Except solid particles resulting from solid, liquid and gaseous fuel combustion and asbestos containing particles i.e. solid particles emitted from energy sources is attributed to II group of pollutants and charged accordingly.

The increase in charge rates during the period 2001-2005 centred on SO₂ and NO_x emissions, while rates for other pollutants remained constant. Charges are levied on hundreds of different pollutants from which four are the main “conventional” pollutants for which individual charge rates are set. All other pollutants are classified in four different groups according to the degree of hazard they pose to the environment.

An exemption is granted for the time period in which implementation of the pollution reduction measure takes place, but not for more than for three years if polluters achieve a reduction which is more than 10 percent of the highest permissible pollution norm (limit). This threshold will be lowered to 5 percent from January 2006. If a measure which relates to the reduction of pollution emissions from stationary pollution sources is not implemented in due time, or if the planned reduction effect is not achieved, the pollution charge is required to be paid for the whole period. The charge for emissions above permitted levels or for concealed emissions, i.e. a non-compliance fee, is calculated as 1.5–100 times the basic rates shown in Table 7.7. The penalty factor depends on the particular pollutant and is highest for group I pollutants. For the illegal emission (without a permit) the compensation in relation to damage to the environment is calculated.

The revenues from the pollution charge are distributed between the state budget (30 percent) and the budget in the municipality where the pollution source is located (70 percent). The funds accruing to the state

budget are used for financing projects under the state environmental investment fund programme. Similarly, the funds allocated to the municipal budget should be spent on environmental special support programmes. The revenues from non-compliance fees are also allocated to environmental support programmes, which are regulated by the Ministry of the Environment.

Total revenues from these economic instruments (relating to air pollution from stationary and mobile sources) amount to around 25 million LTL (7.2 million EUR) per year.

7.2 Economic instruments used in water policy

7.2.1 Introduction – the use of economic instruments in water policy

There are two types of water-related economic instruments used in Lithuania – a water abstraction tax and a pollution charge – in addition to the user charges for water supply and sewerage services. The principles are established in the Law on the State Natural Resource Tax and the Law on the Pollution Charge.

Lithuania has transposed the requirements of the Water Framework Directive (WFD) into national legislation and national legislation addresses the use of user charges and cost recovery. This could lead to increased use of economic instruments (it is more addressed to user charges) compared with the situation at present. As requested under the WFD, a characterisation report was published in Spring 2005 which included an economic analysis of water-related issues as well as an assessment of how the cost recovery principle is applied in Lithuania.

7.2.2 Economic instruments in the area of water pollution

Charges on pollutant discharges to water have a long tradition in Lithuanian water policy and the scheme is similar to that for air pollutants, discussed above. The rates of several main pollutants have increased between 2000 and 2004 (Table 7.9), however, the rates have been fixed at 2004 levels for the next five-year period.

Charges are levied on a whole range of water pollutants. For six pollutants, individual, fixed charge rates apply. The remaining pollutants are all categorised based on the degree of hazard they pose and are assigned into five different pollutant groups. It is to be expected that such a charge scheme covering a large number of pollutants, similar in all three Baltic countries, has high administrative, compliance and monitoring costs if it is to work effectively.

Table 7.9 Charge rates for water pollutants

	Tariffs (EUR/tonne)					
	2000	2001	2002	2003	2004	2005–2009
Pollutants						
BOD ₇	140.5	166	188	207	222	222
Total N	126	126	126	159	174	174
Total P	429	429	429	579	869	869
Suspended particles	24.9	60.8	71.8	81.4	89.5	89.5
Sulphates	0.58	0.58	0.58	0.58	0.58	0.58
Chlorides	2.6	2.6	2.6	2.6	2.6	2.6
Pollutant groups						
I	2,519,827	2,519,827	2,519,827	2,519,827	2,519,827	2,519,827
II	229,585	229,585	229,585	229,585	229,585	229,585
III	37,433	37,433	37,433	37,433	37,433	37,433
IV	8,483	8,483	8,483	8,483	8,483	8,483
V	831.5	831.5	831.5	831.5	831.5	831.5

Source: Law on Environmental Pollution Charge, 1999 05 13 VIII-1183, in force from 2000 01 01 (VIII-2027, 200 10 12; new revision IX-720, 2002 01 22; amendments IX-1265, 2002 12 10; IX-1547, 2003 04 29; IX-1608, 2003 06 10; IX-1970, 2004 01 22, IX-2139, 2004 04 15, IX-152, 2005 03 31)

Similar to the case for air emission charges, an exception is granted for the period in which implementation of the pollution reduction measure takes place, but for no longer than three years if a reduction rate is achieved equal to or more than 10 percent of the emission limit value (5 percent from 2006). The charge for the discharge of polluting substances above permitted levels or for concealed discharges is calculated in the same way as for air pollution taxes by multiplying the base rate with a factor of between 1.5–100. The actual factor depends on the pollutant and the highest rate is applied for group I pollutants.

Total revenues from these economic instruments (relating to water pollution from stationary sources) amount to around 10 million LTL (2.9 million EUR) per year. In addition, fines of around 2 million LTL are collected on average in the form of penalties for discharges exceeding the permit limits and compensation for damage caused by accidental spills.

7.2.3 Tax on water extraction

A tax on water extraction is in force in Lithuania, levied according to the source, purpose of water use and the actual volume of water extracted. Land-users using water on their own land for domestic purposes (i.e. not for sale) are granted exemption from this tax.

Table 7.10 Tax rates for the water extraction

	Unit	LTL	EUR
Mineral Water ¹	m ³	4.15	1.20
Fresh groundwater:			
for domestic use ²	m ³	0.03	0.01
for production	m ³	0.07	0.02
Surface water:	m ³	0.001 – 0.0002	0.0003

Note: ¹Mineral water for medical purposes is not taxed

² shallow groundwater is not taxed.

Source: Governmental decision on the taxes on state natural resources
(No 1320, 1995 10 10; as amended 1997 05 24, 1998 03 05, 2002 04 30)

Tax rates are indexed quarterly according to the consumer price index calculated by Lithuanian Department of Statistics.

In recent years, approximately 10 million LTL (2.9 million EUR) of water abstraction taxes have been collected annually. Around 90 percent of this stream is generated by surface-water abstraction for energy production, mainly for cooling the nuclear reactor of the Ignalina nuclear power station.

7.2.4 User charges for water supply and wastewater services

The main 47 water utilities in Lithuania provide water supply and wastewater management services to approximately 92 percent of the customers on the market (2004). The National Control Commission for prices and energy acts as the national regulator with regard to setting user charges for water services.

The methodology for the calculation of user charges for water supply and wastewater management has to be approved by this commission and is based on the principle of cost recovery. In 2003, the commission started the process of reduction of cross-subsidies and equalising the prices for all water users. The methodology obliges water suppliers to define their costs according to approved water utility development programmes, setting separate costs for sales and water supply, as well as for wastewater management (disposal and treatment). The economic regulation will be fully realised when the Law on Water Supply and Wastewater Management is adopted. Furthermore, the new law plans the reorganisation of the water sector, and merging of smaller utilities into larger units, in order to cope with the new investments foreseen.

In February 2005, the Draft Law on Water Supply and Wastewater Management was submitted by the Ministry of the Environment for discussions in Parliament. Among other provisions, it should regulate economic activities in the water sector.

Table 7.11 Average user charges for water services in 2000–2004 (EUR/m³, VAT excluded)

	2000	2001	2002	2003	2004
Water supply	0.42	0.44	0.45	0.46	0.46
Wastewater management	0.52	0.57	0.59	0.60	0.62

Source: National Control Commission for Prices and Energy, Annual report for 2004, Vilnius, 2005

The level of cost recovery presented in the 2005 water characterisation report required under the WFD ranges from 89.2 percent in the Daugava river basin district to 74 percent in the Lielupe river basin district.

7.3 Economic instruments addressing waste issues and the different types of waste

7.3.1 Waste policy in general

Around 1 million tonnes of municipal waste is generated in Lithuania, of which the majority is still sent to landfill. It was estimated that there are around 850 landfills or dumpsites, of which 350 are currently in operation. With support of ISPA (Instrument for Structural Policies for Pre-Accession) and Cohesion Funds, implementation of a regional waste management system with 10 regional landfills and a national hazardous waste management system is planned. The estimated investments for preparation of waste stream management and regional waste management systems, feasibility studies and other documentation amount to 8.6 million LTL (2.5 million EUR) until 2006 and estimated investments up to 2012 are in the region of 800 million LTL (232 million EUR). Currently, many other waste-related strategic decisions are associated with implementation of this regional system.

User charges, product charges and non-compliance fees represent the types of economic instruments designed to help achieve the targets set by EU directives and transposed into national legislation in the waste sector in Lithuania.

7.3.2 Waste tax

The preparation of the Law on Introduction of a Landfill Tax was foreseen in the Strategic Waste Management Plan in 2005. However, discussions on its introduction have been postponed until the regional waste management systems are in place.

Currently, landfill cost charges are included in the user charges for waste set by municipalities. In some cases, these charges levied on the delivery and disposal of waste to landfill sites differentiate between municipal and commercial waste, or between sorted and unsorted waste.

7.3.3 User charges on waste

The maximum charge rates for municipal waste collection and disposal are set by municipalities and the monthly payments range from 0.14 to 0.87 EUR per person.

At present, waste is collected by municipal and private companies on the basis of contracts with separate waste holders – households or commercial enterprises and, for multi-apartment houses, organisations responsible for maintenance of the buildings. Although contracts are mandatory according to the law, a large number of waste holders avoid paying these charges.

A unified methodology for the calculation of municipal waste management tariffs is in preparation and should be finalised in 2005.

7.3.4 Waste charges on products

7.3.4.1 Charges on packaging

To achieve the targets of the Packaging Directive 94/62/EC, Lithuania was granted a transition period until the end of 2006 and for Directive 2004/12/EC, a transition period until 2012.

A charge on primary packaging was introduced in Lithuania from 2003. An exemption from the charge is granted if established reuse and recycling targets are achieved. In 2004, amendments were introduced to the law also granting partial exemption from the charge if recycling targets are partially achieved.

The revenues from the charge levied on waste products and packaging in 2004 were not as planned; only 8.7 million LTL (2.5 million EUR) was collected instead of the anticipated 77 million LTL (22.3 million EUR). The main reason for the shortfall is that many companies, especially larger ones, have chosen to manage the waste themselves (or through their organisations). Furthermore, the predefined recycling targets were comparably low and easily achieved by the companies. In 2004, only about 3,400 – 4,000 companies delivered and paid the charge as compared to the planned 15,000 companies. In the year 2005, about 5,500 companies provided declaration forms resulting in a state revenue of about 8.3 million LTL (2.4 million EUR). The charges are based on the volume or weight of the packaging material and vary according to the material used.

Table 7.12 Charge on packaging material

Type of packaging	Tariffs 2003–2005 ¹
Glass primary packaging	14.48 EUR/1000 l for filled volume or 26.07 EUR/tonne packaging weight
Plastic primary packaging	20.27 EUR/1000 l for filled volume or 521.32 EUR/tonne packaging weight
Combined primary packaging	20.27 EUR/1000 l for filled volume or 579.24 EUR/tonne packaging weight
Metal primary packaging	26.07 EUR/1000 l for filled volume or 753.01 EUR/tonne packaging weight
Paper and cardboard primary packaging	28.96 EUR/tonne packaging weight
Other primary packaging	57.92 EUR/tonne packaging weight

Note: ¹The tariff is set according to the packaging accounting systems of tax payers, by volume or by weight, however, from 2006 only the tariff by weight will be used
Source: Law on the Environmental Pollution Charge, (IX-720, 2002 01 22; amendments IX-1265, 2002 12 10; IX-1547, 2003 04 29; IX-1608, 2003 06 10; IX-1970, 2004 01 22, IX-2139, 2004 04 15, IX-152, 2005 03 31)

Furthermore, a special product and packaging waste management programme has been introduced and the Ministry of the Environment is organising tenders for waste management under this programme. According to the amendments of the Law on Pollution Charges, from 1 January 2006, the charge will be imposed not only on primary packaging, but on all packaging, including secondary and transportation packaging.

7.3.4.2 End-of-life vehicles (ELV) and electrical and electronic equipment (WEEE)

To stress the producer's responsibilities in achieving recovery targets laid down in Directives 2000/53/EC and 2002/96/EC, Lithuania has amended the Law on Waste Management. The principle of producer responsibility is now included in the law, which states that producers can themselves organise collection systems or use systems established according to contracts. If producers and importers do not ensure the achievement of specified collection and recovery rates, then the possibility of introducing a tax will be considered.

7.3.4.3 Charges on some other products harmful to environment

Charges on products which are harmful to the environment were introduced in the amended Law on the Environmental Pollution Charge. Charges levied on products such as tyres, batteries, mercury light bulbs, filters (oil, fuel, air), hydraulic shock absorbers and others were introduced to encourage waste recovery and recycling. Relief is granted if set recovery rates are achieved (80 percent for all products, except 55 percent for galvanic elements in 2004). The main purpose of these product charges is to stimulate the collection and recycling of some problematic waste streams financially, as well as to encourage a reduction in the consumption of these products by increasing their sales price.

Table 7.13 Charge rates (year 2003–2005)

Product	Tariff	EUR
Tyres, weight more than 3 kg:		
new	0.30 LTL per 1 kg	0.09/kg
retreaded	0.30 LTL per 1 kg	0.09/kg
used	0.36 LTL per 1 kg	0.10/kg
Car batteries	0.50 LTL per 1 kg	0.14/kg
Mercury bulbs	15% wholesale price	15% wholesale price
Galvanic elements and batteries other than car batteries	4% wholesale price	4% wholesale price
Car oil and fuel filters	1 LTL per unit	0.29/unit
Car air filters	1 LTL per unit	0.29/unit
Car hydraulic (oil) shock absorbers	3 LTL per unit	0.87/unit

Source: Law on Environmental Pollution Charge, 2002 01 22, No IX-720 in force from 2003 01 01

7.4 Economic instruments related to agriculture and natural resources

There are separate laws regulating the taxation of gas and oil extraction and the taxation on the use of other natural resources in Lithuania.

7.4.1 Taxes on Oil and Natural Gas Resources

The 2002 National Energy Strategy 2002 anticipates oil extraction of levels in the region of 300–500 thousand tonnes per year. The extraction has been at these planned levels, however, is now decreasing along with the size of the deposits which can be extracted.

Currently the *ad valorem* tax on oil and natural gas resources consists of a base tariff and a compensatory tariff. The base tariff depends on the location of the extraction field (on-shore or off-shore), total amounts extracted per year and on when extraction began (before 1 July 2003 or after), including the amount of oil or gas which was extracted before 1 July 2003, and the residual of the field. The compensation tariff of 9 percent is paid for extraction from fields which were explored and funded by the state.

Table 7.14 Base tax rates on petroleum and natural gas resources¹

Yearly extraction – on shore (thousand/tonnes)	Yearly extraction – off shore (in the economic zone in the Baltic sea) (thousand/tonnes)	Base tax rate (in% of the sales price)
Up to 10	Up to 100	2
10–25	100–200	4
25–50	200–300	6
50–75	300–400	8
75–100	400–500	10
100–125	500–600	12
125–150	600–700	14
More than 150	More than 700	16

Note: ¹ For oil fields where oil extraction started before July 1st 2003 a tax rate of 20% shall apply. The tax can be reduced by a maximum of 50% to compensate for investment costs spent on exploration activities

Source: Law on Taxes on Petroleum and Natural Gas Resources (<http://www3.lrs.lt/cgi-bin/preps2?Condition1=153903&Condition2>) (1996 04 30, amended in 2003 05 20 (in force from 2003 07 01))

Until 2003, the taxation was 20 percent and an additional 9 percent if oil is extracted from the deposits which have been explored with state funding.

A non-compliance fee is also in place with regard to hidden/undeclared amounts extracted. The fee consists of the tax and a fine amounting to 10 times the level of the tax. The revenues from fines are allocated to environmental support programmes, as compared to the tax revenues which are paid directly into the state budget.

The extraction of oil was 470.8 thousand tonnes in 2001, 434 thousand tonnes in 2002, 382 thousand tonnes in 2003 and was further reduced to 303.4 thousand tonnes in 2004. Tax revenue amounted to 58 million LTL (17 million EUR) in 2003 and 44 million LTL (13 million EUR) in 2004.

In 2005, the Ministry of Economy prepared a proposal containing a single tariff of 20 percent with the goal to bring more revenue from the extraction of these resources into the State budget.

7.4.2 Taxes on Natural Resources

The taxes on natural resources are used to increase the user's responsibility for the effective and economical use of resources and to compensate state expenditures for research and for protection of these resources.

Table 7.15 Tax rates on natural resources in the Lithuania
(approved in 1995 with slight amendments in 1997 and 2002)

Resource	Unit	Tariff LTL	EUR
Anhydrite	Ton	0.4	0.12
Dolomite	m ³	0.5	0.14
Limestone	Ton	0.65	0.19
Chalk marl	Ton	0.48	0.14
Clay			0.00
from "Ukmergės" mine	m ³	0.75	0.22
from "Šaltiškių" mine	Ton	0.28	0.08
Other	m ³	0.3	0.09
Opoka	ton	0.4	0.12
Sapropel	ton	0.65	0.19
Sand	m ³	0.25	0.07
Sand for glass manufacturing	ton	2.9	0.84
Sand, gravel	m ³	0.23	0.07
Construction soil	m ³	0.15	0.04
Mineral water	m ³	4.15	1.20
Underground fresh water			
for domestic use	m ³	0.03	0.0087
for production purposes	m ³	0.07	0.0203
Surface water:	m ³		
for industry and agriculture	m ³	0.005	0.0014
for power stations cooling systems and fisheries	m ³	0.0005	0.0001
for hydroenergy			
Kruonis Pumped Storage Plant	m ³	0.00002	0.00001
Kaunas Hydro Power Station	m ³	0.00002	0.00001
Ignalina Nuclear Power Station	m ³	0.001	0.0003
Amber:			
from Smeltė mine	kg	46	13.32
from Juodkrantė mine	kg	30	8.69

Source: Governmental decision on the taxes on state natural resources (No 1320, 1995 10 10; as amended 1997 05 24, 1998 03 05, 2002 04 30)

The tax rates are indexed according to the consumer price indices announced by the Lithuanian Department of Statistics. The quarterly indices applicable for the natural resource taxes, as well as for pollution taxes, are presented in Table 7.16. Indexation of the tax rates results in the real value of tax rates remaining constant over time. Tax rates presented in Table 7.15 are taken from the relevant laws meaning that indexation according to the development of the consumer price indices has not been considered.

Table 7.16 Indexing coefficients for the environmental pollution and natural resource tax (2000–2005)

Year	Quarter	Indexing Coefficients	
		For natural resource taxes (except peat)	For pollution charges
2000	I	1.255	1.015
	II	1.278	1.009
	III	1.27	1.006
	IV	1.266	1.012
2001	I	1.273	1.013
	II	1.275	1.026
	III	1.291	1.030
	IV	1.296	1.031
2002	I	1.298	1.041
	II	1.31	1.031
	III	1.298	1.019
	IV	1.282	1.021
2003	I	1.284	1.021
	II	1.284	1.022
	III	1.287	1.007
	IV	1.268	1.001
2004	I	1.272	1.007
	II	1.268	1.033
	III	1.3	1.03
	IV	1.296	1.041
2005	I	1.31	1.041
	II	1.31	1.053
	III	1.33	1.053

7.5 Economic instruments related to transport

A vehicle registration tax was in place until 1 July 2002, levied on luxury motor vehicles not older than 5 years and whose value exceeds 100,000 LTL (about 29,000 EUR). The tax rate was 15 percent of the taxable amount, exceeding 100,000 LTL (except for special use motor vehicles). Registration of such vehicles was levied with a tax of 15 percent of the price in excess of 17,377 EUR. However, this tax was considered as a fiscal, rather than an environmental, instrument.

Currently, heavy good vehicles (HGV) are subject to an annual circulation tax (ACT) and road user charges. The rates are set as follows:

- ACT for cargo vehicles registered in Lithuania: the tax rates range from 87 to 1,938 EUR depending on weight and suspension type and are paid on an annual basis;
- Road user charges have to be paid by vehicle owners or managers of vehicles registered in Lithuania or foreign countries, including EU Member States. The charges can be paid on a daily, weekly, monthly or yearly basis. The annual rates are between 145 to 753 EUR.

The State Road Maintenance and Development Programme is financed from:

- income taxes (the rate is 0.5 percent of the income for legal persons, a 0.3 percent rate applies to trading organisations and 0.1 percent for organisations trading in liquidised gas for cars)
- a share of the revenues generated by excise taxes levied on energy products, and;
- a share of the excise tax on liquid gas.

From July 2005, the revenues from income taxation will no longer be allocated to this programme as this contradicts EU law. To compensate the loss of revenues, one of the possible items under discussion is introduction of an ACT for private vehicles.

Registration fees for private vehicles and technical supervision fees (every 2 years for private vehicles and twice-yearly or annually for commercial vehicles) cannot be described as a form of environmental tax as they are quite low and imposed mainly as administration fees. For example, the registration of private vehicles costs around 11 EUR and the fee for technical supervision is 10 EUR.

7.6 Economic instruments applied in other environmental areas

7.6.1 Deposit-refund systems

A governmental decision on deposit-refund systems came into force in 2003. A deposit must be collected for 0.5 l and larger re-usable glass packaging for soft drinks (beer, alcohol, soft drinks, mineral water and juice).

7.6.2 Voluntary agreements

In 2004, Lithuania established a scheme according to the EU flower ecolabel, nominating the Lithuanian Environmental Protection Agency as the competent authority. One Lithuanian company, Utenos trikotažas (ho-

siery), has been awarded the EU flower label by a Danish competent body. Additionally, a national scheme is in place, but this scheme is not popular and, to date, has not been used.

7.7 Environmental Funds

Environmental support programmes have been introduced instead of Nature Protection Fund in Lithuania in recent years. These programmes cover a wide range of environmental areas and financial support is provided for different means including:

- compensatory and clean-up measures, design, reconstruction and repair of environmental protection objects, removal of environmental pollution sources;
- protection and enhancement of fish resources;
- research activities, monitoring, EIA, preparation of plans, projects;
- support for state institutions in acquisition of required means, such as equipment, instruments, materials etc., and;
- environmental education.

The fund's income comes from fines collected for damage caused to the environment, fines for exceeding pollution limits, revenues from realisation of confiscated equipment and natural resources, taxes for restoration and protection of fish resources, 30 percent of the tax from users of hunting areas, and voluntary payments (see for an overview of the allocation of the revenues from environmental taxes and charges: Figure 7.1 below).

The fund's expenditure amounted to 1.3 million EUR in 2003, 1.7 million EUR in 2004 and is planned to be around 1.6 million EUR in 2005.

Additionally, the Lithuanian Environmental Investment Fund provides financial support in the form of subsidies and grants. The main sources of financing to this fund are the state budget (30 percent of environmental pollution (water and air pollution) charges are allocated directly to the fund) as well as other sources, such as funds received under the EU PHARE programme. The overall allocation of environmental taxes and charges is presented in Figure 7.1 and discussed further in Table 7.17.

The most recent environmental support programme was started in 2004 in the area of product and packaging waste management. The main policy objective of this programme is to finance waste collection and recycling projects. The tenders are announced by the Ministry of Environment. The programme is funded via revenues collected from the product and packaging waste tax.

Figure 7.1 Allocation of revenue from environmental taxes/charges in Lithuania

7.8 Revenues from environmental taxes

The revenues from all environmental taxes/charges, except from the tax for product and packaging waste, have steadily increased over the past few years.

A quite significant part of these revenues is earmarked for environmental purposes and divided among environmental funds (national, municipal, environmental investment) and distributed in form of grants, soft loans and subsidies.

Table 7.17 Revenues to the state budget (in thousand EUR)¹

	2003	2004	Part of state budget in 2004
Transport charges	11,740	15,873	0.53%
Environmental pollution charges (air, water and ground pollution)	3,289	4,827	0.16%
Tax for pollution from product and packaging waste	2,607	2,505	0.08%
Tax for state natural resources	4,687	4,843	0.16%
Oil and gas tax	16,825	12,670	0.42%
Excise taxes on transport fuels (except LPG)	291,532	292,429	9.7%
LPG	18,21	26,471	0.6%
Total environmental taxes	348,890	359,618	
Environmental taxes as a share of GDP (2004)			2%

¹ part of these taxes go to municipal budgets and are not included

Sources: Income to National budget, 2003, 2004, State Tax Inspection, [http:// www.vmi.lt](http://www.vmi.lt); Review of Economic and Social status of the Economy of the Republic of Lithuania, Ministry of Economy, 2004, February 2005 (www.ukmin.lt)

The overview of revenues generated from environmental taxes shown in Table 7.17 confirms the significant contribution and function of taxes levied on energy products in relation to the state budget. This situation is comparable to that in all EU Member States (see OECD, 2001 and EEA, 2005a).

8. Norway

8.1 Economic instruments related to energy consumption and air pollution abatement

8.1.1 Introduction

The situation concerning electricity consumption and air pollution in Norway differs from the other Nordic countries as almost all electricity is generated by hydropower. In the Nordic countries as a whole, the liberalisation process in the electricity market is at an advanced stage as the markets have been fully open here since 2003. In addition, the Nordic region is Europe's largest electricity trading market meaning that the four countries, Denmark, Finland, Norway and Sweden, can be characterised as one market where electricity is traded and delivered between national borders. Despite the predominance of hydropower, Norway's industry can be seen to be rather greenhouse gas-intensive considering that the petroleum sector is responsible for 30 percent of Norwegian CO₂ emissions. However, Norway was one of the first countries implementing a CO₂ tax already in 1991. Norway has only limited opportunities in relation to achieving domestic reductions in greenhouse gas emissions with regard to electricity generation and, therefore, other policy measures must be considered. Still, the Norwegian government has taken an active position on energy regulation and has introduced several economic regulatory instruments over the past two decades. Furthermore, the Norwegian government has been quite active in the field of greenhouse gas abatement and, early on in 2005, appointed a new Commission which should look into the question of how Norway can become a society with low greenhouse gas emissions within a 50 year period.

8.1.2 Excise duties on fossil fuels for energy purposes

The Norwegian excise duty scheme on fossil fuels is built on three elements: an energy tax, a CO₂ tax and a SO₂ tax.

- First of all, energy consumption in Norway is charged with an energy tax. The energy tax on mineral oil was already introduced in 1970, while coal and coke have never been levied with an energy tax. The energy tax scheme has undergone several changes since it was first introduced. As a reaction to the introduction of the CO₂ tax in 1991, the energy tax on mineral oil was lowered in 1992. In 1993, the

energy tax on mineral oil was abandoned altogether as a consequence of the efforts of the Norwegian authorities to create greater focus on CO₂ emissions within the energy tax scheme. As a result of these changes, excise duties on energy products have been based exclusively on environmental characteristics – i.e. the carbon and sulphur content – of the fossil fuels. The legal foundation concerning the entire energy taxation scheme on fossil fuels was revised and amended in 1998. These revisions led to the current situation whereby all taxes levied on fossil fuels fall under a single act, whereas prior to 1998 there was one legal act for each category of fossil fuels. The changes in legislation entered into force in 1999. In 2000, a basic excise or energy tax on fuel oil used for heating purposes was reintroduced aiming to discourage increased use of heating oil. This development has also to be seen in the context of the increase in the electricity tax (see Section 8.1.4) which took place in 2000 and that the energy authorities wanted to avoid the tax schemes causing a shift from electricity consumption to oil consumption. The effect of the reintroduction of the basic tax, or energy tax, on mineral oils is that almost half of the total tax burden on energy consumption in 2005 stems from the energy/basic tax (IEA, 2004a, and Toll- og Avgiftsdirektoratet, 2004a).

- The CO₂ tax on mineral oil was introduced in 1991. At the end of 1992 the CO₂ tax scheme was extended and a CO₂ tax was also levied on coal and coke. However, the CO₂ tax scheme on coal and coke products was abandoned in 2003. In contrast to the situation in Denmark, the CO₂ tax level (when expressed as per tonnes of CO₂) was not designed to be at a fixed level regardless of fuel type. When the tax was introduced in 1991, the Norwegian CO₂ tax level varied between 97 NOK per tonnes of CO₂ (heavy fuel oil) and 259 NOK per tonnes CO₂ (petrol). These rates have been increased several times since the introduction of the tax and in 2005 the CO₂ tax on heavy fuel oil was equivalent to 171 NOK/ tonne CO₂, the tax on light fuel oil or diesel oil was equivalent to 198 NOK/tonne CO₂ and the tax on petrol was 0.78 NOK/litre equivalent to 337 NOK per tonne of CO₂ emissions. Consumption of natural gas on the mainland is not charged with either an energy tax or a CO₂ tax. However, as the following section on exemptions will show, the CO₂ tax on natural gas is only levied on natural gas consumption on the continental shelf. Table 8.1 below shows an overall picture of the general Norwegian energy and CO₂ tax rates for consumption of fossil fuels on the Norwegian mainland (IEA, 2004a; Toll- og Avgiftsdirektoratet, 2004a; and Statistisk Sentralbyrå, 2005).

Table 8.1 Energy/CO₂ taxation framework for fossil fuel consumption on the Norwegian mainland

		1985	1990	1996	2000	2002	2005
Light Fuel oil ¹ (EUR-cent/l)	energy tax	0.40	3.90				
	basic tax				2.34	5.18	5.06
	CO ₂ tax			5.09	5.68	6.53	6.36
	TOTAL TAX	0.40	3.90	5.09	8.12	11.71	11.42
Heavy Fuel oil ¹ (EUR-cent/kg)	energy tax	0.41	3.98				
	basic tax				2.39	5.29	5.16
	CO ₂ tax			5.20	5.79	6.66	6.49
	TOTAL TAX	0.41	3.98	5.20	8.18	11.95	11.65
Coal (EUR-cent/kg)	energy tax						
	CO ₂ tax			5.19	5.79	6.53	
	TOTAL TAX			5.19	5.79	6.53	0

Source: Statens forurensningstilsyn, 2004; IEA, 2004a; IEA, 2005; Toll- og Avgiftsdirektoratet, 2004a and 2004b

Description of the development of energy tax rates in this chapter, as well as that of other environmental taxes, is slightly distorted as all tax rates expressed in the national currency have been converted into EURO. Norway indexes all tax rates which means that the rates rise in accordance with inflation, guaranteeing that the real value of the tax rates remains constant. Such a policy approach is rarely followed by other European countries. Energy related taxes as well as environment related taxes have increased by around 2 percent annually between 2002 and 2005.

- The third element of the Norwegian excise duties on consumption of fossil fuels is the sulphur or SO₂ tax. The sulphur tax is levied on the fuels according to the sulphur content in the specific fuel. As the sulphur content varies, even within each overall fuel category (such as heavy fuel oil or coal), it is necessary to treat the sulphur tax separately from the energy and the CO₂ tax. The sulphur tax on mineral oil was introduced in 1971 along with the energy tax. The initial rate was 0.02 NOK/litre for each 0.5 percent sulphur content band by weight commenced upon. The rate is currently 0.07 NOK/litre oil for each 0.25 percent of sulphur content by weight. Oil products with less than 0.05 percent sulphur content are exempt from the sulphur tax. The 1998 tax reform, which entered into force in 1999, introduced a sulphur tax on coal and coke consumption. The tax was fixed at 3 NOK/kg SO₂ and, in particular, it was the Norwegian metal and cement industry that was affected by this tax. Along with the introduction of a sulphur tax on coal consumption, a number of sectors previously exempted from the sulphur tax were now liable to the tax. For example, the domestic aviation sector, the North Sea supply fleet and the continental shelf facilities became liable to a reduced sulphur tax (0.013 NOK/l oil) as a result of this 1998 tax reform. In 2005, the reduced rate is 0.03 NOK/ litre – as compared to the standard rate of 0.07 NOK/litre. The SO₂ tax on coal and coke was removed by the

end of 2001 and replaced with a voluntary agreement scheme on reduction of SO₂ emissions (Toll- og Avgiftsdirektoratet, 2004a).

Table 8.2 shows the sulphur taxes for the observed period.

Table 8.2 Norwegian sulphur tax

	1985	1990	1996	2000	2002	2005
Oil (EURcent/l oil ¹)	0.11	0.63	0.85	0.86	0.93	0.86
Coal (EURcent/kg SO ₂)				0.74	0	0

Note: ¹The sulphur tax on oil is levied on each 0.25 percent sulphur content commenced (based on weight). From 1992 onwards oil products with less than 0.05 percent sulphur content are not charged with the sulphur tax.

Source: IEA, 2004a, Toll- og Avgiftsdirektoratet, 2004a and Toll- og Avgiftsdirektoratet, 2004b

8.1.3 Exemptions to the excise duties on fossil fuels

As in Denmark and Sweden, political realities and special political interests are manifest in a number of exceptions for a number of industries. No general tax reduction scheme exists for the excise duties levied on industrial sectors, however, the fishmeal industry and the wood processing industry, including the paper and pulp industry, are eligible for generous tax reductions; i.e. they are charged with around half of the normal level of CO₂ tax on mineral oil. Coal and coke used for non-energy purposes (as reducing agent or raw material) have always been exempt from the CO₂ tax. Coal consumption in the cement industry – which is one of the most energy intensive industries – was also exempted from the CO₂ tax. All these special tax provisions became obsolete when the CO₂ tax on coal and coke was abandoned in 2003 (Toll- og Avgiftsdirektoratet, 2004a).

The Norwegian industrial taxation scheme is, in itself, of great interest as it also includes provisions for levying higher energy taxes on specific sectors. The CO₂ tax rate levied on consumption of mineral oil on the continental shelf is twice as high as the tax rate levied on consumption of mineral oil on the mainland. In addition to the increased tax on mineral oil, natural gas consumption on the continental shelf is subject to the CO₂ tax whereas natural gas consumption on the mainland is completely exempt from the tax. Table 8.3 provides an overview of the special tax provisions available to the various Norwegian industrial sectors.

Table 8.3 Special tax provision scheme for various Norwegian industrial sectors

		1985	1990	1996	2000	2002	2005
Industrial sectors (fish processing and wood processing industry including paper and pulp)							
Light Fuel oil (EURcent/l)	energy tax	0.40	3.90				
	basic tax				2.34	5.18	5.06
	CO ₂ tax			2.55	2.84	3.26	3.18
	TOTAL TAX	0.40	3.90	2.55	5.18	8.44	8.24
Heavy Fuel oil (EURcent/kg)	energy tax	0.41	3.98				
	basic tax				2.39	5.29	5.16
	CO ₂ tax			2.60	2.90	3.33	3.25
	TOTAL TAX	0.41	3.98	2.60	5.29	8.62	8.41
Petroleum sector on the continental shelf							
Oil products (EURcent/l)	energy tax						
	CO ₂ tax			10.37	8.63	9.72	9.53
	TOTAL TAX			10.37	8.63	9.72	9.53
Natural gas (EURcent/ m ³)	energy tax						
	CO ₂ tax			10.37	8.63	9.72	9.53
	TOTAL TAX			10.37	8.63	9.72	9.53

Source: Statens forurensningstilsyn, 2004, Toll- og Avgiftsdirektoratet, 2004a, Toll- og Avgiftsdirektoratet, 2004a, and Finansdepartementet, 2005.

8.1.4 Excise duties on electricity consumption

Electricity production in Norway is primarily based on hydropower and is, therefore, characterised by low emissions of CO₂, SO₂ and other pollutants. Therefore, it is of no surprise that there is no CO₂ tax on electricity consumption in Norway. Furthermore, the excise duties on electricity are generally lower in Norway than in Denmark, where electricity production is primarily based on coal. In 2002, the Norwegian electricity tax was around 0.1 NOK/kWh (0.013 EUR/kWh) whereas the Danish electricity tax was around 0.6 DKK/kWh (0.081 EUR/kWh).

The Norwegian excise duty on consumption of electricity was introduced in 1951 and has been gradually increased. The revenue from the electricity tax was explicitly earmarked for building and improvement of hydropower plants. In the 1970s and 1980s several specific energy intensive industries were charged with a reduced electricity tax or fully exempt from paying the tax. These regulations have been introduced for competitive purposes. In 1993 these agreements were cancelled and, instead, all industry was charged with half of the normal electricity tax. From 1 January 1994 until 31 December 2004 the manufacturing, mining and horticulture (greenhouse growing) industries have been fully exempt from the electricity tax, but a decision by the EFTA-Court in 2005 required Norway to reintroduce the electricity tax (cf. Section 10.7).

Some further development occurred in 1993 as Norway introduced a production tax on electricity generated in hydropower plants. During the period 1993–1997, electricity was therefore subject to a production as well as a consumption tax. The production tax was finally removed in 1997. Some research suggests that the production tax was, most likely, a

critical factor in curbing the further development of hydropower in Norway. On the other hand, it regulated the disruption of the landscape and the natural environment caused by the enlargement of the hydropower plant sector (Toll- og Avgiftsdirektoratet, 2004a, and Nordic Council, 2002). The developments in the electricity tax rates for the period 1985–2005 are illustrated in Table 8.4 below.

Table 8.4 Excise duties on electricity (EURcent/kWh)

	1985	1990	1996	2000	2002	2005
Consumption tax	0.45	0.48	0.65	1.06	1.24	1.21
Production tax			0.19			
Consumption tax paid by industry	0.45	0.48	0.00	0.00	0.00	0.06

Source: Toll- og Avgiftsdirektoratet, 2004a and 2004b, and Nordic Council, 2002

8.1.5 Excise duties on transportation fuels

Two different environmental tax schemes address the transport sector, as is the case in all European countries; energy taxes are levied on transport fuels while the purchase and ownership of motor vehicles are subject to transport related taxes (see Section 8.5).

Taxes levied on petrol consumption were the first energy taxes to be introduced in Norway and were introduced in 1931. The tax rate was set at 0.03 NOK/l at the time of its introduction. The revenues generated from the petrol tax have been hypothecated for improvements in road infrastructure. The petrol tax rates have been increased for both fiscal and environmental reasons during the last 80 years (Toll- og Avgiftsdirektoratet, 2004a).

A tax on diesel oil for transportation purposes was only introduced in 1970 and this move formed part of the introduction of the overall taxation scheme on mineral oils. A specific tax on diesel oil for transportation purposes –in addition to the tax implemented in 1970 – was not introduced until 1993. This tax on diesel oils for transportation purposes was introduced in connection with the phasing-out of an excise duty scheme on distanced travelled (Toll- og Avgiftsdirektoratet, 2004a).

Over the years transport related fuel taxes have been revised three times, aiming to include environmental criteria in calculation of the tax. The process began in 1980 when the tax scheme on petrol was differentiated in a way so that high-octane petrol was charged with a higher tax rate. In 1986 the tax scheme was further amended, focusing on the lead content of petrol instead of the octane content.

The second policy approach with a specific environmental purpose was the introduction of the CO₂ tax. The CO₂ tax on both petrol and diesel was introduced in 1991. However, while diesel was charged with the tax rate relevant to all mineral oils, petrol was charged with a special and significantly higher CO₂ tax rate. The difference between the CO₂ tax rate

on petrol and diesel oil has gradually been decreased since the introduction of the tax in 1991.

The third specific environmentally related tax on transportation fuels is a sulphur tax on diesel which was introduced in 2000. The tax scheme meant that diesel oil with a high sulphur content was charged with a surcharge of 0.25 NOK/l. Since 2002, diesel oils are classified as high and low-sulphur diesel based on the sulphur content and the tax rate is differentiated accordingly. In 2005, the Norwegian authorities also included a tax differentiation on petrol based on sulphur content. This differentiation is to replace the differentiation between leaded and unleaded petrol (Toll- og Avgiftsdirektoratet, 2004a and 2004b). The developments in all the tax rates applied to petrol and diesel are illustrated in Table 8.5.

Table 8.5 Tax rates on transportation fuels (EURcent/l)

		1985	1990	1996	2000	2002	2005
Unleaded petrol	energy tax	26.88	33.09	44.41	53.50	50.74	49.26 ¹
	CO ₂ tax			10.37	11.59	9.72	9.53
	TOTAL	26.88	33.09	54.78	65.08	60.46	58.79
Other petrol	energy tax	26.88	38.50	52.58	56.58	61.53	49.75 ¹
	CO ₂ tax			10.37	11.59	9.72	9.53
	TOTAL	26.88	38.50	62.95	68.16	71.25	59.28
Diesel Class 1	Energy tax	0.46	3.90	35.75	46.10	36.89	35.69
	CO ₂ tax			5.25	5.79	6.53	6.36
	TOTAL	0.46	3.90	40.99	51.89	43.42	42.05
Diesel Class 2	Energy tax	0.46	3.90	35.75	49.18	41.29	36.30
	CO ₂ tax			5.25	5.79	6.53	6.36
	TOTAL	0.46	3.90	40.99	54.97	47.81	42.66

Note: ¹In 2005 the differentiation between unleaded and leaded petrol has been abandoned. Instead a differentiation between sulphur-free and low sulphur petrol has been introduced, i.e. the category 'other petrol' refers to leaded petrol until 2002 and to low sulphur petrol in 2005

Source: Toll- og Avgiftsdirektoratet, 2004a; Toll- og Avgiftsdirektoratet, 2004b and Finansdepartementet, 2005.

As already mentioned above, the data presented in the table are slightly distorted because of the conversion. The indexation of the tax rates during the period 2002–2005 guaranteed that the real value was kept constant when expressed in the national currency.

8.1.6 Renewable energy sources and economic instruments

In addition to the energy taxes, the Norwegian energy authorities have granted funds for research and development and subsidies for improvement of the production of energy from renewable sources. The year 2002 marks an institutional shift in the Norwegian government's effort to regulate energy production and energy consumption. Until 2002, the Norwegian Water Resources and Energy Directorate and the electricity distribution utilities had shared responsibility for promoting green energy production and more efficient energy consumption. By the beginning of 2002 the government agency Enova SF had been given full responsibility for the Norwegian government efforts to change energy production and

consumption by using different subsidy schemes. It is the political aim that by 2010 the programmes governed by Enova will contribute to new green energy production and energy savings, adding up to a total of 12 TWh. By the end of 2005 the Enova is expected to have realised 4.5 of the 12 TWh (Kan Energi/forskningsrådet, 2003, and Enova, 2005a). The Enova activities are funded partly by state budget grants and partly by revenues generated from energy taxes (Enova, 2005b, and Kan Energi/forskningsrådet, 2003). The Enova programmes granting subsidies to wind energy projects, other renewable energy projects and energy savings projects. Energy savings projects in connection with construction of new buildings are entitled to up to 40 percent refund of the additional costs caused by the energy saving project (Enova, 2005c). Windpower projects and other renewable energy projects are entitled to a subsidy constituting up to 25 percent of the investment costs of the projects (Enova, 2005d).

In addition to the tax and subsidy schemes on electricity, the Norwegian authorities have considered collaborating with the Swedish authorities on a common market for green certificates. However, the idea was discarded in early 2006 as the scheme was characterised as ‘too expensive for Norwegian consumers and industry’ by the Government.. The investment subsidy for green energy production projects may be terminated when green energy production starts to receive an additional price surcharge as a consequence of the green certificate scheme (Enova, 2005d).

In addition to the subsidy schemes directed towards green energy production and energy savings, the Norwegian government also grants funds for research and development concerning energy and oil production and consumption. On the 2005 budget the Norwegian government have granted 421.7 million NOK for research and development relating to energy and oil (Ministry of Petroleum and Energy, 2005).

8.1.7 Emission trading scheme

The Norwegian government signed and ratified the Kyoto protocol and accepted not to increase the greenhouse gas emissions in 2008–2012 by more than 1 percent compared to the 1990 emission level. Norway is not obligated to meet the EU requirements in relation to the EU emission trading scheme (ETS), but implemented an emission trading scheme which meets all the criteria and standards for joining the EU’s ETS (Ministry of the Environment, 2004). The Norwegian ETS can be described as a scaled down version of the EU ETS mainly to secure competitiveness of the Norwegian process industry as some of the industrial sectors are subject to the CO₂ taxation.

Initially it was planned that the Norwegian implementation of the ETS should cover 27 percent of total greenhouse gas emissions in Norway. This plan was abandoned as the Bondevik government insisted on keep-

ing the CO₂ tax scheme for the process industry until 2008 and did not want to impose two different economic instruments – energy taxes as well as emission trading scheme – on the same industrial sector. The National allocation plan, therefore, only includes 51 installations and a total of 6.8 million tonnes of CO₂ emissions yearly (2005–2007). This means that the Norwegian ETS covers 10 percent of the total greenhouse gas emission. In comparison, the ETS covers an average of 38 percent of the total CO₂ emissions in EU Member States. Even though the Norwegian ETS is less extensive in scale compared with the EU's, the Norwegian authorities are still using this instrument to regulate greenhouse gas emissions. According to the national allocation plan, the Norwegian government will allocate 6.8 million tonnes of emission allowances annually in the period from 2005–2007. The emission allowances are allocated on basis of historic emissions as well as projected emissions. This level of emission allowances will effectively create an emission level of about 5 percent lower than the projected emission level in a “business as usual” scenario (Centre for International Climate and Environmental Research, 2004 and Norwegian Pollution Control Authority, 2004). In addition it should be mentioned that the coverage of sectors taking part in the Norwegian ETS might still be revised for the Kyoto period 2008–2012.

8.2 Economic instruments used in water policy

8.2.1 Introduction

Municipalities in Norway are not permitted to charge more for water related services than required to cover the associated costs. Substantial investments have been made in municipal *wastewater treatment* in sensitive areas, e.g. North Sea areas, since the early 1980s and wastewater investments in general have increased from approximately 1.3 to 1.8 billion NOK over the 10 years prior to 2003 (Statistics Norway, 2004).

The wastewater treatment sector posed a cost of about NOK 4.3 billion to the municipalities in 2003 which, overall, balanced the revenues municipalities received in wastewater fees (Statistics Norway, 2004). Increased attention has recently been paid to full-cost recovery, reducing the quite considerable differences which existed at the individual municipal level in this regard at this level. The table below presents wastewater treatment by type, however, disguises regional differences between North Sea counties and others. Wastewater treatment efforts are generally greater in the North Sea counties due to e.g. commitments under North Sea agreements.

Table 8.6 Proportion of population connected to wastewater treatment plants according to treatment type

Share of population connected to different wastewater treatment plants (in percent)	2003
Connected to the municipal sewerage system	81
Connected to plants:	
with chemical treatment	34
with biological-chemical treatment	29
with other treatment types	25
Without treatment	7

Source: Statistics Norway, 2004: http://www.ssb.no/english/subjects/01/04/20/var_kostra_en/

Annual investments in municipal water supply increased 18 percent between 1992 and 2003 (Statistics Norway, 2004a). Industry and agriculture largely meet their water needs from their own sources (Statistics Norway, 2003).

8.2.1 Municipal charges for water supply and wastewater treatment

With regard to *water supply*, consumers may often choose to pay according to actual metered usage, fixed rates or a mixture of the two systems. The respective rates vary according to municipality. In the case of payment using the consumption-based method, a minimum payment often applies which also varies according to municipality (Statistics Norway, 2004).

Table 8.7 Average water supply rates for a standard house (120m²) – 2004 (based at county level)

Method of calculation of charges	Fixed (NOK/yr – EUR/yr in brackets)	Variable (NOK/m ³ – EUR/ m ³ in brackets)
Metered usage only	-	9.16 (1.1)
Fixed rate	2,076 (248)	-
Hybrid, i.e. usage and fixed part	1,145 (137)	7.06 (0.8)

Source: Statistics Norway 2004b

Wastewater treatment charges are levied at rates which vary considerably from one local authority to another. The charges are set at a fixed rate. Since 2001, however, a rate based on the actual volume of water used or a mixture of the two methods is also available. The latter method aims to reflect both the constant and variable costs involved in providing the service. In 2002, the fixed rate method still represented the most common method, and these charges ranged between 450 and 6,765 NOK per year for a private house of 120 m² according to municipality (Statistics Norway, 2002). From January 2002 to January 2003, average charges for wastewater treatment increased for the country as a whole by 5 percent (Statistics Norway, 2003a).

8.3 Economic instruments in the waste area – taxes and charges

8.3.1 Introduction

Production of household waste has displayed a marked increase, per capita waste production increasing over 50 percent between 1992 and 2003 (Statistics Norway, 2003a, 2004b). Industrial waste, however, has remained relatively stable over approximately the same period, i.e. from 1995 (SFT, 2004).

In 2003, of the 3.9 million tonnes of waste delivered to waste treatment plants (representing approximately half of total waste production in that year) landfill represented the most important treatment type for waste (36 percent), closely followed by incineration (30 percent) and, thereafter, material recovery (27 percent) and composting (6 percent) (Table 8.8) (Statistics Norway, 2004c). Landfill, however, almost halved in the preceding 10 years. Moreover, from 2009, Norway proposes a ban on the landfill of biodegradable waste aimed mainly at reducing in methane emissions (ENDS, 2004c).

Table 8.8 Treatment of waste delivered to treatment plants per type – 2003

Waste management option (in percent)	2003
Landfill	36
Incineration	30
Material recovery	27
Composting	6

Source: Statistics Norway, 2004c

8.3.1 Waste charges

Recent changes in the waste definitions of the Pollution Control Act came into force in 2004 leading to changes in the respective areas of responsibility of municipalities and industry. The latter have received greater freedom in handling their own waste and municipalities are now responsible only for household waste (SFT, 2004a).

Encouraged by pollution legislation, the majority of municipalities differentiate charges. This can take place according to lower frequency with regard to collection, lower volume containers, weight, or other means. In 2004, waste charges varied between 1,000 and 2,640 NOK per household according to municipality. The development in waste charge rates from 1998 is presented below. From 1995 to 1997, average charges increased by 20 percent. From 1998 and 2004, the lowest charge rate has doubled and the highest charge rate has increased by approximately one-third, implying a significant increase in average charges over the period.

**Table 8.9 Development of the range of waste charges
(in NOK (EUR) per household)**

Year	Lowest	Highest
1998 ¹	530 (63)	2,040 (241)
1999 ²	700 (84)	2,500 (301)
2004 ³	1,000 (119)	2,640 (315)

¹ Source: ¹ Statistics Norway, 1999; ² Nordic Council of Ministers, 2002;

³ Statistics Norway, 2004d

8.3.2 Waste tax

The waste tax in Norway applies to both landfill and incineration and was introduced in 1999 in order to help reduce the amounts of waste produced. The waste taxation system was changed in 2003. The changes were to be revenue neutral and were not designed to affect the relative status of landfill versus incineration (ENDS, 2003).

Since July 2003, landfill tax rates have been differentiated according to the environmental standard of the landfill site to which the waste is delivered. The higher rate applies to sites which do not fulfil requirements with regard to site linings. The landfill option has become more expensive since 2003.

With regard to incineration, until July 2003, a standard rate applied in the case of 100 percent energy recovery and a maximum additional rate applied in the case where no energy was recovered. The standard plus the maximum additional rate amounted to the same rate as that for landfill. Reductions towards the standard rate applied as the percentage of energy recovery increased. Since 2003, waste delivered for incineration has no longer been differentiated according to the degree of energy recovery, but rather the environmental quality of the waste delivered to waste treatment plants, i.e. the tax now relates to the pollutant content of the emissions from burning the waste (Table 8.10). The aim is to better reflect the environmental costs of incineration as well as to stimulate energy recovery from waste incineration. Furthermore, a CO₂ tax is now charged per tonne of waste delivered to incineration plants. Plants burning waste which does not include fossil material are excluded from the charge.

Table 8.10 Development of waste taxes during the period 2000–2005 (unit: NOK per tonne waste (EUR))

NOK per tonne waste	2000	2002	2003	2003 from 1 July	2004	2005
Landfill – all qualities	300 (37)	320 (43)	327 (41)	327 (41)		
Landfill – high site standard	-	-	-	427 (53)	400 (48)	409 (50)
Landfill – low site standard	-	-	-		522 (62)	533 (65)
Incineration- standard rate	150	80	82			
– i.e. with 100% energy recovery	(18)	(11)	(10)			
Incineration- additional rate	150	240	245			
– i.e. increasing function of energy recovery	(18)	(32)	(31)			
Incineration maximum possible	300	320	327			
– i.e. with no energy recovery	(37)	(43)	(41)			
Incineration – variable rates according to pollutant/g				See Table 9.11	See Table 9.11	See Table 9.11
CO ₂ tax				39.00 (4.9)	39.70 (4.7)	40.57 (5.0)

Source: Nordic Council of Ministers, 2002
 2003 figures: Ministry of Finance, Norway, 2003
 2004 figures: Ministry of Finance, Norway, 2004a
 2005 figures: Government of Norway: "Stortingets skattevedtak for inntektsåret 2005"

Table 8.11 Tax rates relating to emissions from incineration – 2003–2005 (introduced 1 July 2003; in NOK per gramme (EUR))

Year	Dust	HF	HCl	NO _x	SO ₂	Hg	Cd
2003	0.577	20.40	0.102	0.015	0.017	27.60	53.10
From 1 July	(0.07)	(2.52)	(0.01)	(0.002)	(0.002)	(3.40)	(6.55)
2005	0.6	21.23	0.106	0.0153	0.0174	28.72	55.25
	(0.07)	(2.60)	(0.01)	(0.002)	(0.002)	(3.51)	(6.75)
Year	Pb	Cr	Cu	Mn	As	Ni	Dioxins
2003	63.40	571.00	0.307	95.00	9.71	9.30	2,350,000
from 1 July	(7.82)	(70.4)	(0.04)	(11.7)	(1.20)	(1.15)	(289,766)
2005	65.96	594.07	0.317	98.84	10.10	9.68	2,445,000
	(8.06)	(72.6)	(0.04)	(12.1)	(1.23)	(1.18)	(298,900)

Source: 2003- figures: Ministry of Finance, 2003
 2005 figures: Government of Norway : "Stortingets skattevedtak for inntektsåret 2005"

8.3.3 Tax on beverage containers

The environmental tax on beverage containers was introduced in 1974, and overhauled in 1994 as well as in 2000, amongst other things, to be differentiated according to the type of material the container is made of. The environmental tax is reduced according to the percentage of containers which are recycled, up to 95 percent, at which level the container-type is exempt from the tax. Exemptions exist on juice and milk products and other products typically consumed in the home (see for a detailed discus-

sion Nordic Council, 2002). The rates have increased by around 10 per cent from 2000 to 2005.

Table 8.12 Rates for former beverage container tax 1997

Beverage container (NOK per unit)	1997
Still, alcohol-free drinks	0.32 (0.04)
Other drinks	3.19 (0.40)
Basic packaging charge – non-reusable	0.74 (0.09)

Source: Ministry of Finance, 1997

Beverage containers made of: (NOK per unit (EUR))	2000	2005
Glass and metal	4.00 (0.49)	4.46 (0.55)
Plastic	2.40 (0.30)	2.69 (0.33)
Cartons	1.00 (0.12)	1.11 (0.14)

Source: 2000 figures: Ministry of Finance, Norway, 2001
2005 figures: Ministry of Finance, Norway 2005

Additionally, since 1994, a flat rate tax has applied to *non-refillable* beverage containers for which the rates in recent years have been as follows. The tax has similarly increased by around 10 percent in the last 5 years.

Table 8.13 Rates for flat rate tax on non-refillable beverage containers 2000–2004

NOK per unit (EUR)	2000	2002	2004
Non-refillable beverage container	0.81 (0.10)	0.85 (0.11)	0.89 (0.11)

Source: 2000 figures: Ministry of Finance, Norway, 2000
2002 figures: Nordic Council of Ministers, 2002
2004 figures: Ministry of Finance, Norway, 2004

8.4 Other economic instruments in the waste area

8.4.1 Introduction

The Norwegian competition authority estimates that consumers in Norway pay around 1.1 billion NOK, i.e. approximately 200 NOK per capita, annually in recycling charges on products where branch-wide organisations operate the associated collection and recycling schemes under producer responsibility obligations.

8.4.2 Deposit-refund and other systems for refillable and non-refillable beverage containers

The system of taxation on beverage containers is supported by producer responsibility in the form of a deposit-refund system. Norsk Resirk (www.resirk.no) is a trade and industry organisation, which has operated since 1999, with which manufacturers and importers of beverages in *cans* or *non-refillable PET bottles* can register their products, enabling them to

benefit from reduced rates of the environmental tax (Section 8.3.3). The tax rate decreases as the return rate for different packaging types increases, e.g. a 90 percent return rate for cans translates into a 90 percent discount on the tax, enabling the products to be sold at a lower price. Resirk estimate that the refundable deposit system saved Norwegian consumers over NOK 1 billion in environmental levies in 2003, which would translate into around 200 NOK per capita. The deposit/refund is currently 1.0 NOK for PET bottles and cans up to 0.5 litres and 2.5 NOK if over 0.5 litres. In 2003, 77 percent of PET bottles and 92 percent of cans were collected and of these 100 percent were recycled (Resirk, 2003).

In addition to Norsk Resirk's refundable deposit scheme, three other return systems operate for *one-way drinks cartons* (Norsk Returkartong), *non-refillable glass bottles* (Norsk Glassgjenvinning) and *refillable glass and plastic bottles*. The latter are collected through a system operated by the Norwegian Brewers and Soft Drinks Producers. For refillable beverage containers the same deposit/refund rates apply as to non-refillable bottles and cans, however, the retailer receives a slightly higher refund than the consumers, at 1.20 NOK for refillable containers up to 0.5 litres and 3.0 NOK if over 0.5 litres (Norwegian Brewers and Soft Drink Producers, 2004). For one-way cartons and non-refillable glass, no deposit-refund system applies, the system being financed through recycling fees on the products. For example, in 2004, the fee charged to the packer or filler is 0.029 NOK per beverage carton and 0.90 NOK per kilo of carton packaging (Returkartong – Facts about Norsk Returkartong AS). In 2004, municipal collection schemes were in place in the majority of the municipalities, covering approximately 96 percent of the Norwegian population (www.returkartong.no). In the case of glass, the material handling company is responsible for collecting the bottles themselves.

8.4.3 Packaging waste

Producer responsibility for packaging stems from 1991 when parliament placed the obligation to reduce the amount of packaging used and to collect and recover packaging waste. Waste management companies responsible for different waste streams have been assisted in recovery of membership fees since 1998 by the trade and industry organisation Materialretur AS (www.materialretur.no).

8.4.4 Batteries collection system

The Norwegian Government introduced battery regulations in Norway in 1990, representing an early example of producer responsibility being enforced in legislation. In response, in 1994 the trade and industry organisation AS Batteriretur was set up to collect environmentally harmful batteries addressed by the regulations (e.g. lead and nickel-cadmium bat-

teries) free-of charge, as well as to finance and organise the scheme and recycle the used batteries. In 1999, the allied organisation, Rebatt AS was set up to collect portable rechargeable batteries and the two organisations together will be able to address the requirements of the EU battery Directive to collect and recycle all types of battery, which extend to Norway as an EEA member. The current responsibility area for AS Batteriretur is start and industrial batteries.

From 1994 to 2003, a 100 percent return rate for environmentally hazardous batteries has been achieved for the period with the exception of 1996 (Batteriretur, 2005).

8.4.5 Deposit-refund system and producer responsibility for ELV

On average, approximately 100,000 vehicles are scrapped in Norway annually with a collection rate of over 90 percent. The current proportion of material recycled is approximately 80 percent by weight. The refund system for scrap cars weighing less than 3.5 tonnes was established back in 1978. A charge is made on purchase of a new car (1,300 NOK in 2004) and a refund is given (1,500 NOK in 2004) when a vehicle is returned to an authorised car breakers yard. The car dismantlers, themselves, receive a fee (611 NOK in 2005) per car for removing the environmentally hazardous elements (Ministry of the Environment, Norway, 2004a). Further funding is provided for costs associated with compressing and transporting the scrapped cars.

The Norwegian Pollution Control Authority (SFT) aims to increase the proportion of material recovered from the scrap car collection scheme and meet the requirements set by the new 2002 scrap car regulations. The latter address the requirements of the EU Commission's amendment to End of Life Vehicle Directive 2000/53, such that from July 2002, car importers and producers gradually overtake the responsibility for collection and recycling of scrap cars from SFT. The regulations state, moreover, that the refund system will be maintained until 31 December 2006, at which time SFT will evaluate whether the instrument should continue to be in operation from 2007 (SFT, 2002, 2003a and 2004d).

8.4.6 Waste Electrical and Electronic Equipment (WEEE)

Producer responsibility has applied to WEEE since 1988, however, the EU WEEE Directive is to be implemented in Norwegian legislation by mid-2005. The costs for treatment and disposal are covered by recycling charges incorporated in the retail price. Under Norway's original scheme, industry reached its 80 percent target for take-back by July 2004, bar 1 percent (ENDS, 2004b and SFT, 2004d).

8.4.7 Deposit-refund system for waste oil

The lubricating oil product charge was introduced in 1988 and a refund in 1994. Lubricating oil is termed waste oil and is classified as special waste. The development in rates for the charge is as follows:

Table 8.14 Development of charge levied on waste oil

NOK per litre	1988	1997	2002	2003	2004	2005
Waste oil	0.50	1.05	1.52	1.56	1.59	1.62

Source: 1988 figures: Ministry of the Environment, Norway, 1995

1997 figures: Ministry of Finance, Norway, 1997a

2002 figures: Ministry of Finance, Norway, 2001

2003 figures: Ministry of Finance, Norway, 2003

2004–5 [figures](#): Ministry of Finance, Norway, 2004a

A refund on the charges was introduced to promote the collection and recycling of waste oil. The necessary funds are paid by the Norwegian Pollution Control Authority (SFT) to approved collectors who, in turn, make the refund to those delivering the waste oil, minus the costs associated with operating the scheme. In practice, this means that for by far the majority, waste oil can be delivered either free-of-charge or against receipt of a payment.

The return scheme achieved a return on amounts converted to pure oil of about 80 percent during the late 1990s compared with 54 percent in 1990 (Ministry of the Environment, Norway, *not dated*), however, the aim since 2000 has been for 90 percent to be collected (SFT, 2003). To achieve this, the refund was extended to charge-free waste oil in 2000, except for large-size international shipping. Moreover, when the scheme was introduced the same rate applied to the refund as the charge, however, the refund rate has since been set at a higher level than the charges. For example, in 2003 the refund amounted to 1.76 NOK per litre whereas the charge was 1.56 NOK per litre (SFT, 2003).

8.4.8 Charge-refund system for trichloroethylene (TRI) and charges on tetrachloroethylene (PER)

A charge-refund system for the TRI content in products was introduced in 2000 to promote phasing-out use of the chemical and to reduce the environmental impact arising from use of these chemicals. A charge-only system was introduced at the same time for PER. The charges, listed below, relate to the percentage of TRI or PER in a product and have increased by approximately 8 percent in both cases from 2001 to 2005. The refund rate for TRI delivered to authorised collection has remained at 25 NOK per kg since the scheme was introduced.

Table 8.15 TRI and PER charge rates – 2001–2005

content/kg (NOK-(EUR))	2001		2002		2005	
%	TRI	PER	TRI	PER	TRI	PER
0.1–1	-	0.50 (0.06)	-	0.51 (0.07)	-	0.54 (0.07)
1+ –5	2.60 (0.32)	2.60 (0.32)	2.65 (0.35)	2.65 (0.35)	2.82 (0.34)	2.82 (0.34)
5+ –10	5.20 (0.65)	5.20 (0.65)	5.30 (0.71)	5.30 (0.71)	5.64 (0.69)	5.64 (0.69)
10+ –30	15.40 (1.91)	15.40 (1.91)	15.70 (2.09)	15.70 (2.09)	16.70 (2.04)	16.70 (2.04)
30+ –60	30.80 (3.83)	30.80 (3.83)	31.40 (4.18)	31.40 (4.18)	33.40 (4.08)	33.40 (4.08)
60+ –100	51.40 (6.37)	51.40 (6.37)	52.40 (6.98)	52.40 (6.98)	55.71 (6.81)	55.71 (6.81)

Source: Ministry of the Environment, Norway, 2000, 2001 and 2005

8.4.9 Charge-refund system for hydrofluorocarbons (HFC) and perfluorocarbons (PFC)

From January 2003, a charge has been levied on the import and production of HFCs and PFCs and, from July 2004, an associated refund scheme for waste containing these chemicals has been in operation. The charge in 2004 was 183 NOK per tonne of CO₂ equivalent. The refund rate is also based on the associated global warming potential of the compounds and is applied at the same rate as the charge. The purpose of the scheme is to reduce use of these gases, providing an estimated 40 percent emission reduction by 2010, and to promote alternative technologies. The total amount refunded is estimated to range annually between 10 and 18 million NOK and, over the period as a whole, to be lower than the corresponding income to the scheme via the charges (SFT, 2004b).

8.5 Economic instruments related to agriculture and natural resources

At present, Norway levies a tax on the use of pesticides. A tax on nitrogen and phosphorous in mineral fertilisers was in place between 1988 and 2000. The effects of this tax on the use of fertilisers were negligible due to the rather low tax rates (GLU, 2004) and the tax was removed as a means to reduce the costs face by Norwegian agriculture.

The pesticide taxation scheme underwent some revision in 1999 when the idea of having a flat-rate tax was abandoned and, instead, a tax differentiated according to environmental and health risks, was introduced. The tax scheme still consists of a control (inspection) and an environmental tax with the aim of the former tax being to cover part of the costs imposed on the Norwegian agricultural authorities.

The redesign of the pesticides tax was aimed to encourage farmers to switch from use of pesticides with high environmental and health risks to

pesticides with lower risks. The tax rates of the environmental tax component are, therefore, differentiated according to the particular type of pesticide applied (Norwegian Agricultural Inspection Service, 2003).

8.6 Economic instruments related to transport

In addition to the taxes on transport fuels, Norway has a comprehensive system of taxes levied on motor vehicles comprising a purchase tax as well as annual circulation taxes.

In 1955, a purchase tax on passenger cars and other motor vehicles was introduced to reduce the increasing problems with the trade balance. The objective of the tax was to increase the purchase price of new vehicles in order to limit the demand and, thereby, reduce import of motor vehicles. The initial tax rate was set at 10 percent of the import value and was gradually increased. However, the tax scheme has since been differentiated, leaving delivery vans and heavy trucks with a lower tax rate than passenger cars. In 1996 the purchase tax scheme on motor vehicles was radically reformed. The purchase tax on new motor vehicles changed from being based on the import value and the weight of the car to being entirely based on environmental merit (weight, horsepower and piston displacement). One of the aims of the new purchase tax was to encourage consumers to buy smaller cars – in terms of weight and power – and hence cars with a lower environmental impact (Toll- og Avgiftsdirektoratet, 2004a). The tax has only recently been revised so that the tax is currently levied when the vehicle is registered for the first time in Norway. The registration / purchase tax scheme valid for passenger cars in 2005 is presented in Table 8.16. Heavy cargo trucks and buses longer than 6 meters with more than 17 seats are not charged with the registration tax.

Table 8.16 Registration tax rates in 2005

34.75 NOK/kg for the first 1,150 kg
69.50 NOK/kg for the next 250 kg
139.00 NOK/kg for the next 100 kg
161.66 NOK/kg for the rest of the weight
and
10.26 NOK/cm ³ for the first 1,200 cm ³ of the piston displacement
26.86 NOK/cm ³ for the next 600 cm ³ of the piston displacement
63.18 NOK/cm ³ for the next 400 cm ³ of the piston displacement
78.93 NOK/cm ³ for the rest of the piston displacement
and
134.22 NOK/kW for the first 65 kW of the motor effect
489.54 NOK/kW for the next 25 kW of the motor effect
979.38 NOK/kW for the next 40 kW of the motor effect
1,657.36 NOK/kW for the rest of the motor effect

Source: Toll- og Avgiftsdirektoratet, 2004c.

In addition to the registration tax, Norwegian passenger cars are charged with an annual road tax. In 2005, passenger cars, mini-buses and small delivery vans were charged with an annual tax of 2,815 NOK (344 EUR) as compared to 2,310 NOK (307 EUR) in 2002 (Nordic Council, 2002 and Toll- og Avgiftsdirektoratet, 2004d). Heavy duty trucks weighing more than 12,000 kg are charged with an annual road tax according to the weight, suspension system and number of axels on the truck. In 2005, a two axle truck with air suspension weighing between 12,000 and 12,999 kg is charged with an annual road tax of 358 NOK (43.75 EUR), while a truck with 4 axles weighing more than 29,000 kg is charged with an annual road tax of 3,663 NOK (448 EUR) (Toll- og Avgiftsdirektoratet, 2004e).

The annual road tax is not the only road fee levied on the motorists in Norway. Norwegian authorities have a long-standing experience using road tolls dating back to the beginning of the 1930s. Motorists are charged with a small fee when crossing the ring into the city centre of 7 Norwegian cities. Motorists are also charged with a road toll when entering special stretches of road (around 40 stretches of road in the entire country). The road toll is not specifically designed to reduce road-traffic, although it can be argued that a tax on road transportation will reduce traffic. The purpose of the road-toll is to finance bridges, tunnels and road construction. In 2002, the revenues from toll roads financed almost 27 percent of the total road construction budget (Norwegian public roads administration, 2005a and 2005b).

The Norwegian authorities introduced a noise-differentiated surcharge on landing charges at some airports in 1990. This surcharge is environmentally motivated as the main rationale for implementing such a surcharge is the attempt to encourage airlines to use aircraft which generate the least noise. In addition, a special surcharge on air traffic by night is also in force in Norway. Another feature of the Norwegian energy taxation scheme deserves some attention as it has a fuel tax on domestic flights. This CO₂ aviation fuel tax was introduced in 1999 and amounts to 0.31 NOK per litre in 2005 and the Government plans to increase the rate to 0.53 NOK per litre in 2006 (see for a more detailed discussion: OECD, 2005a).

8.7 Economic instruments applied in other environmental areas

The Norwegian government continues to provide financial support for environmental protection activities. In 2005, financial support is provided in many environmental areas such as measures to reduce the environmental impact of hazardous chemicals and to preserve wild salmon stocks. Woodland and forest conservation projects are also funded. One

of the main funding themes is climate policy aiming to stimulate new “greener” energy production. Furthermore, the government is also currently investing in climate change abatement measures in the Baltic Sea Region as well as granting some funding for research related to carbon sequestration.

Table 8.17 highlights the development of environmental tax revenues in Norway. By far the largest share of all revenues is generated by energy related taxes (including the CO₂ tax) and a rather dismal share is generated by resource and pollution taxes, in particular when compared with Denmark. However, there is an on-going debate on whether all taxes on resource extraction fulfil the criteria and definition for being an environmental tax, with implications for their inclusion in such an overview report. There is now a general agreement that taxation on resource extraction should be classified as environmental taxation, with the exception of taxes on oil and gas extraction. The main reason for their exclusion is “related to comparability between countries and over time” (Eurostat 2001, p.13). The main function of the latter taxes is to capture the resource rent which can be described as a “pure profit” from extraction (EC 2000), defined as the value of output less all extraction costs containing a normal return on fixed capital. Revenues generated by the petroleum sector in Norway are of central significance considering that 28 percent of all revenues came from this sector in 2004 (Norwegian Ministry of Petroleum and Energy, 2005). Norway, just as other countries rich in oil and natural gas resources have, introduced a combination of different economic instruments including royalties, special regulations and forms regarding corporation taxes, etc. The justification for these comprehensive taxation schemes is the exceptional return associated with the extraction of the natural resources.

The underlying postulate with regard to the design of the taxation scheme imposed on the petroleum sector is “....neutrality, so that an investment project that is profitable for an investor before tax, will also be profitable after tax. It is, therefore, possible to harmonise the requirement for significant income to the society with the requirement for sufficient post-tax profitability for the companies (Norwegian Ministry of Petroleum and Energy, 2005, p.55)”.

Revenues received by the Norwegian government from petroleum activities are hypothecated and transferred to the Petroleum Fund. At the end of 2004, the market value of the Petroleum Fund amounted to more than 1,000 billion NOK. The fundamental principle of having established this fund is to have reserves for future expenditures and, therefore, the funds are not earmarked for any special purposes.

Table 8.17 Revenue from environmental taxes in selected year (million NOK)

	1997	1998	2000	2002	2005 (est)
CO ₂ tax	1,627	1,665	3,520	3,555	7,647 ^x
CO ₂ tax petroleum activities on continental shelf	3,043	3,229	3,047	3,012	
Sulphur tax (SO ₂ tax)			117	98	91
Petrol tax	10,903	11,312	9,762	8,530	9,341
Autodiesel tax	3,406	3,763	4,803	3,955	4,990
Excise on use of electric energy	4,765	2,901	4,205	6,072	6,550
Tax on mineral oil etc.			4,215	4,162	
Tax on heating oil			489	455	682
Sales tax on motor vehicles (purchase)	9,771	10,078	9,629	12,248	
First time registration tax					15,610
Kilometre tax etc. (diesel driven vehicles)			273	314	
Annual user weight tax on motor vehicles	3,688	4,247	4,636	5,583	367
Registration duty			1,410	1,598	
Tax on boat engines			111	125	
Tax on waste			484	498	720
Tax on pesticides	21	24	55	56	
Environmental tax on beverage containers	166	162	159	433	175
Tax on chemicals TRI and PER			5	6	11
Tax on lubricating oils	63	67	88	80	86
Tax on greenhouse gases (HFC, PFC)					141
Basic tax on non-refillable beverage containers					474
Total environmental taxes	37,453	37,448	41,272	44,895	46,885
GDP	1,111,349	1,132,134	1,469,075	1,522,176	1,682,124
Share of environmental taxes as a percentage of GDP	3.4	3.3	2.8	2.9	2.8

Note: ^x figure includes revenues generated by the CO₂ tax levied on petroleum activities on continental shelf
Source: Statistics Norway

9. Sweden

9.1 Economic instruments related to energy consumption and air pollution abatement

9.1.1 Introduction

Since the 1970s, Sweden has made wide use of environmental taxes and charges as well as other economic instruments in environmental policy. The number of economic instruments currently applied is striking when compared with the situation in other EU Member States (OECD, 2004). Already in the early 1990s, Sweden implemented a tax shifting programme of around 1.8 billion EUR, when taxes on energy were raised while other taxes, such as income taxes, were lowered. An even more challenging fiscal programme commenced in 2001 as the Swedish government announced implementation of a green tax shifting programme of 30 billion SEK (around 3.3 billion EUR) over a ten year period. This included increases in environmental taxes and simultaneously reductions in other taxes, mainly taxes levied on income. The tax shifting programme can be said to be proceeding according to the plan considering that a shift of 10 billion SEK (1.1 billion EUR) was achieved during the first four years of the programme (period 2001–2004) and a further shift of 3.8 billion SEK (430 million EUR) is planned for 2005 (Speck, 2005). By far the largest share of revenues raised by environmental taxes originates from taxes levied on energy products and the carbon dioxide tax which have been raised continually over recent years.

The objective of Swedish energy policy is to secure a reliable supply of energy and electricity while meeting national and international commitments to reduce emissions. The electricity generation mix in Sweden differs from the situation in neighbouring countries as Sweden relies heavily on hydropower and nuclear power, explaining the relatively low degree of greenhouse gas emissions from electricity consumption. Increasing energy consumption and the political decision to close down the Barsebäck nuclear power reactors have increased the need for an active and effective energy policy, including the further use of economic instruments in order to meet national and international commitments. However, energy policy must also pay close attention to securing Swedish industry's international competitiveness when economic instruments are being introduced.

9.1.2 Excise duties on fossil fuels for energy purposes

The overall principle in both the Swedish and Danish taxation schemes on fossil fuel is similar. While the energy tax in Denmark is built on three separate taxation schemes, the excise duties on fossil fuels in Sweden consists of four elements; an energy tax, a CO₂ tax, a sulphur tax and a tax on NO_x emissions.

- The energy tax on fossil fuels has been a part of the Swedish tax system since the late 1950s. In 1957 an energy tax on mineral oil and coal was introduced, and the scheme was extended in 1964 by levying an energy tax on LPG. The final step occurred with the inclusion of natural gas into the scheme in 1985. The tax rate was relatively modest when it was first introduced in 1957 – mineral oil was charged with a 25 SEK/m³ duty and coal was charged with 12 SEK/tonne (Skatteverket, 2005a). The energy tax has undergone periodic increases ever since, especially in the 1980s when both the energy crises and a growing attention on the environmental harmful effects of fossil fuel consumption supported stronger interference in the energy market.
- The energy tax rate peaked in 1990 when the tax rate on fuel oil reached 960 SEK/m³ and the tax rate on coal 460 SEK/tonne. In 1991 the entire energy taxation scheme was restructured, principally as a consequence of the introduction of the CO₂ tax. The energy tax was lowered, offsetting the increase caused by the implementation of the CO₂ tax, leaving the overall tax burden almost unchanged (Nordic Council, 2002).
- The second element of the excise duties on fossil fuels is the CO₂ tax which was introduced in Sweden in 1991. The effective CO₂ tax rates on the various fuel types are based on the carbon content of the fossil fuel. The intention for launching the CO₂ tax scheme was to introduce a tax that would give a strong economic incentive to reduce CO₂ emissions. As mentioned above, there was no intent to increase the overall tax burden when the CO₂ tax was introduced. The objective was rather to provide the consumer with an economic incentive to consume energy products that reduce environmental harm. The Swedish excise duty scheme differs significantly from the Danish scheme in relation to the cost distribution of energy and CO₂ tax. In the Danish scheme the CO₂ tax holds a relatively small proportion of the total excise duties on energy. In Sweden, the CO₂ tax constitutes the most significant part of the excise duties levied on energy. In 2005, the CO₂ tax constituted more than three-quarters of the total tax on fossil fuel consumption, as Table 9.1 demonstrates. Peat is considered to be a biofuel and is, therefore, not charged with the CO₂ tax (IEA, 2004a and Nordic Council, 2002).
- The third element of the excise duties on fossil fuels is the sulphur tax. The sulphur tax was introduced in 1991 along with the CO₂ tax and is

not levied on all fossil fuels, only on heavy fuel oil, coal and peat, which are the fuel categories with the highest sulphur content. Like the CO₂ tax, the sulphur tax is levied on the fossil fuel according to the sulphur content. Since the introduction of the sulphur tax in 1991, the tax rate has remained constant at 30 SEK/kg sulphur for solid fuels and 27 SEK/kg for each thousandth of sulphur content by weight in such oils (SOU, 2003 and Skatteverket, 2005a). There exists a threshold in the sulphur taxation scheme with the result that fuels with a sulphur content not exceeding 0.05 percent in weight are tax exempt. It has to be asked whether the sulphur tax can be considered to be environmentally effective taking into account that the actual rates have not been raised since 1991. A fair evaluation cannot be made due to the effect of other policy instruments on fuel use. However, using revenues generated from this tax as a proxy for assessing effectiveness, it can be concluded that the tax was successful as revenues dropped from 217 million SEK in 1996 to 122 million SEK in 2003.

- The fourth and final element of the taxation scheme on fossil fuels is the NO_x charge. From 1 January 1992, nitrogen oxide emissions from certain large combustion plants have been subject to a NO_x charge of 40 SEK/kg nitrogen oxides emitted. Originally the charge scheme applied only to plants generating at least 50 GWh. Since then the scope of the NO_x charge has been broadened and, since 1997, has applied to plants generating more than 25 GWh, implying that only around 5 percent of total NO_x are covered by the scheme. This scheme is quite interesting as the charge's revenues are refunded to the combustion plants according to the energy produced in each plant. This way the combustion plants with the highest emission of NO_x per unit of energy generated being net payers to the NO_x tax scheme (Naturvårdsverket, 1997; Nordic Council, 2002; Sterner, 2003 and IEA, 2004a).

Table 9.1 Energy¹ and CO₂ tax rates for different energy sources

		1985	1990	1996	2000	2002	2005
Light fuel oil (EURcent/l)	energy tax	6.3	12.77	6.93	8.8	7.72	8.18
	CO ₂ tax	1.81 ²	1.57 ²	12.38	12.53	19.63	29.02
	TOTAL TAX	8.11	14.33	19.31	21.33	27.34	37.2
Heavy fuel oil (EURcent/l)	energy tax	6.3	12.77	6.93	8.8	7.72	8.18
	CO ₂ tax	1.81 ²	1.57 ²	12.38	12.53	19.63	29.02
	TOTAL TAX	8.11	14.33	19.31	21.33	27.34	37.2
Natural gas (EURcent/m ³)	energy tax	4.72	4.65	2.24	2.85	2.5	2.65
	CO ₂ tax			9.25	9.38	14.69	21.74
	TOTAL TAX	4.72	4.65	11.5	12.23	17.19	24.39
LPG (EURcent/l)	energy tax	1.07	2.79	1.35	1.72	1.51	1.6
	CO ₂ tax			12.98	13.17	20.63	30.53
	TOTAL TAX	1.07	2.79	14.33	14.88	22.14	32.13
Coal (EUR- cent/l)	energy tax	2.3	6.12	2.95	3.74	3.29	3.48
	CO ₂ tax			10.76	10.89	17.07	25.25
	TOTAL	2.3	6.12	13.71	14.64	20.36	28.73

Note: ¹ From 1993 onwards, the excise tax became an energy tax but in this table it is named energy tax for the entire period. ² CO₂ tax was not faced in before 1991. Before 1991 a special excise tax (särskildskatt) was levied on fuel oil.
Source: Skatteverket, 2005a and IEA, 2004a, p.253–262

Since 2001, the Swedish energy taxation regime has developed rather differently compared with that in neighbouring countries. The rise in energy tax rates in Denmark, Finland and Norway is almost negligible, at around 5 percent in nominal terms. The situation in Sweden is in strict contrast to this as the non-transport energy tax rates increased between 50 and 60 percent during the same period. These nominal increases must be seen in the context of the programme of tax shifts over a period of 10 years which was launched by the Swedish government in 2001. The primary political objective of this programme is to shift the tax burden away from taxes levied on labour and to compensate the loss in revenues by increasing environmental taxes. In addition, the increase in energy taxes is an effective instrument in energy and climate policy issues.

9.1.3 Excise duties on fossil fuels in the industry

The Swedish energy and CO₂ tax rates presented in Table 9.1 above do not represent the tax burden paid by industrial sectors in Sweden. As in Denmark, only the household sector is charged with the full energy and CO₂ tax in Sweden. This has not always been the case as, until 1993, industry and households had been charged with the same high energy and CO₂ tax rates. In order to deal with the competitiveness problems of Swedish industry during the economic crisis in Sweden in the 1990s, the energy and CO₂ tax burden was dramatically lowered for industry, agriculture, forestry and fisheries in 1993. From 1993 onwards, these economic sectors have been granted some generous tax privileges as they have been entirely exempt from the energy tax payments and, in addition, they have been charged only with a reduced CO₂ tax, currently (2005) amounting to 21 percent of the nominal CO₂ tax rate. Since 1998, the

actual CO₂ tax rate paid by industry has been almost constant in real terms, but has increased slightly in nominal terms. The fluctuation in the share paid by industry (shown in Table 9.2) is a consequence of the rising CO₂ tax rate. To keep a constant CO₂ tax burden on industry, the overall rise in CO₂ tax rate has to be countered by a lower share to be paid by industry (Gasforeningen, 2003).

In addition to these general tax exceptions applicable to industry – agriculture, forestry, and fisheries, energy-intensive industries can receive further tax reductions (24 percent of the excise duties actually paid) if the CO₂ tax burden paid by the company exceeds 0.8 percent of the value of sales. If the CO₂ tax payment exceeds 1.2 percent of the value of sales, the company receives a full refund of the share of the CO₂ tax exceeding 1.2 percent (SOU, 2003 and Rättsnätet, 2005: Law (1994:1776) with 2004 revisions).

In comparison to the comprehensive Danish tax exemption scheme on energy, the Swedish scheme appears to be less elaborate, giving industry fewer possibilities to avoid paying excise duties on energy consumption, but more transparent. Implementation also appears to be simpler and cheaper. First of all, there are simply fewer exception options in the Swedish legislation. Secondly, the Swedish scheme for excise duties on energy is dominated by the CO₂ tax whereas the Danish scheme for excise duties is dominated by the energy tax. This is of significance as industry is entirely exempt from the energy tax in both countries although industry is subject to CO₂ taxes to different degrees. The dominance of the CO₂ tax over the energy tax in Sweden, therefore, causes a higher tax burden for fossil fuel energy consumption on Swedish industry compared with Danish industry (Speck, 2005).

Table 9.2 Household and industrial payment of the energy and the CO₂ tax (percentage share of total tax)

	1990	1996	2000	2002	2005
Energy tax:					
Household	100	100	100	100	100
Industry	100	0	0	0	0
CO₂ tax:					
Household		100	100	100	100
Industry		25	50	30	21

Source: Naturvårdsverket, 1997, p.46–50, Svenska Naturskyddsföreningen, 2005, SOU, 2003, p.458–459, Gasforeningen, 2003 and Rättsnätet, 2005, law1994:1776.

9.1.4 Excise duties on electricity consumption

An excise tax on electricity consumption in Sweden was introduced already in 1951. During the last 50 years the tax on electricity consumption has been gradually raised and the taxation scheme has been revised and amended countless times. The rough development of the tax rates during

the last 20 years is shown in Table 9.3. As in Denmark, the consumption of fossil fuels used for electricity production is not charged with energy or CO₂ taxes. Instead the consumers of electricity are charged with the electricity tax, i.e. an end-user tax applies (Rättsnätet, 2005: Law 1994:1776, Chapter 6).

The tax on electricity consumption in Sweden is not levied in a uniform manner. In 1991, the tax on electricity consumption in industrial facilities was completely abandoned and was not reintroduced before the second half of 2004 as a consequence of the adoption of the EU Energy Products Tax Directive. There are also some distributional aspects in establishing the tax rates as they are set based on geographical considerations. Since 1981 certain municipalities in the northern parts of Sweden have been charged with a lower electricity tax. In 1998, the electricity tax scheme was further refined when the tax rates were further differentiated according to high and low consumption, leaving large consumers with a higher tax rate than smaller consumers (Skatteverket, 2005a).

Table 9.3 Excise duties on electricity (EURcent/kWh)

	1985	1990	1996	2000	2002	2005
Electricity tax	1.10	0.96	1.14	1.92	2.16	2.83
Electricity tax north ¹ (low consumption ²)	0.95	0.29	0.51	1.26	1.53	2.16
Electricity tax north ¹ (high consumption ²)	0.95	0.29	0.51	1.53	1.79	2.43
Electricity tax industrial consumption	0.77	0.66	0.00	0.00	0.00	0.06

Note: ¹The northern municipalities charged with the low electricity tax are situated in Norrbottens län, Västerbottens län, Jämtlands län, Västernorrlands län, Gävleborgs län, Dalarnas län, and Värmlands län

²Low consumption is <2 MW and high consumption is >2 MW.

Source: Skatteverket, 2005a

As mentioned above, the Swedish government increased all energy related taxes considerably during the last five years as compared to other Nordic countries. The same applies for the electricity tax paid by households, which was raised by around 40 percent. The complete tax exemption of industrial electricity consumption ceased to exist in mid-2004 when electricity for the manufacturing industry was reintroduced with a rate equal to the minimum as established under the EU Energy Products Taxation Directive. However, Swedish companies can still opt for a zero electricity tax when they are participating in a voluntary programme to improve energy efficiency and by taking actions to reduce electricity consumption.

Sweden is the only country with a separate tax on nuclear power generation. Nuclear power generators are subject to a tax of 5,514 SEK per MW of thermal power of the reactor. This tax rate amounts to around 0.027 SEK per kWh and has to be paid regardless of whether electricity has been generated or not (Swedish Energy Agency, 2004). Two additional surcharges are levied on electricity generated in nuclear power plants – a supplement of about 0.0015 SEK per kWh based on the “Studs-

vik Law” (Act 1988:1597) and of 0.006 SEK per kWh on average, according to the law on the financing of future expenditure for spent nuclear fuel (Act 1992:1537).

9.1.5 Excise duties on transportation fuels

The tax on petrol consumption was the first energy tax to be introduced in Sweden in 1924. The tax rate was set at 0.05 SEK/l at that time. Taxes on diesel were implemented later in the late 1950s and diesel has always been charged with a lower rate than petrol. In 1986, the petrol tax was modified by considering the harmful health effect of lead in petrol. Two different tax rates for leaded and unleaded petrol have been introduced in order to offer an economic incentive to choose the least harmful type of petrol. When the CO₂ tax scheme entered into force in 1991, transportation fuels were also included in this tax scheme. Companies are not given a rebate on the CO₂ tax when the fuel is used for transportation purposes. Tax rates for the most common transportation fuels are shown in Table 9.4 below.

Table 9.4 Tax rates on transportation fuels (EURcent/l)

		1985	1990	1996	2000	2002	2005
Unleaded petrol 1	energy tax			38.76	42.75	34.49	31.59
	CO ₂ tax			10.10	10.18	15.94	23.58
	TOTAL TAX		39.62	48.86	52.93	50.43	55.18
Unleaded petrol 2	energy tax			39.46	43.10	34.82	31.93
	CO ₂ tax			10.10	10.18	15.94	23.58
	TOTAL TAX		39.62	49.56	53.28	50.76	55.51
Other petrol (leaded)	energy tax			45.80	50.56	41.92	39.38
	CO ₂ tax			10.10	10.18	15.94	23.58
	TOTAL TAX	35.73	42.02	55.90	60.74	57.85	62.97
Diesel ¹ Class 1	energy tax	6.29	12.77	17.38	22.02	14.41	11.57
	CO ₂ tax			12.33	12.55	19.65	29.04
	TOTAL TAX	6.29	12.77	29.71	34.58	34.06	40.60
Diesel Class 2	energy tax	6.29	12.77	19.73	24.75	17.03	14.24
	CO ₂ tax			12.33	12.55	19.65	29.04
	TOTAL TAX	6.29	12.77	32.06	37.30	36.68	43.27
Diesel Class 3	energy tax	6.29	12.77	22.90	28.18	20.41	17.80
	CO ₂ tax			12.33	12.55	19.65	29.04
	TOTAL TAX	6.29	12.77	35.23	40.73	40.06	46.83

Note: ¹ The classification of diesel into three different categories started in 1991 when the Swedish authorities distinguished diesel accordingly to different environmental characteristics such as sulphur content of the fuel.

Between 1984 and 1990 diesel was charged with a special tax (särskildskatt) of 0.118 SEK/l. During the period October 1993 and July 1994 diesel was charged with an extra tax of 1.3 SEK/l.

Source: Skatteverket, 2005a and IEA, 2004a

9.1.6 Renewable energy sources and economic instruments

A whole range of different economic instruments related to renewable energy sources are available in Swedish energy policy, ranging from specific rules and regulations within the energy tax legislation to capital and

research subsidies, as well as to the launch of a quota-based certificate scheme in 2003.

The Swedish energy tax legislation excludes biofuels from all energy related taxes (EEA, 2004 and SOU, 2003). However, the tax exemptions granted to biofuels, which are in accordance with the conditions laid down in the Energy Products Taxation Directive, have not been sufficient as an economic tool to make renewable energy competitive in relation to other energy sources. The Swedish authorities, therefore, granted an investment subsidy for energy facilities relying on renewable energy sources. The investment subsidy is intended to reduce some of the uncertainties when investments in facilities relying on renewable energy sources are being undertaken. The investment subsidy, together with the rules under the energy taxation scheme, has had the intended effect with regard to improving the competitive situation between biofuels and oil in the combined heat and power (CHP) sector. Some form of investment support, which amounted to around 6.7 million EUR in 2002, is also available for wind power. However, the investment subsidy has not been sufficient to secure an economic foundation for wind power.

Furthermore, the CHP taxation scheme was amended in 2004 by fully exempting CHP generators from paying the energy tax and by introduction of a 79 percent partial exemption of the CO₂ tax on the heat generated in the plant. Until 2004, heat generated in a CHP plant was subject to the full energy tax and a 50 percent reduction in the CO₂ tax.

The most important change in Swedish policy affecting renewables was the introduction of a quota-based certificate system in 2003. Such a scheme effectively gives electricity production from renewable energy sources a production subsidy, thereby improving the production economy of renewable energy (Swedish Energy Authority, 2003 and IEA, 2005a). The underlying principle of the scheme is to have some form of obligation on the part of electricity users to meet a certain proportion of their electricity output from renewable sources. The intent of this approach, as compared to other measures such as feed-in tariffs, is to support the development of renewable energy, but in a cost-effective way. This means that only the production of electricity from the renewable sources which can produce the electricity most cheaply is supported.

According to the Swedish green certificate scheme, electricity generators using solar energy, wind, biomass, geothermal energy, wave power or small hydro plants are awarded one certificate for each 1 MWh produced. Consumers are then obliged to buy these green certificates. In 2003, consumers were obliged to buy certificates representing 7.4 percent of the total electricity consumption and this share is planned to reach 16.9 percent in 2010. However, energy intensive industries are exempt from these requirements (IEA, 2005a).

In addition to these economic instruments directly affecting the production of energy from renewable sources, the Swedish authorities also

support research in and development of green energy technologies. The Swedish budget on the research and development of renewable energy sources and new energy technologies has amounted to around 93 million EUR per year over recent years (IEA, 2005b).

9.1.7 Emission trading

Under the Kyoto protocol, Sweden accepted not to increase the Swedish climate gas emissions by more than 4 percent during the first commitment period, 2008–2012. Therefore, it is not surprising that the Swedish “National Allocation Plan” for the “Emission Trading Scheme” (ETS) takes the Kyoto obligations into consideration. As a result of the Swedish obligations, i.e. Sweden being allowed to increase the greenhouse gas emissions by 4 percent, the national allocation plan does not include a commitment to reduce CO₂ emissions in the sectors covered by the ETS in the first trading period (2005–2007). However, the lack of a legal obligation to reduce emissions in the ETS sectors has not prevented the Swedish authorities from using the trading scheme to regulate the carbon dioxide emissions from these sectors. According to the Swedish national allocation plan, the Swedish authorities will distribute 22.9 million tonnes of CO₂ emission allowances per year in the first trading period. This represents 3.7 million tonnes CO₂ less than the projected business as usual scenario. 499 installations are covered by the Swedish national allocation plan. These 499 installations were responsible for around 29 percent of the total Swedish CO₂ emission in 2002 and are projected to account for 31 percent of the total emission in 2005–2007.

Despite the legislative possibility of auctioning up to 5 percent of the total emission allowances (Directive 2003/87/EC, Article 10), the Swedish authorities have chosen the option to grandfather all the emission allowances. Apart from a small pool of allowances set aside for new entrants, the Swedish emission allocations are distributed among the ETS industries according to the average historic emissions of the period 1998 to 2001 (Ministry of Industry, Employment and Communication, 2004).

9.2 Economic instruments used in water policy

9.2.1 Introduction

Practically 100 percent of all urban households are served by municipal wastewater treatment works, in which 95 percent of the water undergoes both biological and chemical treatment, including nitrogen removal in a significant number of cases. However, approximately 1 million households in sparsely-populated areas are not connected to the municipal system (North Sweden European Office, 2004). The costs of all water and

wastewater treatment services may be covered by the charges and since 1970 legislation requires a profit not to be produced (SFS, 1970, p.244). In 2002, costs were covered in the majority of cases, however, a number of smaller municipalities received contributions through local taxation (EU, 2002).

9.2.1 User charges for water supply and wastewater services

Municipalities levy charges for water supply and wastewater treatment combined via the “VA-avgift” which applies to both industry and households. Charges are generally made up of both a fixed charge and a charge which varies according to water consumption. To promote fairness, practically all water supply is metered. Charges vary considerably according to municipality, due to e.g. population density (i.e. the length of pipeline required per capita), use of groundwater versus surface water, etc. In 2004, for example, annual charges for domestic water and wastewater services in different municipalities ranged from 2,055 to 7,770 SEK per year for a detached house (based on, among other things, a consumption of 150m³ per year). For an apartment in a block of 15 flats (based on an average consumption of 133m³ per year) charges for water supply and wastewater services amount on average to 1,095 to 5,903 SEK (Svenskvatten, 2004). Average charges have increased by approximately 3–4 percent from 2004 to 2005 (Svenskvatten, 2005) and have remained relatively stable since the early-1980s taking inflation and the introduction of purchase tax into account (Svenskvatten, 2001). Volume consumers may receive rebates.

Where the character of industrial wastewater differs from that of normal wastewater by way of e.g. BOD, then industrial users can be charged additional wastewater charges calculated as a function of trade effluent loads. No charge applies for agricultural use as every landowner has a right to use the groundwater resources below their property.

9.3 Economic instruments in the waste area – taxes and charges

9.3.1 Introduction

Incineration of household waste with energy recovery accounted for around 45 percent of total household waste in 2003, followed by material recovery at 31 percent, landfill at 14 percent and biological treatment at 10 percent (RVF, 2004). The recycling of waste almost doubled in the two years from 2001 to 2003 (RVF, 2004). In January 2002, a ban was introduced on the landfill of unsorted waste suitable for incineration and in 2005 a ban on the landfill of organic waste has entered into operation.

9.3.2 Municipal waste charges

User charges for household waste management services should cover the costs associated with provision of these services, for example, transport, treatment, information and advisory services, planning and administration. Only rarely are tax revenues used to subsidise waste management activities (www.sopor.nu). Waste charges vary according to municipality, however, in 2002 the charge was 1,300 SEK per year on average for a detached house (with fortnightly collection) and 700 SEK for an apartment (weekly collection) (RVF, 2003). More recently, however, the Swedish Association of Waste Management (RVF, 2004a) puts average annual waste charges for a one-family detached house at 1,575 SEK per year. The waste charges incorporate the landfill tax (see Section 9.3.3 below).

Charge differentiation can evidently be an element in the apparent differences between charges within different municipalities. Municipalities can charge households according to the volume of waste produced, its weight or the frequency of collection or the establishment of home-composting and, in so doing, provide economic motivation to reduce and recycle household waste. Industry is responsible for its own waste.

9.3.3 Landfill tax

Sweden introduced a tax on waste sent to *landfill* in January 2000 with the express purpose of minimising waste disposed of via this route and promoting material recycling as a first priority, followed by energy recovery. In its first year of operation a 300,000 tonne reduction in landfill deposits occurred (Ministry of Finance, 2002). Where councils send all household waste to incineration, the tax applies to that fraction of waste remaining – slag and ashes. The landfill operators are subject to the tax in the first place and the tax is passed on to, for example, households as part of municipal waste charges. The tax on landfill has risen almost 50 per cent since introduction in 2000.

Table 9.5 Development of the landfill tax (2000–2005; SEK per tonne of waste (EUR))

	2000	2001	2002	2003	2004	2005
Waste landfilled	250 (30)	250 (27)	288 (31)	370 (41)	370 (41)	370 (41)

Source: Swedish Tax Agency, 2005

Material re-use, recovery and biological treatment find it hard to compete on economic grounds with incineration with energy recovery as alternatives to landfill. In order to balance the treatment of *non-landfill* waste treatment routes, and in light of the 2003 increase in landfill tax, the Department of Finance has, therefore, initiated a review (*in preparation*) of waste taxation (BRAS-utredningen – dir. 2003:96). As well as review of

the performance of the current landfill tax, analysis is being carried out with regard to a potential tax on the incineration of waste. Two methods for developing an incineration tax have been under consideration; a tax per tonne of waste incinerated and a tax which varies according to carbon content per tonne for household waste. Whether electricity certificates should be issued for incineration of waste has also been under consideration as these may promote energy effectiveness through the simultaneous production of heat and electricity (RVF, 2004b).

The potential tax on incineration is to be reviewed in relation to the effect it may have on the separation of waste fractions for material recovery, including biological treatment and the choice of fuel for CHP plants, as well as the impact it may have on the landfill tax level. The cost effectiveness of the tax is also an issue and consideration will be given to whether the desired effects can be achieved by more cost-effective methods than a tax. Other economic instruments are to be considered, for example, recycling certificates, producer responsibility, subsidies for biofuels, etc.

An interim report published in March 2005 recommends the fossil fraction as the focus for the tax via inclusion in the existing energy taxation system. The incineration tax would aim to increase waste sorting and promote material recovery by making waste incineration more expensive in relation to other methods of waste management. The analysis involves an energy tax rate proposed at 150 SEK per tonne and a CO₂ tax rate at 3,337 SEK per tonne. If the potential tax does not have the desired effect, then the report recommends that other instruments should be examined, such as increased producer responsibility. The report estimates that municipal waste charges would increase by 4 to 26 percent dependent on whether waste was burned in power stations or CHP plants. The report also estimates that waste sorting will increase by 40 percent and that CO₂ emissions will be reduced by 65,000 tonnes per year due to reductions in the burning of fossil material (RVF, 2005). The Swedish Association of Waste Management (RVF), itself, however, does not support the tax and instead favours increasing producer responsibility and the use of el-certificates (RVF, 2005a).

9.4 Other economic instruments in the waste area

9.4.1 Introduction

Producer responsibility has been implemented in Swedish legislation with regard to aluminium cans, beverage containers, waste paper, tyres and most recently, vehicles and packaging in 1997, and electrical and electronic equipment in 2001 (Swedish EPA, 2004 and Svensk författningssamling, 2001).

9.4.2 Deposit-refund system for beverage containers

Deposit return systems operated by trade and industry organisations for various types of beverage packaging have operated for a number of years (see for more detailed discussion Nordic Council, 2002). Deposit rates have remained relatively stable since introduction of the respective schemes. For refillable glass and PET bottles, the scheme is operated by Svenska Returglas.

Table 9.6 Deposits-refunds for refillable cans and PET bottles (inc. VAT)

Containers	Rate
33cl refillable glass bottles-	0.60 SEK (0.07 EUR) per unit for the past 30 years
50cl refillable glass bottles	0.90 SEK (0.9 EUR) per unit
Large PET refillable	4.00 SEK (0.45 EUR) per unit since introduction in 1994
Crates for 33cl	22.4 SEK (2.5 EUR) per crate
Crates for 50cl	28.0 SEK (3.1 EUR) per crate

Source: Swedish EPA (2003a)

With regard to *non-refillable* beverage containers, Returpack has been responsible for aluminium cans and PET bottles since 1984. Deposit rates have also remained relatively stable. The Swedish government levies a charge of 0.035 SEK per imported 33 cl can. From January 2006 the deposit-refund system will be extended to all plastic bottles and metal non-concentrated beverage cans to reduce frustration arising from difficulties in distinguishing containers with deposit from those without, for example, steel plate cans. Juice and dairy products are exempt, however, extension of the deposit system to these containers is being investigated.

Table 9.7 Deposits-refunds for non-refillable cans and PET bottles (in SEK per item)

Container	1984	1987	1995	2005
Aluminium cans (for recycling) (introduced 1984)	0.25 (0.04)	0.5 (0.07)		0.5 (0.06)
PET – small (for recycling) (introduced 1995)			1 (0.1)	1 (0.1)
PET – medium (for recycling) (introduced 1995)			2 (0.2)	2 (0.2)

Source: Returpack: <http://www.returpack.se/>

In 2002, collection rates for refillable PET and glass bottles were 97 percent and 99 percent, respectively. On the other hand, the rates for aluminium cans and non-refillable bottles were approximately 86 percent and 78 percent, falling below the 90 percent target (Swedish EPA, 2003a).

9.4.3 Packaging charges

Producer responsibility on packaging dates from legislation implemented in 1997. Producers, importers and retailers of packaging or packed goods stand for a collection and recovery system and informing consumers of

their duties with regard to disposal. The Swedish waste portal estimates that packaging charges amount to between 220 and 440 SEK per year for a normal household in a detached house (www.sopor.nu – *Rena Fakta, Miljömål och avgifter*).

Industry and trade have established waste management companies for the different waste streams to discharge their responsibilities. REPA administers the packaging charges for these companies with regard to plastic, corrugated cardboard, paper and cartons, metal packaging. The waste management company for glass packaging takes care of their own financing. The charges are passed on to the consumers for the waste management companies to be self-financing. REPA charges are shown in Table 9.8.

Table 9.8 Packaging charges (SEK per kg)

Packaging material	1 January 2005 to 31 March 2005	From 1 April 2005
Metal (aluminium)	1.20	0.60–1.20 ¹
Metal (steel-plate)	1.20	0.60–1.20 ¹
Metal (drums)	0.06	0.06
Card/Paper	0.45	0.45
Corrugated cardboard	0.10	0.02–0.75 ²
Plastic	2.00	1.50 ³ –2.00 ⁴
Plastic (foamed)	2.00	2.00

Source: REPA – Afgifter & Redovisning, Avgifter : www.repa.se

¹ Charge varies according to two sizes

² Charge varies according to branch

³ Plastic bags

⁴ Foamed plastic and other

Recent reductions for industrial corrugated cardboard packaging reflect the lowering of costs associated with industrial packaging types which can be collected under market conditions without involving a waste management company.

A study published in 2005 based on a random sample in seven municipalities reveals that packaging and waste paper, which should come under the responsibility of producers, comprises approximately 30 percent of household waste. Producer take-back is found to lie at 55 percent of the packaging and waste paper which enters the market (RVF, 2005b).

9.4.4 Environmental charges for used batteries

Collection of batteries began in Sweden in the 1970s, however, the first national scheme involving a charge and collection system for environmentally hazardous batteries started in 1987 and ran to 1993, when the collection of nickel-cadmium batteries came under producer responsibility. Legislation introducing a system of charges dates from 1990. In 1997, a new scheme was launched and, in 1998, the collection and charge system was extended to all types (see, for further details, Nordic Council of

Ministers, 2002). Environmental charges levied on producers and importers of batteries should cover the costs to the municipalities of the collection scheme, for instance, the disposal, treatment or recovery activities associated with environmentally hazardous batteries as well as information dissemination with regard to operation and promotion of the scheme. An example here is the public information campaign “Hem till Holken” which began in 1999 (<http://www.hemtillholken.nu>).

**Table 9.9 Battery charges in 2003
(SEK/kg unless otherwise stated (EUR))**

Type of batteries	2003
Alkalide batteries	500 (55)
Silver-oxide batteries	500 (55)
Zinc air batteries	500 (55)
Cadmium batteries	300 (33)
Lead accumulators	30 (3.3)each
Other lead batteries	1.70 (0.2)

Source: Swedish Environmental Protection Agency (Swedish EPA)

– Förteckning över miljöskatter : <http://www.naturvardsverket.se/dokument/hallbar/miljoeko/mljskatt.pdf>

The rate for collection of batteries in Sweden in 2004 was approximately 65 percent, in relation to the targets set by the directive of 25 percent rising to 45 percent after a year (Ministry of Sustainable Development, 2004).

9.4.5 Waste paper – magazines, newspapers, brochures, etc.

Producer responsibility on packaging dates from legislation implemented in 1994. Consumers, including households, are required to sort the waste and make use the collection system provided by the producer. The scheme target is to collect 75 percent of this particular waste stream for material recovery or alternative environmentally desirable methods. Collection has risen from 65 percent in 1994 to 80 percent in 2003 and all material collected undergoes material recovery (Swedish EPA, 2004a).

9.4.6 Recycling charge on scrap tyres

Svensk Däckåtervinning AB (SVDAB – <http://www.svdab.se/>) is the branch organisation responsible for collecting and recycling scrap tyres set up in response to legislation implemented in 1994 introducing producer responsibility for tyres. SDAB finances itself through recycling charges on each replacement tyre sold. In 2003/2004, SDAB introduced a physical collection system for the tyres replacing permanent collection centres. This extra level of service led to the tyre recycling charge applying to, for example, Category I to rise from 7 to 13 SEK per tyre, excluding purchase tax. The current rates vary according to tyre size and type. Category I (at 13 SEK) and category IR (retreaded) (at 8 SEK) relate, for example, to cars and smaller commercial vehicles. Category III, IIA and

IIB relate to progressively larger commercial vehicles, with the charges ranging from 80 SEK to 350 SEK and 800 SEK, respectively.

Of the 76,700 tonnes collected in 2003, 44 percent was used for energy recovery, the largest part in the cement industry, in contrast to practice in e.g. Denmark and Finland, where the incineration of tyres is minimal or altogether absent. No tyres have been sent to landfill since the year 2000 and since 1995 between 90 percent and 100 percent of all tyres have been collected (Swedish EPA, 2004).

9.4.7 End-of-Life Vehicles (ELV)

The charge system was introduced in 1975, and the refund system shortly after in 1976, with the express aim of increasing the incentive to return cars to authorised car dismantlers, and later, to promote the scrapping of older vehicles. Producer responsibility was implemented via legislation in 1997 whereby the producer or importer is responsible for collection and recovery of waste from the vehicles produced or sold. The branch organisation Bil Producentansvar Sverige AB was established in 1999 to support its members in this area.

The charge, currently 700 SEK, applies when a new vehicle (under 3.5 tonnes) is registered, however, the rate is 1,500 SEK if the car is imported privately. For 12 years prior to 2001, the fee was 500 SEK. The increase was aimed to allow for increased costs associated with stricter environmental requirements in the dismantling of cars. The funds are collected in a special fund from which a refund is paid on delivery of an end-of-life vehicle to an authorised dismantler according to the rates below. The refund rates have remained the same since 2001 (see Table 9.10 below). In practice, the fee which car dismantlers charge for their services outweighs a portion of this refund and, in some cases, may exceed the refund rates. However, the estimation of dismantling costs at approximately 1,150 SEK for a vehicle without saleable parts has been instrumental in setting the refund rates, to allow for a net financial gain to the last owner of the vehicle in the majority of cases. Evidently, younger cars provide greater potential for car dismantlers to earn on saleable parts.

Table 9.10 Refund rates for ELV – 2001–2005

700 SEK	if the vehicle is covered by the scheme on producer responsibility for vehicles (i.e. has come onto the market after 1 January 1988)
700 SEK	if the vehicle is not covered by the above and is not more than 7 years old
1,200 SEK	if the vehicle is between 7 and 16 years old
1,700 SEK	if the vehicle is more than 17 years old

Source: Government Offices of Sweden, 2005 and Swedish EPA, 2005

9.4.8 Waste Electrical and Electronic Equipment (WEEE)

Producer responsibility with regard to WEEE has been in force since 2002 (Svensk författningssamling, 2001), however, as of spring 2005,

Sweden is yet to implement the 2003 EU WEEE Directive and subsequent EU legislation on certain hazardous substances in these products. Existing producer responsibility entails that, on purchase of new equipment, a customer can deliver an equivalent amount and type of used equipment, without charge, for environmentally responsible disposal. The legislation prescribes which products are relevant, but the scheme generally applies to products used by households, offices, medical facilities and laboratories. The producer is charged with dissemination of information to customers outlining their duty to receive the scrap equipment. The new scheme taking EU legislation into account enters into force in August 2005, whereby the restriction on type and amount is omitted (Swedish EPA, 2005) (Swedish waste portal – www.sopor.nu).

9.5 Economic instruments related to agriculture and natural resources

9.5.1 Fertiliser tax

In 1984, Sweden introduced a price regulation charge as well as a fertiliser tax on nitrogen (N) and phosphorous (P). These two instruments worked in parallel until 1992 when the price regulation charge was abolished and the fertiliser tax based on the phosphorous content was replaced with a tax on cadmium. The primary aim of the tax on nitrogen in fertiliser is to reduce the environmental damage caused by the leaching of nitrogen to groundwater. The objective of the cadmium charge is to provide some incentives to use more effective abatement technology. The rates have remained stable since 1994 and are currently 1.80 SEK per kg of nitrogen (if the fertiliser contains more than 2 percent nitrogen) and 30 SEK per gram of cadmium if the cadmium content exceeds 5 gram per tonne phosphorous (Ministry of Finance, 2005). All fertiliser nitrogen, whether manufactured in Sweden or imported, is taxed with the same rate meaning that no tax exemptions apply. This is also the case with regard to the tax on cadmium in fertilisers. It is worthwhile mentioning that the effect on the price of fertilisers was highest before 1992 as the then price regulation charge constituted 35 percent of the price as compared to 20 percent for the taxation at present.

9.5.2 Pesticide tax

The rate of the tax on pesticides, which was initially introduced in 1984, is currently 30 SEK per kg of active substance. Apart from this tax, the Swedish authorities introduced a price regulation tax in 1986 intended to raise revenues for financing the export of agricultural products. However, this tax was removed in 1994 and instead the tax on pesticides was in-

creased from 8 SEK to 20 SEK per kilogram of active substance. Further similarities between this tax and the tax on fertilisers can be found as the tax is imposed on manufacturers as well as on imports and no exemptions from the tax exist. The increase in the tax rate has been promoted by an assessment of the Swedish policy on pesticides in 2001 and was implemented via the 2003 budget.

9.5.3 Tax on natural gravels

This tax was introduced in 1996 with the intention of closing the price gap between natural gravel and crushed rock, which was seen as its closest substitute (Nordic Council, 2002 and Söderholm, 2004). Furthermore, the tax on landfill has had a positive effect with regard to use of inert waste as fill as a substitute for natural gravels.

The current rate of the tax is 10 SEK per tonne, representing a 100 percent increase over the rate when the tax was actually implemented in 1996. The rate of 5 SEK raised the price of natural gravel by around 10 percent. The design of this tax is rather interesting as the tax only affects domestic supply and exports, and imports are exempt. This differs from the Danish extraction tax (Section 2.5) where the tax is levied also on imports. However, the trade intensity of gravel is rather limited due to high transportation costs. The increase in the tax rate is also a means to accomplish another policy aim, namely to reduce extraction of natural gravel to less than 12 million tonnes in 2010 (Söderholm, 2004).

9.6 Economic instruments related to transport

The Swedish scheme of vehicle taxation differs from that in neighbouring countries as Sweden does not impose any registration taxes. The Swedish legislation adopted the EU requirements for motor vehicles and, in addition to the technical requirements set up by EU legislation, Swedish motor vehicle owners are obliged to pay a yearly excise duty on vehicles. In 1991, the Swedish tax authorities introduced a vehicle tax scheme that differentiated the yearly tax rate levied on motor vehicles according to environmental performance. This differentiation was meant to create an economic incentive for the car owners to purchase motor vehicles with better environmental performance. When Sweden became a member of the EU this special tax scheme was abandoned.

Currently, the annual circulation tax is charged on passenger cars according to the weight of the vehicle and fuel type used. For private vehicles, the rate was raised by 23 percent in the 2005 budget. In 2005, petrol driven passenger cars weighing below 900 kg were subject to a tax amounting to 720 SEK (80 EUR). The annual tax increases according to the weight of the vehicle and a petrol driven passenger car weighing be-

tween 2,900 and 3,000 kg is charged with an annual rate of 4,563 SEK (508 EUR). Diesel driven passenger cars are charged with a significantly higher annual tax than petrol driven vehicles. In 2005, the annual tax on diesel driven vehicles weighing below 900 kg was 2,290 SEK (255 EUR) while the tax for a diesel driven passenger car weighing between 2,900 and 3,000 kg amounts to 14,470 SEK (1,610 EUR). The annual tax on buses and heavy-duty trucks is relatively lower than the excise duties on passenger cars (Skatteverket, 2005b; Naturvårdsverket, 2005 and World Bank, 1993).

Alongside the annual vehicle taxation scheme, all domestic and foreign heavy good vehicles (HGV) above 12 tonnes driving on Swedish roads are levied with a road toll as set out under the Eurovignette Directive (99/62/EC). The charges are dependent on the size and environmental classification of the HGV and the annual charge amounts to between 8,743 SEK (972 EUR) and 11,385 SEK (1267 EUR) (Skatteverket, 2005c).

9.7 Economic instruments applied in other environmental areas

Probably the most detailed overview of environmental subsidies granted by a government has recently been published by Statistics Sweden (Statistics Sweden, 2003). The report highlights the main dilemma faced when studying environmental subsidies, namely the lack of having a generally accepted definition of the term subsidy, and in particular of the classification of what can be understood by an environmental subsidy. It should be kept in mind when analysing this form of an economic instrument, regularly used in environmental policy in Nordic and Baltic countries, that subsidies can have a negative impact on the environment, but that they can also be pro-environment. This leads to an interesting paradox insofar as politicians, the public as well as different stakeholder groups argue for the abolishment of specific environmental subsidies, while at the same time there is a call for additional financial support for policy measures which are classified as being positive to the environment (see also EEA, 2005a).

The Swedish report, using an approach of defining subsidies based on the national accounting framework, provides an inventory of environment subsidies offered by the Swedish government in the period between 1993 and 2000. A significant part of the environmentally motivated subsidies have been granted for research activities as well as for investment programmes concerning renewable energy and energy efficiency which have been discussed previously in Section 9.1.6. New governmental programmes, such as the provision of grants for certain environmental and energy investments in public buildings, are an indication that financial

support is still being provided for investments in energy efficiency measures. These grants are differentiated according to the level of the investment, with e.g. support reaching up to 70 percent of the cost of installation of solar cells.

Total environmental subsidies, as discussed in the report of Statistics Sweden, amounted to 4.2 billion SEK (around 500 million EUR), which represented around 12.3 percent of total subsidies revealed under the national accounting framework and 0.2 percent of the Swedish GDP in 2000.

Revenues from environmental taxes have increased continually since 1995 as illustrated in Table 9.11. However, this increase has been accompanied by a consistent growth in GDP so that the ratio of revenues generated by environmental taxes to GDP has remained more or less constant, amounting to around 2.9 percent over the last decade.

Table 9.11 Revenue from environmental taxes in selected year (million SEK)

	1995	2000	2002	2003 ^[2]
Energy tax (total plus carbon dioxide tax)	43,551	52,762	59,578	62,584
Energy tax	29,675	38,411	37,221	36,482
Out of which: fuel tax	23,509	27,113	23,252	20,831
electricity tax	6,166	11,298	13,969	15,651
Other product taxes on electricity	2,436	2,345	2,433	2,288
Out of which: hyrdroelectric power tax	933	-	-	-
nuclear power tax ^[1]	133	1,708	1,789	1,829
fees/tax for reduction and storage	1,370	637	644	459
Carbon dioxide tax	11,440	12,006	19,924	23,814
Tax on certain substances	674	1,567	1,452	1,435
Out of which: Sulphur tax	157	67	146	122
tax on domestic air transport	186	-	-	-
tax on insecticides / pesticides	32	58	44	67
tax on commercial fertilisers	299	357	356	340
Tax on waste	-	1,085	906	906
Tax on transportation	5,798	7,026	7,438	7,687
vehicle tax	4,049	6,832	7,423	7,687
sales tax on motor vehicles	1,749	194	15	0
Tax on natural resources	-	125	117	193
Natural gravel tax	-	125	117	193
Total Environmental Taxes	50,023	61,480	68,585	71,899
GDP	1,770,247	2,194,967	2,347,400	2,438,874
Share of environmental taxes as a percentage of GDP	2.8%	2.8%	2.9%	2.9%

Note: [1] The tax on electric power ceased July 1, 2000 and was replaced with a tax on nuclear reactor thermal power.

[2] 2003 = Preliminary data

Source: Statistics Sweden

Part II

An evaluation of the
opportunities and drawbacks
associated with use of economic
instruments in the Nordic states

10. An evaluation of the opportunities and drawbacks associated with the use of economic instruments in the Nordic states

10.1 Introduction

Economic instruments are widely used in environmental policy to achieve environmental objectives. While the application of these policy instruments may accomplish the positive, desired outcomes – it may also lead to undesired effects in the economy, such as distributional effects in relation to households or loss of competitiveness for domestic industries in the global market. This chapter addresses a number of these issues in some detail, by combining the findings and experiences gained in applying economic instruments in the current Nordic political context with rather short theoretical discussions regarding the underlying principles of these instruments.

The first three sections of this chapter highlight the potential of economic instruments in terms of achieving the environmental objective (*environmental effectiveness of economic instruments* – also sometimes referred to as the *first dividend of economic instruments* – Section 10.2). Furthermore, economic instruments, in particular environmental taxes, may be implemented as part of a major fiscal reform package (cf. environmental tax reform) with the aim of attaining a second dividend in terms of economic and employment benefits. This approach has been followed in the Nordic countries in the past, and it is discussed in Section 10.3. Section 10.4 assesses the potential of the application of new economic instruments in environmental policy.

The remaining three sections of the chapter look into the drawbacks and impediments associated with the use economic instruments. The starting point is the question of the potential impact of environmental taxes on income distribution (Section 10.5). This is followed by a discussion on the impact of environmental taxes on the competitiveness of industry (Section 10.6). These topics are both often seen as the main obstacles to more widespread use of economic instruments, although they can be overcome by applying specific mitigation and compensation measures, when economic instruments are in the process of being designed. Still, all

the measures implemented in the individual countries must be in accordance with EU legislation and regulations. This topic is extensively discussed in Section 10.7 of this chapter.

10.2 Ex-post evidence of environmental effectiveness

This section provides an overview of ex-post evidence with regard to the environmental effectiveness of environmental taxes and charges in the Nordic countries. Effectiveness is assessed against expectations derived from theory on economic instruments in environmental policy; specifically, expectations that relate to more effective environmental protection (also referred to as the first dividend of environmental tax reforms). Updating the Nordic Council of Ministers 2002 report on the use of economic instruments in Nordic environmental policy (Nordic Council, 2002), the section offers a cross-sectoral analysis, focusing specifically on carbon-energy taxation and waste taxation.

The section leads with a brief review of the theoretical foundation of environmental taxation, including design requirements. The review also discusses relevant criteria of evaluation. The subsection that follows describes the main effects of energy taxes in the Nordic countries and analyses these effects in relation to the design of the tax instruments, themselves. This is followed by a similar analysis of waste taxes.

The focus on environmental taxes as opposed to market-based policy instruments in general is forced, in part, by the scarcity of ex-post evaluations of economic instruments other than taxes. Emissions' trading is in the Nordic countries a very novel instrument, with which the experiences have not yet been assessed ex-post.

10.2.1 Theoretical expectations regarding environmental taxes

Environmental taxes affect relative prices of raw materials, pollution or products, offering a price signal to producers and consumers that a certain product or production method involves externalities in the form of environmental damage. This provides incentives for producers or consumers to change behaviour, whether it be towards consumption of more environmentally sustainable products, use of more sustainable production methods, or reductions in the generation of waste or the consumption of natural resources. This would be the environmental effect of such taxes.

Moreover, economic theory holds that economic instruments can effect such changes in a more efficient manner than other types of policy instruments. Environmental taxes on emissions or resources ensure that those economic actors who face the lowest abatement costs will undertake a larger share of abatement than those with higher abatement costs. In this way, environmental taxes make for the most cost-effective means

to achieve a certain environmental policy target. Because consumer prices reflect marginal abatement costs, taxes will encourage consumers to substitute away from environmentally damaging products as they become relatively more expensive. In turn, industrial structures will shift as capital and labour is shifted toward more environmentally sustainable sectors. This is also referred to as the static efficiency of taxes (OECD, 2001, p.22–23).

But even further, environmental taxes are also said to bring about dynamic efficiencies as businesses face continual incentives to reduce pollution abatement costs in order to avoid tax payments. They will be more likely, or quicker, to switch to new technologies that are either more resource efficient or less polluting, and at a larger scale it is expected that the economy will restructure as less environmentally damaging industries are strengthened (OECD, 2001, p.23).

Finally, economic textbooks hold out the promise of lower administrative and compliance costs than those arising under command-and-control policies.

10.2.2 Design issues

To achieve the effects predicted by theory, however, environmental taxes must be suitably designed. Firstly, the tax rate should be set at the appropriate level, which means that it should reflect the externality cost (the Pigouvian approach). Yet, precise information about the level of environmental damage and the cost of abatement is rarely available, making it difficult to determine the right tax rate. An alternative approach in economic theory calls for setting the tax rate at a level that offers just the right incentive to beget a certain environmental target (Andersen, 2000).

Secondly, theory holds that the tax base – i.e. who is taxed and what is taxed – must be designed for optimal incentive effect. The goal is to tax the polluting substance as directly as possible and to target all polluters. Hence, exempting large polluters such as energy-intensive productions may undermine the effect of environmental taxes (Andersen, 2000 and OECD, 2001). Ideally, the tax should apply uniformly to units of emission with identical environmental damage properties (ECON, 2004). However, the difficulty and cost of measuring environmental damage makes this ideal an illusive one.

Thirdly, revenues should not be recycled back to polluting industries as this may confound the effect of economic signals (Andersen, 2001). However, some environmental economists make a case for refunding tax revenues, at least under some circumstances. The Swedish NO_x charge is regularly presented as an effective environmental instrument due to the coupling of taxes with revenue recycling to industry. The NO_x charge is levied on large combustion plants, while the revenue is refunded in proportion to their energy production. This offers an incentive to reduce

emissions relative to energy output (Swedish Environmental Protection Agency, 2000, p.5). It also prevents market distortions between large plants, subject to the tax, and smaller un-taxed plants. Such distortions might otherwise encourage a backward technology shift toward environmentally less efficient, small combustion units (Environmental Institute, 1998, citing Hogland and Sterner). The case of the Swedish NO_x thus demonstrates that refunds may actually improve environmental effectiveness and economic efficiency of taxes (Environmental Institute, 1998). Likewise, revenue recycling in the form of subsidies to pollution abatement equipment may also intensify the effect of the taxes, as funds would be redistributed to companies and industries with greater environmental abatement efforts.

Finally, the policy literature holds that the tax design should take into account other policies affecting a particular activity, to prevent that the different instruments cancel out or diminish their respective effects (Andersen, 2000).

10.2.3 Criteria for assessment of environmental taxes and fees

The criteria, on which ex-post evaluations should then be based, follow from the theoretical expectations presented above:

- Environmental effectiveness: ideally, this would be measured in terms of the contribution of taxes toward reduction of the environmental problem in question, e.g. the greenhouse effect, but in practice, here, it is necessary to measure environmental effectiveness in terms of reductions in emissions of polluting substances (Enevoldsen, 2005). For other policies, effectiveness would be measured as reductions in waste or reduced resource consumption. Environmental effect can also be measured as a shift toward more environmentally friendly products or production technologies, or in the area of waste, for instance toward recycling over land filling. With carbon-energy taxes, some studies measure own-price elasticity of the taxed item, e.g. fuel, as this indicates how difficult it is to achieve a desired effect.
- Cost effectiveness: what are the costs of achieving a given policy objective?
- Innovation: Does the environmental tax lead to development of new, cleaner production technologies?
- Administrative costs of measuring and verifying compliance.

While most evaluation guidelines (see for instance: OECD, 1997) include these evaluation criteria, in practice the ex-post evaluations carried out and reviewed here, with just a few exceptions limit their focus to environmental effects.

10.2.4 What is the evidence of environmental effectiveness?

This section summarises the findings of recent ex-post studies of carbon-energy taxes and waste taxes, respectively, in the Nordic countries and analyses the findings in light of the theoretical expectations and design requirements outlined in the previous section.¹⁵ The analysis focuses on *environmental effectiveness* of the taxes as this has been studied to a much greater degree than other aspects of taxes.

10.2.4.1 Ex-post evaluations of carbon-energy taxes

All Nordic Countries have in place environmental tax systems targeting energy consumption and air pollution. In all countries but Iceland, taxes are levied on fuels, electricity and heat supply for industry and households *as well as* on fuels for transportation (see Chapter 1). Generally, the tax regimes consist of energy taxes, CO₂-taxes and sulphur taxes. Iceland, due to its special energy supply situation, does not tax energy used for heating and electricity, but the transport sector is subject to taxation on fuels (cf. Chapter 5 of this report). Ex-post evaluations of carbon-energy taxes, however, appear to focus on taxes levied on the industrial response to carbon-energy taxes, generally leaving out households as well as the transport sector. Particularly the ex-post evaluations carried out since 2000 appear to have had such an industry focus. More studies of the transportation sector, and even households, would be valuable to gain a comprehensive picture of the effect of carbon-energy taxation.

Emissions reduced

Review of ex-post evaluations of carbon-energy taxes across countries show that carbon taxes have been environmentally effective. Across countries and sectors, growth-adjusted energy-use and CO₂ emissions have declined since the introduction of carbon tax regimes in the early 1990s.

One study of Danish emissions found that industrial CO₂ emissions declined by 23 percent during the 1990s, after adjusting for both growth and market-induced industrial restructuring (Enevoldsen, 2005, p.173). The Danish Environmental Protection Agency, in a recent report, estimates that total CO₂ emissions were reduced by 13.5 million tonnes CO₂ equivalents in 2001, compared with a business-as-usual scenario, as a result of energy-related policies introduced between 1990 and 2001 (The Danish Environmental Protection Agency, 2005, p.31). As actual emissions in 2001 amounted to 43.2 million tonnes CO₂ equivalents, this led to a 24 percent reduction in relation to the level emissions would have been without the policy-instruments (predominantly taxes and subsidies). The two studies indicate acceleration in emission reductions in the latter half of the 1990s compared with studies previously cited in Nordic Coun-

¹⁵ Focus is on studies reported since the publication of the Nordic Council, 2002.

cil (2002). Hence, the Danish EPA calculated a reduction in CO₂ emissions of 6 percent for the years 1988 to 1997 (Nordic Council, 2002, p.115).

Likewise, a Norwegian study estimated that average CO₂ emissions per unit of GDP have been reduced by 12 percent between 1990 and 1999 (Bruvoll and Larsen, 2004, p.501). This reflects a relative decoupling of CO₂ emissions from growth, as CO₂ emissions in absolute terms increased by 19 percent (*ibid*). The study used a general equilibrium simulation. Previous studies, focusing more narrowly on the oil and gas extraction companies, have reported an 8 percent decline in CO₂ emissions from oil and gas production in 1996 (ECON, 1994 and 1997, cited in ECON, 2004).

Swedish greenhouse gas emissions have oscillated in the 1990–2002 period, mostly determined by variations in temperature, but since 1999 have remained below the 1990 level, according to a recent status report on the climate strategy (Swedish Environmental Protection Agency, 2004). Given an annual growth rate of 3 percent since 1994, this would indicate a growth-adjusted decline in emissions. Model calculations from the Third National Report on Climate Changes estimated that CO₂ emissions were 5,000 tonnes lower in 2000 than they would have been without the energy and carbon tax policies passed between 1990 and 2000 (Swedish Ministry of the Environment, 2001, p.13–15). The Nordic Council report (2002) also cited Swedish EPA findings that CO₂ emissions fell by 19 percent between 1987 and 1994 in the district heating, industry, service and household sectors, but less for total emissions as the transport sector was not included in the study (Swedish EPA, 1995, cited in Nordic Council, 2002, p.119–121).

Finally, a Finnish study estimated that CO₂ emissions in Finland would have been 7 percent higher in 1998 had the energy taxes remained at the 1990 level (Finland's Economic Council, 2000, cited in Hiltunen, 2004). Likewise, a study carried out by the Prime Minister's office in 2000 concluded that CO₂ emissions had been reduced by up to 4 million tonnes due to decreases in petrol consumption (Nordic Council, 2002, p.117).

Higher energy efficiency and cleaner fuels

Improved energy efficiency and substitution toward less carbon-intensive fuels account for a large part of the emission reductions. As a result, energy efficiency in Danish industry improved by 26 percent during the 1990s, with this trend accelerating after 1996, when CO₂ taxes were increased and SO₂ taxes introduced (Enevoldsen, 2005, p.178)¹⁶. In Norway, average energy intensity was reduced by 11 percent between 1990

¹⁶ The tax scheme introduced in 1996 did allow for tax deductions for some heavy energy consumers provided that they entered voluntary agreements to improve their energy efficiency (Enevoldsen, 2005, p.147).

and 1999, adjusted for economic growth (Bruvoll and Larsen, 2004, p.496).

In all countries the trend has been some substitution away from carbon-intensive fuels (Bruvoll and Larsen, 2004; Enevoldsen, 2005; and Nordic Council, 2002). For instance, Swedish district heating plants increased their use of bio fuels as a substitute for fossil fuels (Swedish Environmental Protection Agency and The Swedish Energy Agency, 2004). Finland's industry switched from coal and heavy fuel toward natural gas and wood (Hiltunen, 2004; Prime Minister's Office, 2000 in Nordic Council, 2002). Danish industry increased its use of CHP and natural gas but, on the other hand, fuel taxes resulted in a greater demand for electricity, which in the case of Denmark is rather carbon intensive (Enevoldsen, 2005).

Were emissions reduced because of carbon-energy taxes?

Evaluations suggest that environmental taxes can be credited with some of the emission reductions, but much of the change owes to other factors, including other policies or industrial restructuring. Few studies are designed to measure this precisely, but typically, reductions in CO₂ emissions directly attributable to carbon-energy taxes are in the order of 2–3 percent for the decade, although some authors ascribe greater effect directly to the taxes (ECON, 2004; Bruvoll and Larsen, 2004 and Miljøstyrelsen 2004 and 2005).

At the high-end, an econometric analysis estimated that new Danish CO₂, SO₂ and energy taxes reduced total industrial CO₂ emissions by 9–11 percent between 1992 and 2000, compared with a business-as-usual scenario (Enevoldsen, 2005, p.218). The effectiveness of the taxation was increased through earmarking green taxes for subsidies for energy efficiency, according to the evaluation, estimating the effect of the entire tax-subsidy package at 13–17 percent for the decade (ibid: p.252). An interview study also showed that CO₂ taxes encouraged investments in energy-saving technologies and a move to low-carbon energy sources (ibid: p.233). The Swedish EPA estimated that about 60 percent of emission reductions between 1987 and 1994 were attributable to the energy tax system (Nordic Council, 2002, p.119). Recently, the Swedish EPA credits the switch to environmentally improved energy sources in the heating sector to the tax (EPA, 2004, p.73). As mentioned above, Finnish studies estimated that taxes, by 1998, accounted for a 7 percent decrease in CO₂ emissions compared with a business as usual scenario (Hiltunen, 2004).

At the lower end, Bruvoll and Larsen (2004), in their general equilibrium simulation, estimate that energy taxes in Norway contributed with a 2.3 percent reduction in CO₂ emissions over the period, most of which came in the oil and gas sector. Regarding onshore activities, carbon taxes only accounted for a 1.5 percent decrease in CO₂ emissions. The Danish EPA study, cited above, estimated the effect of tax changes during the

1990s to be a reduction of 1.5 million tonnes CO₂ equivalents in 2001, compared with a business-as-usual scenario. This corresponds to 3.5 percent of total energy-related emissions of greenhouse gasses (Miljøstyrelsen, 2005, p.31–32). For comparison, subsidies to private windmills and decentralised CHP reduced emissions by 4.8 million tonnes CO₂-equivalents (ibid: p.31–32). Taxes on transport fuel contributed with an additional reduction of 1.2 million tonnes CO₂ equivalents, or about 9.5 percent of actual transport-related emissions in 2001 (ibid: p.31–32).

Tax effect and design

This review of ex-post evidence suggests that carbon-energy taxes have been environmentally effective, although effects could have been greater had the taxes been designed optimally. Discussions of design flaws point to tax rates being too low to offer adequate incentives and to exemptions that exclude large shares of energy consumption from taxation.

Bruvoll and Larsen (2004) conclude that differentiations and exemptions within the Norwegian tax regime tend to “impair the composition of sectors and the mix of energy types and intermediates that an optimal tax regime would have created” (2004, p.497). Due to exemptions of emission-intensive sectors, the carbon taxes cover only about 64 percent of total CO₂ emissions, while the tax hits sectors with a fairly inelastic energy demand (household transport).

Likewise, studies of the Finnish tax system conclude that the effect of energy taxation on Finnish industry is sub-optimal due to relatively low tax rates and refunds to energy-intensive companies (Hiltunen, 2004, p.27). The effect of the tax system is further undermined by the fact that industry pays lower electricity tax rates than households and the service sector. Finally, a tax revision in 1997 further distorted the price incentive. Previously, the electricity tax was based on the carbon-dioxide intensity of the energy source, but following the reform the tax was levied on *consumption* of electricity and the rate made uniform across energy sources. This suggests that some of emission reductions achieved by 1998 may have been squandered since, but the report does not cite any recent studies (see also Chapter 4).

On the other hand, Enevoldsen concludes that the Danish CO₂ taxes have been “the major political driving force behind the enhanced decoupling of production and energy consumption in Danish industry in the 1990s” (2005, p.206). Furthermore, emission reductions accelerated after the mid-90s reform of the Danish energy tax system, which increased industrial carbon-energy tax rates, continued earmarked subsidies and linked exemptions to agreements to improve energy efficiency (Enevoldsen, 2005, p.174).

ECON (2004) points to another aspect regarding environmental taxes. A study of the Norwegian oil and gas industry attributes an estimated 3 percent reduction of CO₂ emissions in 1996 to the carbon taxes, but given

overall emission reductions of 8 percent, ECON concludes that many of the investments and efficiency gains would have paid for themselves, also without the introduction of taxes (p.37). This raises the question as to whether taxes introduce unnecessary, hence economically inefficient, distortions into the economy. Then again, environmental economics would point out that carbon taxes also *reduce* economic distortions by internalising environmental externalities into prices.

Taxes do not work through prices alone

Yet, ex-post studies also indicate how taxes may work in ways not predicted by economic theory. First, taxes may work via their attention-seizing function as much as via the price signal, i.e. taxes focus *attention* of industries on the cost-effectiveness of environmental abatement and energy savings, regardless of the pre-tax cost-effectiveness of abatement, (ECON, 1997 cited in ECON, 2004). This mechanism was uncovered through an interview study.

Second, taxes may confer a signalling effect, in the terminology of Hilden et al. (2004). A Finnish case study of the paper & pulp and the chemical industries indicates that the tax, while numerically insignificant, may have prompted an interest in companies to enter voluntary agreements (Hilden et al., 2004). They cite a 2000 study by Motiva, which showed that companies representing 75 percent of industrial energy-use had entered voluntary agreements (2004, p.72). Yet, this signalling effect has been undermined by the unpredictability of the tax scheme, due to the many revisions (Hilden, 2004, citing an analysis by Määttä).

Finally, other instruments such as subsidies for energy savings may enhance the effect of the carbon-energy taxes, demonstrated in the case of Denmark (Enevoldsen, 2005 and The Danish Environmental Protection Agency, 2005). This confirms theoretical conjecture that earmarked subsidies may be an effective way to return tax revenue to businesses in order to intensify the effect of the taxation.

Taxes are effective, but are they cost effective?

Economic theory also holds that environmental taxes are more cost effective and confer lower administrative costs than other instruments. Few studies assess systematically the cost effectiveness of the tax instrument. One study by the Danish EPA (2005) assesses the shadow prices of selected policy instruments, measured as the average social cost per tonne reduced CO₂ emission forecast for the years 2008–2012. In this assessment energy taxes emerge as a fairly cost effective instrument for CO₂ reduction. Changes in energy taxes are estimated to cost 325 DKK per tonne CO₂ reduced. Taxes are a more expensive approach than subsidies for windmills, for which the shadow price is set at 275 DKK (for private mills) or decentralised CHP, this costing only 100 DKK per tonne of CO₂ reduced. The report warns that the estimates are rather uncertain and de-

pend on the underlying assumption, such as the starting point of the comparison (Danish Environmental Protection Agency, 2005).

10.2.4.2 Ex-post evaluations of waste taxes

Economic instruments in waste regimes consist of *user charges* related to waste treatment, which are generally designed to recover the direct cost of waste handling, and of *waste taxes* aimed to reduce waste or offering incentives for different forms of waste treatment. Some countries tax hazardous waste. Additionally, there are specific charges levied on certain items such as packaging, batteries, etc.

While studies on carbon energy taxes are relatively numerous, waste taxes have been subject to less scrutiny, with just a few studies across the Nordic countries. As is the case with carbon-energy taxes, the effect of taxes is contingent upon the design of tax rates and bases.

Waste reductions

Evaluations of the Danish waste tax found that net-delivered waste to municipal sites was reduced by 26 percent, while net waste delivered to smaller sites and private landfills was reduced by 39 percent between 1990 and 1996 (Miljøstyrelsen, 1997). The waste tax, introduced in 1987, targets local authorities and their waste management organisations to encourage these to provide more recycling facilities. The waste tax was not designed to affect household behaviour directly, as weight-based taxes were passed onto households in the form of volume-based user fees, thus twisting price signals. Originally the waste tax was 40 DKK per tonne, but throughout the 1990s taxes were increased and differentiated repeatedly, so that by 1997 tax rates amounted to 335 DKK per tonne for waste deposited at landfills, with lower rates for incineration (Andersen, 2000). Since 2003 the tax rates have been 375 DKK for landfill and 330 DKK for incineration (cf. Section 2.3). The overall reduction in waste volume masks an actual increase in waste from commerce and industry calculated at 8 percent. Reductions primarily involved the heavier components of household waste (16 percent) as well as construction waste and mixed waste (63 percent), despite increasing household consumption and construction activities. Moreover, recycling data showed an increase in recycling, particularly of heavier waste fractions such as concrete and compost.

Following the 1997 tax hike, the volume of net taxable waste decreased by 0.5 percent from 1996 to 1998 for municipal waste treatment plants (landfills and incineration plants), and some waste was being diverted from landfill deposition to incineration, which was one of the objectives of the tax policy (Danish Environmental Protection Agency, 1999).

In Finland, the waste tax is levied on the landfill operator and passed on to the waste producer through municipal waste charges. Several stud-

ies, although limited in scope, indicate altered behaviour in response to the waste tax. Waste deposited at municipal landfills has been reduced “according to the targets of the National Waste Plan until 2005 and the Revised Waste Plan”, concludes one study commissioned by the Ministry of Environment (Plancenter Ltd, 2005). The targets of the revised plan are a reduction in municipal waste by 2005 of “at least 15 percent less than that predictable on the basis of the volume of waste in 1994 and real growth in GDP” (Ministry of the Environment, Finland (2002, p.10). In absolute numbers, the target is listed as a volume reduction of 8 million tonnes for waste, excluding mining and agriculture waste, against a reference scenario of 55.5 million tonnes waste deposited (ibid: p.23). Hiltunen (2004) also reports increased recovery of municipal waste. The largest change has occurred in construction and demolition waste and in commercial waste (Plancenter Ltd, 2005, p.2; see also Hiltunen, 2004).

The Swedish waste disposal tax was evaluated in 2001, within a year of its introduction, using time-series data on responses to price developments, so this evidence is indicative. The tax is aimed at household waste, but collected at the waste disposal sites. It is supposed to be passed on to households to provide incentives to reduce waste and increase recycling. The evaluation concludes that a price increase would lead to a reduction in waste disposal among Swedish households of the order of 20–30 kg per person annually, given a tax-induced price increase of 90 SEK (Swedish Environmental Protection Agency, 2001, p.39). However, waste generation is also closely related to development in household incomes; thus it is estimated that an increase of 1 percent in annual income increases household waste volume by 2 percent.

Taxes work on heavy waste fractions

The evaluation of the Danish waste taxes prior to 1997 concludes that the waste tax contributed *somewhat* to the sorting of household waste and played a *decisive role* in the recycling of construction waste. The fact that the greatest reductions occurred in heavier waste fractions, such as construction waste, indicates that the weight-based waste tax offers an economic incentive to reduce such waste. On the other hand, the waste tax was not sufficiently effective vis-à-vis a reduction in commercial waste. Interview studies showed that only waste-intensive companies, or companies who were able to make an income from reuse of waste, would pay attention to the waste tax. A subsequent evaluation showed that the 1997 tax increase did accomplish a decoupling of waste generation from growth, as the apparently insignificant reduction of 0.5 percent occurred in the face of a 7 percent growth in production and consumption. The study also found that tax differentiation encouraged a move from landfill to incineration. An interview-based study, furthermore, suggested that businesses were paying more attention to waste management issues and costs. As for recycling, the study found that the financial performance of

the business was the key determinant, as businesses with higher growth rates were more inclined to recycle.

In Finland, the waste tax is credited with playing a clear role in the reduction of construction and demolition waste, as it has improved the competitive position of treatment plants for these waste fractions (Plancenter Ltd, 2005 and Hiltunen, 2004). Furthermore, the waste tax is said to offer a clearer incentive to business and industry, whereas the effect on households is less direct due to collection and transportation fees. Also, waste management costs are included in rents, and even when they are charged directly, they are low relative to other cost-of-living expenses (Plancenter Ltd, 2005). A study of 14 large industrial companies showed that municipal waste charges and the national waste tax prompted waste recovery (Melanen et al., 2002). Twelve of 14 companies increased waste recovery after introduction of charges and taxes and, significantly, the companies reported to have sought new methods for waste recovery *in anticipation* of future increases in waste taxes and charges (Melanen et al., 2002, p.11).

Generally, though, Hiltunen finds that, up until 2003, the price signal of waste taxes was much too weak to be effective (2004). This is underscored by the finding of Kautto and Similä that the cost of raw materials is a more important incentive for improving resource effectiveness than the cost of waste handling. Even with the taxes, waste handling costs are low compared to the cost of investing in cleaner technologies (Kautto and Similä, 2005, p.64).

Finally, a study of Swedish waste management operators revealed that the waste disposal tax increased awareness about alternatives to landfill, although these actors could not easily separate the effect of different policy instruments. The study concluded that the incentive effect of the tax works best in the waste management sector, less so at the level of the waste generators (ECON, 2004).

Other waste taxes

In addition to these general waste charges, the Nordic countries use specific product charges.

Sweden has levied a charge on batteries in order to contain disposal to the environment of cadmium, quicksilver and lead (Swedish Environmental Protection Agency, 2003). The charge was increased in 1997 and varies from 30 SEK/kg on batteries containing lead to 500 SEK/kg of silver-oxide batteries. While the sale of lead and quicksilver batteries continued to increase until about 2001, sale of NiCd batteries showed a sharp drop from 1997 to 1998, from nearly 350 tonnes to less than 200 tonnes (see also Section 9.4.4). Denmark introduced a tax on certain types of batteries in 1996, including NiCd accumulators which are taxed at 6 DKK apiece. Revenues from the tax fell from 31 million DKK in 1996 to 21 million DKK in 2002 in constant prices, leading the Ministry

of Finance to conclude that the tax has been effective (Ministry of Finance, 1999, cited in Miljøstyrelsen, 2004).

Packaging waste is another popular tax objective. Finland's tax on packaging waste has resulted in a near complete recycling rate of packaging for soft drinks, according to Hiltunen (2004). The Danish tax on packaging introduced in 1978 is estimated to have reduced the annual waste volume by 350,000 tonnes and another 60,000 tonnes due to refilling of wine bottles (Miljøstyrelsen, 2004). In 1993, a separate weight-based tax on carrier bags was introduced. Assessed by revenues collected, the tax has resulted in a reduction of consumption of materials for such bags by as much as two-thirds.

Generally, these direct product charges appear relatively effective. In all of the cases cited above, use or final disposal of the environmentally damaging product has decreased, although the evidence linking this to the taxes is suggestive at best.

In summary, waste taxes seem to work when the price signal is clear and targets relevant groups in a straightforward manner. Hence, weight-based systems appear more effective for heavy waste fractions, such as construction waste, according to studies in Finland and Denmark. Industry, in general, has been less responsive to taxes because price signals have been relatively weak, a tendency that is even more pronounced for household waste due to the structure of the waste tax, which means that the price signal is not translated directly into user fees.

10.2.5 Conclusions – ex-post evaluations

This review of ex-post evidence of the effect of environmental taxes in the Nordic countries tends to confirm theoretical expectations regarding environmental taxes: taxes work through their price signal, yet design is the key to how much of the potential effect is realised. The studies cited here point to relatively low tax rates in terms of the incentive aspects and also to deductions or exemptions that tend to exclude large shares of energy-related activities from taxation as a detractor of the full tax effect. However, the studies also indicate that reforms introduced at the doorstep of the 21st century have begun to correct such flaws, increasing tax rates and removing exemptions, both in energy taxation and in waste handling. The studies reviewed confirm that it matters what is taxed, as taxes that target, as directly as possible, the carbon emitting activities and polluting materials are more successful. In the case of waste taxes, the success of the taxes appears to turn on whether they appropriately target weight or volume.

The studies also demonstrate some unpredicted effects of environmental taxes. They prompt companies to join voluntary agreement schemes due to their signalling effect and they make companies pay attention to pollution abatement or environment-incurred costs, i.e. taxes

work through generating attention, not simply through the price signal. In fact, the potentially dismal effect of low tax rates is mitigated by these other mechanisms. Furthermore, taxes work well with subsidies designed to enhance their effect, for instance subsidies for energy savings.

Finally, it should be pointed out that comprehensive ex-post evaluations of taxes, let alone market-based instruments, are few and far between. Most evaluation guidelines, including OECD 1997, suggest that evaluations include not only environmental effectiveness, but also economic efficiency and administrative and compliance costs. This review shows that studies still tend to limit their scope to environmental effectiveness. Yet the analysis also illustrates the arduousness of measuring, with any degree of precision, the effect of individual policy instruments. Such precise evaluation requires econometric analyses. Examples of such analyses are starting to appear. These might be combined with interview analysis, which also turn up effects that are not otherwise detectable in macro-level statistical analyses. It is recommended, therefore, that the Nordic Council commissions appropriate research studies to measure, comprehensively and accurately, the effect of economic instruments in environmental policy.

10.3 Economic effectiveness: the second dividend from market-based instruments

As is the case with the environmental effectiveness of market based instruments, the issue of the economic effectiveness has been under ongoing debate and scrutiny, with a similar improvement in analytical sophistication, but less clarity prevails as regards the overall economic effectiveness.

David Pearce (1991) first directed attention to the possibility for a double dividend feature of environmental tax reform (ETR) in the debate on policies and measures that followed the first report from the International Panel on Climate Change. Since pollution taxes serve to correct market failures, by definition they do not share the distorting properties of many other taxes. A fiscally neutral package can be adopted by exchanging distorting income taxes or corporate taxes by carbon taxes – revenue recycling – with the possible effect that not only the environment, but also the overall economy improves!

The Pearce argument acknowledges that environmental regulations normally bring a first dividend of environmental benefits, but because of their long time horizon, and due to the inter-temporal dimension of many environmental issues, the possible existence and magnitude of a second dividend of more short-term immediate benefits for the present-living, should be accorded equal attention. With CO₂-taxation under consideration this is certainly the case in the climate change issue. The second

dividend would then bring increased social welfare, the principal route of effects causing employment to increase, as labour costs lower while energy and environment costs increase.

In the context of the European Commission President Jacque Delors' white-paper from 1993 the Pearce argument was extended even further to the improvement of competitiveness, as the paper advocated to tax "bads" (pollution) rather than "goods" (labour), so as to improve overall efficiency. However, the Pearce argument on the second dividend can be regarded as a slightly more timid hypothesis – it simply claims that social welfare, rather than competitiveness, is improved when an environmental tax reform is undertaken.

Many economists had difficulties with the 'free lunch' implied in the double dividend argument and with the rhetoric on the win-win options of environmental policy applied by its adherents. Goulder (1995) introduced more analytical stringency to the debate, by establishing a distinction between weak and strong versions of the double dividend argument.

According to Goulder's definitions, the strong version of the double dividend argument implies that an environmental tax which replaces another distortionary tax will improve social welfare in any case – which is along the lines of Pearce (1991). The weak version, however, focuses on the revenue-recycling aspect only and merely claims that using revenues from environmental taxes to reduce other distortionary taxes is better than a lump-sum return of revenues – which is an uncontroversial claim. Finally, an intermediate form of the double dividend, according to Goulder, states that whether overall social welfare will be improved as a result of environmental taxation depends on the specific properties of the distortionary tax which is replaced with an environmental tax.

The intermediate version of the double dividend argument has been further explored by Bovenberg and de Mooij (1994), who from a public finance position point to the existence of a *tax interaction effect* that countervails the revenue-recycling effect of ETR. In essence Bovenberg and de Mooij argued that the tax interaction effect may exceed the revenue recycling effect except under special circumstances of environmental taxes replacing highly distortionary taxes. The basic mechanism of the tax interaction effect is that the environment taxes cause commodity prices to increase, lowering the real value of after-tax income. It is hypothesized that because of labour supply elasticities usually the net effect of the ETR will be negative, as the reliefs on income taxation provided by ETR are too small to offset the price increases.

This finding hinges on the assumption that income taxation a priori minimises the excess tax burden (Weinbrenner, 1999). If natural resources are introduced in the production function or if the assumption about separability between the leisure and commodity consumption is modified, the conclusion may differ (cf. Bye et al., 2002, p.342). The finding also seems to hinge on the assumption, that ETR is introduced on

top of existing environmental taxes or regulations that already internalise most externalities.

One important exception to the tax interaction effect occurs if the ETR involves a direct lowering of employers' social contributions, so that no or only marginal price changes will result (Parry, 1995). The swap between environment taxes and social security contributions is hence one that has been practised in several ETR's.

However, there is much to suggest that many of the analyses which focus on the tax interaction effect are too stylised and restrictive. Bovenberg and de Mooij's first article was based on a static model, in a second article (1997) where they explore the relationships in the context of a dynamic model the findings are relaxed somewhat. If the ETR leads to a lower regulatory pressure on companies then a double dividend may arise. Bovenberg and van der Ploeg (1998) find a strong double dividend where the economy is characterised by, among other things, imperfect competition and involuntary unemployment. Several empirical analyses, particularly in Europe, find that the revenue recycling effect exceeds the tax interaction effect, and that double dividends can be obtained (Bye et al., 2002).

Nielsen et al. (1995) explore the double dividend hypothesis with a dynamic model that includes unemployment. They show that unemployment will be reduced if a pollution tax is introduced. In this case the tax interaction effect also influences the value of the unemployment benefit, causing more unemployed to enter the labour market. The overall effect on the economic growth-rate could become negative, however.

Goodstein (2003) generally questions the basic assumption of the tax interaction effect, that higher prices will reduce labour supply. Quoting empirical literature based on micro-data the relationship is found to be ambiguous. In fact, higher prices lead to an increase of labour supply if one considers dual earner families – which is completely reverse to the impact claimed by several economists following Bovenberg and de Mooij. Data from Nordic countries show that workers may in fact increase labour supply, partly because they overestimate the reduction in family income generated by the price increases (cf. Gustafson and Hadley, 1989, quoted in Goodstein).

However if a tax interaction effect exists, it is likely to be especially strong in the case of grandfathered emissions permits, where no revenue accrues, that can be used to mitigate these effects. Grandfathered emissions permits are not associated with the possibility for a double dividend, as are environmental taxes (Parry, 1997).

Results on macro-economic simulations generally do not confirm expectations for a strong double dividend. Norway's green tax commission (NOU, 1996) was the only analysis so far that provided such a clear result; the Swedish green tax commission and analysis in Finland came to more ambiguous results.

The general tendency is for a neutral or slightly positive impact on employment and GDP; still much depends both on the exact scenarios analysed and on the properties of the models employed for the analysis. More recent analysis has focused on the possibilities for attaining Kyoto and post-Kyoto targets on basis of adjustments of energy and carbon taxes, and especially the more demanding scenarios in terms of reductions in CO₂ emissions tend to produce negative impacts on employment and GDP. These negative impacts are often reduced when emissions trading substitutes carbon-energy taxation increases.

The discussion in recent years has focused on the specific properties and characteristics of the models applied to forecast macro-economic effects of environmental tax shifts. Computable general equilibrium (CGE) models are a conventional and standard choice of tool, readily available in many economic research institutes and ministries, but it is important to understand that their results are often a conditioned outcome of specific assumptions and parameters inherent in the model-setup. Recent orientations in environment-energy-economy modelling acknowledge the need for macro-economic models that have a strong basis in empirically established data and relations, as well as a high level of disaggregation with the economy divided into 40 or more sectors with the particular characteristics of trade, exports and value added performance. Technology, in particular, is a crucial element of environment-energy-economy modelling, and is not well captured in most CGE-models, which in the absence of specifications of innovation activity sometimes tend to overestimate the need to pass over costs from environmental taxes, while conversely underestimating the possibility to offset cost increases through technology shifts. CGE models also tend to provide higher estimates for the tax interaction effect, than more empirically based macro-economic models (Bye et. al., 2002).

The recent literature on tax interaction effects from environmental taxation has caused a renewed interest in getting the externalities right. In the absence of estimates of the precise external effects, many contributors to the tax interaction debate have assumed that external effects were already internalised through regulations or pre-existing taxes, and that environmental taxes would add to the distortions in the tax system.

In recent years considerable advances have been made in developing methods to account for external effects. These advances have taken place primarily in the context of the ExternE research project series, financed by the European Union's Research Programmes. To begin with these efforts were undertaken in cooperation between US and EU research programmes, but since 1995 the efforts have been entirely EU financed.

ExternE has addressed externalities of energy production and transport, and has primarily focused on the effects related to the use of the environment as a waste sink for air pollution. Comprehensive progress has been accomplished in quantifying the impacts of air pollution on

crops, forests, building materials as well as on human health. ExternE uses the impact pathway approach to trace the specific impacts of pollutants.

The main methodological challenge in accounting for external costs is that it is necessary to know the marginal contribution of a particular economic activity to the state of the environment. In the case of air pollution one needs to know what the contribution of, say, a particular power plant's emissions is to the air pollutant concentrations in a particular area. Such changes in air pollution concentrations, and in subsequent exposures, can in fact be figured out by combining local and regional air pollution models. This is the first step in the impact pathway methodology of ExternE.

Figure 10.1 The impact pathway (Holland, et. al., 1999)

Once the marginal changes in concentrations are known, the second step in the impact pathway is to figure out the exposed numbers. Geographical information systems (GIS) are here used to keep record of land use and population densities, so that for instance the number of exposed persons to air pollution is matched directly with the changes in air pollution exposure in specific parts of the geographical grid. In this way the analysis can capture the significance of potentially high exposures in areas with high population densities. The method is highly site-specific in the accounting of external effects, as both the emissions and the exposures are calculated according to the specific site in question.

The third step in the impact pathway assessment involves a screening of the scientific literature for dose-response functions for the effect end-points. Dose-response functions describe how various entities will react to changes in exposures. Vegetation cover, for instance, reacts to changes in air pollutant concentrations, and so do humans. Especially the medical literature is rich on exposure-response functions. These functions are with current knowledge often treated as linear, but there are sometimes thresholds to consider, below which no effects may occur.

The fourth and final step involves attaching unit values to the end-points of the impact pathway analysis. With regard to air pollution the end-points comprise both mortality and morbidity effects for humans; the latter comprise workloss days, cases of bronchitis, prevalence of asthma medication, hospital admittances etc. The endpoints can be valued either with cost-of-illness figures, or if desired with preference-based values based on contingent valuation surveys.

Table 10.1 Externality estimates for air pollution from stationary and mobile sources – background values)

€/tonne	SO ₂	NO _x	PM2.5	VOCs
Austria	7,200	6,800	14,000	1,400
Belgium	7,900	4,700	22,000	3,000
Denmark	3,300	3,300	5,400	720
Finland	970	1,500	1,400	490
France	7,400	8,200	15,000	2,000
Germany	6,100	4,100	16,000	2,800
Greece	4,100	6,000	7,800	930
Ireland	2,600	2,800	4,100	1,300
Italy	5,000	7,100	12,000	2,800
Netherlands	7,000	4,000	18,000	2,400
Portugal	3,000	4,100	5,800	1,500
Spain	3,700	4,700	7,900	880
Sweden	1,700	2,600	1,700	680
UK	4,500	2,600	9,700	1,900
	5,200	4,200	14,000	2,100

Source: European Commission, 2002 BeTa-tables

Table 10.1 provides an overview of figures for the externalities of air pollution arrived at in analysis for the European Commission. The figures differ between Member States not only because of differences in population densities, but also because of differences in abatement technologies, e.g. at power plants. The difference between Belgium and Denmark for PM2.5 for instance is believed to reflect both of these circumstances.

It is important to point out that the figures are likely to increase if emissions occur in highly populated areas, e.g. in cities. In a city with 100,000 persons the externality estimate for PM2.5 is 33,000 EUR/tonne and for SO₂ 6,000 EUR/tonne. In a city with 0.5 million people the estimates increase with a factor of 5. NO_x differentials are less significant, as it is a regional pollutant, with a greater dispersion than particulates and sulfates.

There have been some inconsistencies in the calculation of external effects in early stages of the ExternE project and even in the Benefit Tables, BeTa. Scrutiny of the health effects from air pollution by the US EPA and by panels in WHO have led to an upscaling of external effects. The BeTa values were calculated on a basis where the health effects from particle pollution were scaled down by a factor of three, but as a reanalysis of the Pope cohorte study reduced the uncertainty, the prevailing practice in externality calculations have adjusted to these results. Hence, the external effects in BeTa were adjusted upwards in the clean air for Europe (CAFE) assessment.

Rather than providing pro ton emissions damage estimates, the following table provides estimates for external effects per kWh electricity produced with different types of fuel and energy sources. In contrast to BeTa estimates above the table here includes effects from global warming (CO₂ and other greenhouse gases) for the fossil fuels. The external effects are of course highly uncertain for CO₂, and the ranges indicated for coal and oil are influenced mainly by the uncertainty range of 19–38 EUR/t CO₂, and account for the greater part of the external effects. However, the ExternE calculations are instructive in showing that also some renewables, such as biomass, are associated with external effects. In this case the externalities are related mainly to the conventional air pollutants, such as SO₂ and PM2.5. In the case of wind energy the external effects are minor, and are related to noise and landscape effects, as measured through changes in property prices.

EXTERNAL COST FIGURES FOR ELECTRICITY PRODUCTION IN THE EU FOR EXISTING TECHNOLOGIES ¹ (IN € CENT PER kWh*)									
Country	Coal & lignite	Peat	Oil	Gas	Nuclear	Biomass	Hydro	PV	Wind
AT				1-3		2-3	0.1		
BE	4-15			1-2	0.5				
DE	3-6		5-8	1-2	0.2	3		0.6	0.05
DK	4-7			2-3		1			0.1
ES	5-8			1-2		3-5**			0.2
FI	2-4	2-5				1			
FR	7-10		8-11	2-4	0.3	1	1		
GR	5-8		3-5	1		0-0.8	1		0.25
IE	6-8	3-4							
IT			3-6	2-3			0.3		
NL	3-4			1-2	0.7	0.5			
NO				1-2		0.2	0.2		0-0.25
PT	4-7			1-2		1-2	0.03		
SE	2-4					0.3	0-0.7		
UK	4-7		3-5	1-2	0.25	1			0.15

* sub-total of quantifiable externalities (such as global warming, public health, occupational health, material damage)
 ** biomass co-fired with lignites

In view of the tax interaction effect debate it is instructive to compare the external effects per kWh with the electricity taxes in place in individual countries. Can they be justified as internalisation of external costs, or are they, as assumed by certain tax theorists, too high? In the Danish case the range from 4–7 eurocent/kWh compares with an electricity tax of about 7 eurocent/kWh. However, the external effects in the table are with background emissions and technologies of the early 1990's and more recent calculations indicate that present external effects are somewhat lower. In the case of Sweden and Norway the ExternE figures seem to indicate a reasonable match with the rates of the recently introduced electricity taxes. As for Finland the larger share of coal and peat provide reasons to believe that the electricity tax does not exceed the external costs.

To sum up on tax interaction effects and externalities it is observed that claims for negative tax interaction effects from environmental taxes

should not be accepted before the external effects have been more carefully assessed, taking the uncertainties into account.

Outlook: What kind of economic efficiency are we talking about ?

The difficulty with much of the debate on the double dividend hypothesis is that it implicitly frames the issue to one of simple *allocative* efficiency. The proposal in the Delors whitepaper (1993) to shift taxation from labour to pollution and natural resources, indeed, was conceived within a conceptual framework of improved allocative efficiency resulting from a change in input factors. However, a number of authors argue that what the Delors whitepaper and subsequent reforms seem to be addressing should probably be regarded rather as *incentive* efficiency (Pearce, 2001).

In a landmark article Berkeley economist Leibenstein (1966) proposes to distinguish so-called X-efficiency from traditional allocative efficiency. While allocative efficiency addresses the optimal combination of productive resources, X-efficiency addresses the optimal use of the individual factor of production. Leibenstein discusses whether labour is always used optimally, citing extensive evidence for productivity improvements achieved in the use of labour. The scope for such improvements would normally be assumed away by neoclassical theory's assumption of optimality and rationality in the management of firms. Yet, in the issue of monopoly regulation, the welfare improvements from X-efficiency could be justified theoretically and empirically to be of a much larger scale than simple allocative efficiency gains.

Leibenstein provide a number of reasons why managers and employees would in fact prefer not to produce at the outermost bound of optimality, e.g. to avoid the required effort and pain of full efficiency. "It is one thing to purchase or hire inputs in a given combination, it is something else to get a predetermined output out of them" (Leibenstein, 1966, p.408). The magnitude of the possible improvements in incentive efficiency is represented by an unknown factor X, the reason why Leibenstein introduced the concept under the label of X-efficiency. However, he suggests that X-efficiency accounts for a great deal of the unexplained residual in economic growth.

Much of the anecdotal evidence on inoptimal energy and resource use in the management of firms cited in support of the Delors whitepaper is similar to the evidence on the labour factor that accumulated in the literature following Leibenstein's hypothesis. There are several good reasons why companies would not be rational and optimal in their use of energy as an input factor, and these reasons go beyond simple transaction costs of gathering the necessary information and undertaking the required technical changes. They relate to the degree of slack in human behaviour and in company operations, and the failure to mobilise all the knowledge which is embedded in an organisation. Energy might be squandered away at some occasions as long as prices are relatively modest compared with

other input factors such as labour and capital, but once outside pressure is introduced the companies will be motivated to mobilise the knowledge and technology available so as to control unit costs. Out of such a process the innovations evolve which may improve economic efficiency and competitiveness.

The literature is rich on evidence of how energy-efficiency can be improved at little or no cost. In one of the more rigorous explorations DeCanio (1993, p.445) found that energy-saving projects under the EPA's Green light programme were "far more profitable than any plausible risk-adjusted cost of capital for comparable projects". Most of the case-studies have failed to bring the results further to assessments of the benefits at the macro-economic level. However, in revisiting the study on the impact of waste water taxes on efficiency Andersen (1999, and Andersen et al. 2005) found that the Netherlands' operate their waste water sector at lower costs than countries not having employed waste water taxes, and assessed the benefit to 0.2 per cent of annual GDP.

10.4 The potential of new economic instruments

The Nordic countries are regularly seen as forerunners in environmental policy and, in particular, in the application of environmental taxes. They have been the first countries to implement environmental taxes, such as CO₂ taxes (Finland, Sweden, Denmark and Norway), but also taxes levied on greenhouse gas emissions other than CO₂ (Norway and Denmark). In addition, environmental policies in the Nordic countries rely on environmental taxes and charges to a greater extent than in the other EU Member States, where other economic instruments, such as tradable allowances in the waste sector in the UK or voluntary agreements in the Netherlands, are applied (see, for an overview of environmental taxes implemented in the Nordic and Baltic countries, Table 10.2 below). During recent years, a number of new economic instruments have been introduced in environmental policy in the Nordic countries, while those already in existence have been continuously revised and refined. Moreover, introduction of further economic instruments is still on the political agenda in these countries and an overview of the potential application of new instruments, focused on the different environmental areas and domains, follows.

10.4.1 *Energy and air pollution*

Major new developments in the use of economic instruments in the energy field are not currently on the political agenda. The launch of the EU Emission Trading Scheme (ETS) at the beginning of 2005 was a milestone in EU energy and climate policy, as this is the first trans-national

greenhouse gas emissions trading scheme in the world (see Chapter 1 and, for more detailed information, EEA, 2005). Discussions are already underway on how to change and improve the ETS in its second phase (2008–2012) – the suggested revisions mainly addressing ways to make the allocation mechanism more transparent, fair and cost-effective. Probably one of the most striking issues in this field is the question of whether aviation will be added to the EU ETS from 2008 (see Section 10.4.4 below). Additionally, the Taxation of Energy Products Directive was adopted in 2003 and widened the scope of the pre-existing EU 1992 mineral oils Directive by setting minimum excise duty rates, also for energy products which were not previously covered.

Some further developments can also be expected in the field of renewable energy in the coming years, especially with regard to the use of economic instruments. Promoting renewable energy has some considerable significance as it addresses two policy objectives simultaneously – tackling the problem of climate change as well as the potential problems associated with the growing dependence on energy imports in Europe.

A range of different national policy measures have been implemented in the Nordic countries with the underlying objective of ensuring the achievement of EU, as well as national, renewable energy targets for 2010. One of the potential areas where some development regarding the use of economic instruments can be expected during coming years is the promotion of renewable energy and, in particular, electricity generated from renewable energy sources (RES-E). Support schemes for promoting RES-E are in place in the Nordic countries, but they differ widely. The main supporting policies are exemptions from the energy tax for renewable electricity (the situation in Finland) and direct price support schemes¹⁷. Direct price support schemes are categorised into a quota-based system and a fixed-price system. Although in both systems the generator of RES-E receives some financial support per kWh electricity supplied to the network, some marked differences do exist between the two systems.

In this context it is worthwhile to mention a recent Norwegian study as the authors are criticising electricity certificate systems for not being a cost efficient method to reduce CO₂ emissions (Golombek and Hoel, 2005). According to this Norwegian study an electricity certificate system does not support a cost efficient reduction of CO₂ emissions. A certificate scheme is only a cost efficient political instrument if the political goal is to reach a pre-defined level of a certain production method for electricity production.

¹⁷ Some forms of investment subsidy schemes are also in place in the Nordic countries but these schemes are not discussed in detail. Such schemes are in place in Finland (investment subsidies of up to 30 percent (wind 40 percent)) and in Sweden: wind energy investment grants offering up to 15 percent of the investment costs (EC, 2004b).

The quota-based system

The aim of a quota-based system is to establish competition between RES-E generators in the sense that a political decision is made on the desired amount of RES-E to be generated. Two different competition mechanisms are conceivable. The first one is the green certificate model where RES-E is sold at market prices and, to finance the higher costs of generating RES-E, an obligation is placed on suppliers or consumers to purchase a certain predefined number of green certificates from RES-E producers, proportional to their annual electricity consumption. Such an approach is in place in several European countries including Belgium, Sweden and the UK. The Swedish green electricity certificate system has been in place since 1 May 2003 and the share of certificates purchased by electricity consumers increases over time, to reach 16.9 percent in 2010. This means that 16.9 percent of the electricity consumed is generated using renewable energy sources. That is to say that the target for an increase in RES-E is 10 TWh, but the Swedish Government suggested in 2005 that the target should be increased to 15 TWh. The second mechanism under the quota-based system is the so-called tendering procedure where the state normally places tenders for the supply of RES-E. Ireland currently makes use of this system, while it has been used in the UK in the past.

The fixed-price system

This support scheme operates in a number of European countries, including Germany and Spain. The underlying principle is the setting of a specific price, a feed-in tariff, for RES-E which electricity companies have to pay to producers of RES-E. One of the major differences from the quota system is that no quota or ceiling exists, which means that electricity companies have to pay for all the RES-E which is generated. However, the setting of the price represents, indirectly, a quota as the generation costs of RES-E that exceed the predefined price level would not be economically viable. A slightly revised fixed-price scheme is currently in place in Denmark – the fixed-premium scheme. This scheme differs from the fixed-price mechanism in that RES-E producers receive only a fixed premium in addition to the normal electricity price. Although the introduction of a green certificate scheme in Denmark has been under discussion for quite some time, so far it has not been implemented.

In a recent report, the European Commission evaluated the situation in EU Member States with regard to the achievement of the renewable energy targets (EC, 2004a and 2004b). The evaluation showed several differences between the Nordic EU Member States. Denmark and Finland are on track to achieve the national RES-E targets of 29 percent and 21 percent, respectively, in 2010 as compared to Sweden, where the situation is roughly on track to achieve the 60 percent indicative target of RES-E in 2010. Interesting to note is the fact that “an attractive support system in a

stable and long-term framework” (EC, 2004a, p.14) was noted as one of the drivers of success. Germany and Spain, which are on track to achieve the national RES-E targets, are both applying the fixed-price scheme for a longer period of time without any major changes. The situation in Denmark is slightly bewildering considering the fundamental changes which took place following the election of the new government in 2001 as “most of the favourable promotion scheme for RES has been abolished” (EC, 2004b p.20). In particular, the high feed-in tariffs for RES-E have been superseded by the fixed-premium scheme which has been described as “insufficient to attract new investments” (EC, 2004b p.20).

A recent study shed light on the success story of the fixed-price system as compared to the quota-based system (EREF, 2005) in the sense that the former has “been most successful at increasing rapidly the share of RES-based electricity, and promoting economies of scale in production and learning. ... This report disproves the many arguments against feed-in systems, demonstrating that they can, in fact, bring about large-scale implementation of RES more rapidly and cheaply than can quota systems (EREF, 2005 p.3)”. The German Institute for Economic Research (DIW) comes to the same conclusion, backing the German fixed-price system as the most effective way of promoting renewables as well as being cheaper than the quota-based system in place in the UK and Italy. It is calculated that the fixed-price system has led to massive cost savings as households would have faced a 1.7 billion EUR higher electricity bill between 2000 and 2004 if a quota-based system had been installed in Germany instead (DIW, 2005). In addition, the EREF study illustrates that the often cited argument of increased competition leading to reduced prices for RES-E, as the consequence of having established a quota system, is not necessarily the reality as consumers in those countries (UK and Italy) with a quota system paid higher prices than consumers in other countries, such as Spain.

The quota approach, as it is implemented in Sweden, is under criticism, not only as a more expensive way of promoting renewables, but also as an expensive instrument to abate carbon dioxide emissions compared with other economic instruments, such as carbon taxes and emission trading. Furthermore, this instrument must also be described as ineffective, when the aim is to promote renewables, as it largely supports technologies which are already profitable as compared to “marginal technologies such as wind (and solar) that are really in need of support and where the potential for future cost reductions are largest” (Kåberger et al., 2004 as quoted in EEA, 2005a).

These analyses show the advantages of the fixed-price scheme in terms of being a more effective instrument for the promotion of RES-E compared with the quota-based system. Nevertheless, it seems that the quota-based system has more support in the Nordic countries as Sweden has already introduced it, Denmark announced the introduction of such a

system to replace the fixed-price system but still has not implemented it.. However, a new development in Denmark following the presentation of the 20-year energy strategy, presented by the Danish government to the parliament in June 2005, is the intention to apply a pure market-oriented approach in the promotion of renewables. The argument of the current Danish government is that with the current high oil prices and high CO₂ allowance prices, renewables will be competitive without any additional support and that they could provide up to 80 percent of electricity in the long-run (ENDS Daily, 2005).

In this context, it is worthwhile shedding some light on the fact that some form of double regulation occurs with regard to the use of economic instruments in energy policy. As presented in the country chapters above, and further discussed in Section 10.5, some energy intensive industries are burdened with energy/CO₂ taxes as well as having come under the EU emission trading scheme (ETS) since 2005. Although energy-intensive industries are regularly eligible for energy tax reductions, there has been a call, in particular from business organisations, for this double regulation, arising from energy/CO₂ taxes and the trading scheme, to be abolished. The Swedish Government wholly adopted this line as it suggests, in the 2006 budget, that CO₂ taxes will be completely eliminated for industrial companies that trade in emission rights. This request is largely understandable from the perspective of businesses, however, it is not in full accordance with the Polluter pays principle as the allowance allocation method is primarily based on grandfathering, i.e. allowances are awarded for free to the sectors covered under the ETS. Industries have therefore only to purchase allowances for emissions exceeding their initial allocation, meaning that all externalities up to the initial allocation are not internalised. These externalities are – at least partly – internalised via the prevailing energy/CO₂ taxes. However, it can be argued that the costs are internalised by using a permit scheme as there is always an opportunity cost to using a permit but with the consequence that the seller of the permit achieves a windfall profit. The Taxation of Energy Products Directive (2003/93/EC) addresses this subject as energy intensive businesses are eligible only for tax reductions (Article 17 of the Directive), provided that the minimum levels of taxation are still respected where agreements are concluded with undertakings or associations of undertakings, or “where tradable permit schemes or equivalent arrangements are implemented, as far as they lead to the achievement of environmental protection objectives or to improvements in energy efficiency” (Art 17.1b). It can, therefore, be expected that such policy approaches, exempting ETS industries from any energy tax burden, will be closely monitored by the European Commission, in particular with regard to the issue of State aid (see Section 10.7 for a more detailed discussion on State aid).

Increased interest in the implications of the ETS is observable on the part of electricity producers, consumers and politicians – in particular in the context of the increase in the CO₂ price on the EU allowance market from around 10 EUR per tonne CO₂ in the autumn of 2003 to around 30 EUR per tonne of CO₂ in the summer of 2005. Attention is focused, thereby, on the implications for electricity prices as studies analyse the extent to which electricity producers will be able to pass the carbon costs of power production on in electricity prices. Some stakeholders expect that some parts of the opportunity costs of the freely allocated allowances will be passed on through higher electricity prices, providing electricity producers with windfall profits as power companies having received most of their emission allowance free of charge but often not the full (100 percent) allocation they requested. This may lead to a situation that the generation of the marginal unit of electricity must be backed up by purchases of permits.

A further case of a form of double regulation can be found regarding electricity generated from renewables (RES-E). Financial support schemes for RES-E are implemented in the Nordic countries, but have been revised on a regular basis during the past years in Nordic countries. In addition, the consumption of electricity is levied with an electricity tax, i.e. an end-user tax. The result of such a policy is that RES-E is also levied with an electricity tax. However, there are exemptions, as is the case for example in Finland where RES-E is exempt from the electricity tax. The taxation of electricity at the end-user level is based on a fiscal motivation intention, but it does not reflect environmental considerations as this would require tax energy products used to generate electricity to be taxed, i.e. an electricity input tax. Such a policy approach could match the notion of internalising externalities as input taxes could be set based on the environmental impact of different methods of production and of different energy products. This is difficult under the current tax scheme as it needs to be determined how electricity was generated when it reaches the grid. End-user taxation of electricity is the selected option under the Taxation of Energy Products Directive as energy products used to produce electricity are to be exempt from taxes (Art. 14).

In the case of electricity, the taxation of primary energy products would be more efficient in relation to the above, in particular from an economic point of view. However, the principle of non-discrimination – one of the foundations of the European Union – provide complications. Tax rates levied on imported electricity cannot be established in the same way (based on production method and energy products used as fuels) as domestic electricity generation, unless a certification scheme is in place. Nonetheless, the issue mentioned above of providing financial support for RES-E, followed by taxation of RES-E can be overcome as the Taxation of Energy Products Directive states that electricity produced from renewable energy sources can be fully or partially exempt from taxes (Art. 15).

Considering the current conditions concerning the use of different types of economic instruments in the field of energy policy simultaneously, it can be expected that the current rather complex situation will attract even more attention in coming years and will lead to further developments, both on the EU as well as on the national political level.

10.4.2 Economic instruments in the water sector

The Nordic countries do not face problems of water scarcity as in other European regions. Water quality issues are of some significance, although traditional point sources are by and large controlled via regulatory measures. Eutrophication of waters, in particular the Baltic Sea, as a consequence of intensive agricultural production methods, is still a problem in the Nordic region. These diffuse sources of environmental pollution are almost impossible to control via regulatory measures or by applying effluent taxes. Instead Nordic countries, such as Denmark and Sweden, make extensive use of economic instruments to address these environmental problems, such as the recently introduced Danish tax on phosphorous in animal feed.

As discussed in the country chapters above, user charges for water supply and wastewater provision are regularly based on the cost recovery principle. However, it is not completely clear, to date, whether the Water Framework Directive (WFD) objective of achieving “good ecological status” can be reached under the current institutional setting or whether new economic instruments have to be introduced as part of the programme of measures to achieve this objective. So far, only Denmark has introduced trade effluent taxes in the wastewater area.

A further interesting aspect of the WFD is Article 9 as EU Member States are required to “take account of the principle” of the recovery of the costs of water services. This principle should also guarantee that water pricing policies provide adequate incentives to ensure efficient water use and that this is spread across different water use sectors. All EU Member States should have provided reports according to the WFD, focusing mainly on the assessments required for the characterisation of river basin or river basin districts, as the deadline for sending the corresponding characterisation report to the European Commission was March 2005. With regard to economic instruments, preliminary assessments of the recovery of the costs of water services must have been dealt with in these national reports. The focus so far, however, has been on financial cost recovery and traditional water services (mainly public water supply, and wastewater provision for households and industry) – little attention having been given to the issues of environmental and resource costs, their recovery and the incentive property of pricing regimes.

An important part of the assessment of cost recovery relates to recovery of the costs of pollution treatment or control incurred by water ser-

vices. The costs that users currently pay may not be in proportion to the costs users give rise to. For example, industrial activities may have imposed (currently or historically) deleterious effects on water quality necessitating enhanced levels of treatment for public water supply. Trade effluent taxes could, therefore, be implemented to address these imbalances. Such a policy approach would also be in line with the Polluter pays principle (PPP) which is at the foundation of all European environmental policies (Article 174.2 of the EU Treaty). Economic instruments are being considered as one way to implement this principle and providing the general framework for internalising environmental externalities.

10.4.3 Economic instruments in the waste sector

All Nordic countries adopted wide-ranging waste policy measures, ranging from waste taxes (landfill and incineration) to taxes and charges levied on individual waste types (packaging, tyres, etc.) and producer responsibility, as discussed in the country chapters above. Nevertheless, differences do exist between the countries and the implementation of further instruments can be expected. For example, Sweden currently discusses the revision of the waste tax by extending the scope of the tax to waste delivered to incinerators, as these wastes are exempt from the waste tax under the present scheme. Nordic countries must undoubtedly be portrayed as forerunners in using economic instruments in waste policy in Europe. Also the far-reaching Icelandic system of recycling fees, covering a whole range of diverse products, is advanced when compared with the situation in some of the southern European EU Member States. It is too early to think about the introduction of further economic instruments in this sector as the effectiveness of the recently introduced measures – taxes, deposit-refund schemes as well as producer responsibility – have to be proven in due course (see also Section 10.2).

10.4.4 Transport

There is no doubt that major changes will occur in the transport sector in the coming years and that more extensive use of economic instruments will take place. Several new approaches are currently on the political agenda addressing all different modes of transport. This latter point is of great significance as economic instruments are mainly applied in the area of road transport. For example, fuels used in the aviation sector and in international shipping are generally exempt from any energy taxes.

Road transport

Two developments attract special attention, namely the European Commission's suggestion of phasing out registration taxes and the more ambi-

tious suggestion of the European Conference of Ministers of Transport (ECMT) for reform of transport taxes and charges.

The former suggestion, which would set a common framework for vehicle taxation without harmonising tax rates, was presented by the European Commission in July 2005. However, to come into force, this proposal would require unanimous backing from all 25 EU Member States as it is a tax measure for which the competence lies within the EU Member States and not the European Commission. Under this proposal, registration taxes paid on purchase or import would be phased out within ten years and annual circulation taxes would become increasingly linked to CO₂ emissions, so that by 2008 a minimum of 25 percent of the circulation tax burden would be based on CO₂ emissions, and 50 percent by 2010. The motivation for this proposal is to eliminate obstacles to the free movement of passenger cars within the European Union and to promote environmental sustainability.

The Nordic countries are differently affected by this proposal, as Sweden has not imposed a registration tax in contrast to the other countries. Probably Denmark would be most affected as the registration tax is significant in terms of the revenue generating effect (see Table 2.16 above). The Commission suggests a revenue neutral implementation of this proposal meaning that the annual circulation tax and, if necessary, other taxes would be increased to compensate the loss of revenues from the abolition of the registration tax. As mentioned above this plan includes suggestions to modify the basis of the annual circulation taxes in a way that less polluting vehicles would be charged with a lower tax, thereby encouraging car owners to switch to more environmentally friendly vehicles.

The ECMT submission is to overhaul the whole current scheme of transport taxes and charges with the ultimate aim “to charge for the use of transport infrastructure close to the point of use, with charges set at a level in line with that for other goods and services in a market economy, that is close to marginal costs” (ECMT, 2003, p.15). The instruments for implementing this approach would be distance-related charges which should be differentiated by weight and environmental performance. Furthermore, such charges could be set depending on “time and location in relation to infrastructure damage, congestion, environmental and other marginal costs, using satellite or land based positioning systems” (ECMT, 2003, p.15). In addition, the ECMT report presumes that such charging schemes are also appropriate for cars and vans, but that they require some further examination in terms of implementation and acceptance. Proposals along this line would lead to a helpful policy tool to address major problems associated with road traffic, however, they would certainly infringe personal privacy as a consequence of satellite or land-based tracking systems and it is, therefore, such proposals are rightly challenged.

As this ECMT proposal is only in the discussion stage a similar, but lighter, type of distance charging is rather common in Nordic countries in the form of road charging for entering city centres as it has, for example, been introduced in Trondheim. This form of economic instrument will undoubtedly come into more extensive use as it is seen as a major success story in relation to the curbing of traffic. A seven month trial period of this type of road charging scheme will start in Stockholm at the beginning of 2006. Motorists entering or leaving the city centre will have to pay a time dependent tariff of between 10 SKR (1.1 EUR) and 20 SKR (2.2 EUR) between 6.30 a.m. and 6.30 p.m. The introduction of similar road charging schemes has achieved some impetus in Denmark, with the government granting the responsibility for implementing such measures to the local authorities.

Air transport / aviation

Currently there is no tax on aviation fuel, no value added tax (VAT) levied on international air travel and no tax on noise or greenhouse gas emissions caused by aircraft, although a number of countries, including Nordic countries, have set landing charges depending on the environmental performances of aircrafts. This has to be seen in the context that air passenger traffic is currently growing faster than road transport with an annual growth rate of around 4 percent, while the growth rate of air freight traffic is still higher, amounting to around 6.4 percent per annum. It is estimated that the aviation sector could be by far the biggest contributor of carbon dioxide emissions in the EU by 2050, accounting for more than 50 percent of emissions. It is not surprising that proposals are being discussed either to introduce a tax on fuel aviation (kerosene) or to include the aviation sector into the EU emission trading scheme (EU ETS). The latter seems to be the preferred option on the part of politicians and some actors in the airline industry. However, discussions on how to integrate air transport in the ETS have only recently begun, and are still underway.

The open issues include questions of distributing emission allowances to the airline industry and whether the industry could be included in the ETS from 2008, as suggested by the UK, or only after 2012. A further aspect to be solved is the fact that carbon emissions from international aviation (and shipping) are not bound by rules and requirements introduced under the Kyoto Protocol on greenhouse gas emissions. Under the Kyoto Protocol only domestic emissions are considered and emissions due to international aviation are only mentioned in the form of a memo.

The most recent study commissioned by the Directorate General Environment of the European Commission analysed different options and concepts of amending the EU ETS Directive (2003/87/EC) to integrate international aviation into emission trading and, therefore, to address the full climate change impact of aviation (CE, 2005). The findings of this study are rather interesting as “the main conclusion with regard to legal

feasibility is that international provisions such as the Chicago Convention and bilateral agreements contain no obstacles to including aviation's climate change impact in the EU ETS. This conclusion is in respect of the inclusion of all aircraft, irrespective of ownership or country of registration, within the scope of the options that are considered in this study" (CE, 2005, p.7). Based on their analysis, the authors come to the overall conclusion that "the introduction of emission trading for the aviation sector ... does not appear to pose many challenges that have not already arisen in the context of the existing EU Emission Trading Scheme. This suggests that emission trading is a policy option that can be considered alongside other policy instruments to tackle the climate impact of aviation" (CE, 2005, p.17). It can be assumed that this rather optimistic finding is not necessarily in line with political feasibility with regard to implementing the options analysed in this study as, for example, none of the options differentiate with respect to the nationality of the aircraft meaning that "all commercial aircraft flying on a route falling under the scheme are subject to it. This means that European and non-European airlines receive equal treatment under all the proposed policy options for including aviation in the EU ETS" (CE, 2005, p.15–16).

Discussions regarding the introduction of a tax on aviation fuel for commercial air transport have taken place for many years and are still ongoing. The 2003 EU Energy Products Taxation Directive, retaining the principle of tax exemption of aviation fuel due to the Chicago Convention from 1944, provides EU Member States the possibility of implementing such a tax for national flights and intra-EU flights on the basis of bilateral agreements. So far, only the Netherlands made use of this option as aviation fuel used for domestic flights has been taxed since the beginning of 2005.

It should not be forgotten in all these discussions concerning the introduction of economic instruments in the aviation sector that there are already taxes and charges which have been introduced, either in form of landing fees or, also, passenger taxes. These taxes are usually not classified as environmental taxes in official documents and, therefore, have not been discussed in this report. However, landing fees can be differentiated according to environmental criteria as is the case in Norway (Nordic Council, 2002). Sweden has also introduced a tax on aviation based on the emission level of hydrocarbon and NO_x (Naturvårdsverket, 2003). In addition, taxes on air tickets are either already in place (Denmark) or are suggested as it was done in the 2006 Swedish Budget. It is interesting to note that the potential introduction of such a tax in Sweden has been justified on grounds of environmental considerations, as the tax would ensure that air traffic would bear a part of its environmental costs (Ministry of Finance, 2005).

Shipping

Shipping emissions are largely uncontrolled and will take on increased importance as shipping movements are expected to grow in the future which has to be seen against the decline in emissions from land-based sources partly due to regulatory requirements. However, national measures have been introduced in the shipping sector. For example Sweden implemented a shipping tax which is based on the weight of the ship and the amount of cargo transported (Naturvårdsverket, 2003, p.73–74). Special regulations are also in place as a reduced tax rate is applicable if a low sulphur and low NO_x fuel is used. Because of the general low level of regulations in this sector, new measures are also under consideration as emissions of the air pollutants, sulphur dioxide (SO₂) and nitrogen oxides (NO_x), from shipping are projected to equal all land-based emissions in the EU by 2020 (NERA, 2004). As a consequence of this development, the European Commission commissioned a report examining the feasibility of various market-based instruments, ranging from emission trading schemes to different charging schemes tackling the further increase of atmospheric emissions from seagoing ships (NERA, 2004). Another study initiated by the shipping industry also looked into the possibility of using economic instruments to reduce air emissions from shipping (Pricewaterhouse Coopers, 2005). Both studies conclude that some form of emission trading scheme could be the way forward for introducing a cost-effective tool to reduce these air emissions. However, the former report also looks into different options, such as fuel or emission taxes as well as port dues, dealing with the fact of increasing emissions from shipping. These studies demonstrate that economic instruments can be effective tools and, considering the prediction of future growth in air emissions from the shipping industry, the introduction of economic instruments in this economic sector can be expected in the future. The most current study in this field was again carried out by NERA and sponsored by the DG Environment of the European Commission (NERA, 2005). This study builds on the findings of the earlier NERA study and recommends some form of trading – benchmark trading for SO₂ and credit-based trading for NO_x – as the most promising options for addressing environmental pollution from shipping in the near future (NERA, 2005, p.ii).

10.4.5 Other economic measures

The adoption of the Environmental Liability Directive (2004/35/EC), which entered into force on 30 April 2004, with formal compliance required by 30 April 2007, is not an economic instrument in the sense of a tax or emission trading. Nevertheless, liability as well as compensation, may lead to some economic impacts which may affect the market. For that reason, liability can be branded, in a wider sense, as a form of an economic instrument.

The Directive is, in itself, interesting and may have some consequences in the environmental field as EU Member States have to adopt legislation specifying liabilities for environmental damages. The link between liability and economic instruments becomes clearer as the process of establishing liability for environmental damage can be carried out based on the polluter pays principle (see, for a more detailed discussion and analysis of this directive and the potential consequences: EEA, 2005).

Similarly, the use of voluntary agreements in environmental policy may develop further, although voluntary agreements are not as widespread in the Nordic countries as compared to other EU Member States, such as the Netherlands and the UK, where the government negotiated a voluntary agreement with pesticide producers and farmers restricting the use of these products. There is also an ongoing debate on the environmental effectiveness of voluntary agreements as well as whether this instrument should be classified as an economic instrument at all (see, for further information: tenBrink, 2002).

10.4.6 Overview of the use of economic instruments in the Nordic and Baltic countries

An overview of economic instruments implemented in the Nordic and Baltic countries can be found in Table 10.2 including environmental taxes and charges, emission trading schemes, deposit-refund schemes as well as producer responsibility programmes. When the analysis is based purely on the number of economic instruments implemented, the table shows that Denmark can be described as the forerunner.

Table 10.2 Overview of economic instruments in the Nordic and Baltic countries

	DK	FIN	ICL	NO	SW	EST	LV	LT
Air/Energy								
Carbon dioxide tax								
Sulphur dioxide tax								
Nitrogen oxides tax (NO _x)								
Taxes on other air pollutants								
Excise taxes on energy products								
Tax differentiation – sulphur in transport fuels								
Emission trading – energy intensive industries								
Transport								
Vehicle registration /sales taxes								
Annual circulation tax								
Water								
Water effluent tax								
Water abstraction tax								
Waste								
Waste taxes (landfill and incinerators) including hazardous waste								
Economic instruments on products								
Tyres								
Beverage /disposable containers	DRS; tax	DRS; tax	DRS	DRS; tax	DRS	DRS	DRS	DRS
Packaging								
Bags			2006 ^x					
Pesticides								
Chlorinated solvents								
GHGs (industrial gases)								
Batteries								
Light bulbs								
PVC/phthalates								
Lubrication oil								
Fertilisers (N,P) – minerals		(1994)		(2000)				
Mineral phosphorous (animal feed)								
Paper, board								
Resources								
Tax on raw materials (aggregates)								
Producer responsibility (PR)								
Packaging								
Tyres								
Batteries								
End of Life Vehicle (ELV)							tax, PR	
Waste electrical and electronic equipment	2006 ^x			Tax, PR				

Note: for fertiliser taxes where dates are given in (), this means that they were abolished; DRS – deposit refund scheme; 2006^x – planned to be introduced in 2006, Iceland has introduced an extensive system of recycling fees for a number of different waste products, such as tyres, batteries, etc., complementing and replacing hazardous waste fees – Norway: economic incentives for collecting used car batteries are in place (based on an agreement between government and industry)

Source: authors' compilation based on chapters 3 – 10 of this report

10.5 Economic instruments and distributional implications

Equity implications with regard to environmental taxation are seen as a major issue on the political agenda as the distribution of the costs associated with the implementation of this policy instrument is fundamental for determining its wider acceptability. However, an analysis of distributional impacts is not an easy task, but rather a very complex task as the overall distributional impact of environmental taxes is associated with several factors, such as the size and income of families, as well as whether families are living in rural or urban areas (OECD, 2001). In addition, difficulties can arise as the various impacts may be measured considering various different dimensions – distribution between households over different income groups, between households living in rural or urban locations, between different types of households (single households vs. households with various different numbers of children) (Baranzini et al., 2000). However, distributional consequences of environmental taxes can also arise on the production side, i.e. by influencing the choice of technology, and can have some significance concerning geographical considerations. Although the latter issues are of some significance, the main object of investigation when distributional questions are analysed is the implications of environmental taxes for the financial situation of different household types. The consequences of environmental taxes for production are generally dealt with under the headline of the possible loss of competitiveness and will be discussed in Section 10.6, to follow, in more detail.

It must be clearly stated that the assessment of distributional impacts is not straightforward due to the complexity surrounding environmental taxes and charges, including user charges for environmental services. The focus in developing countries is mainly directed towards the effects of energy taxes (including CO₂ taxes) levied on transport fuels and on domestic energy products (fuels used for heating, cooking, lighting, etc.), compared with the situation in developed countries, where analysis of equity implications often addresses the question of water pricing. When searching for literature assessing the distributional implications of environmental taxes in the Nordic countries, only studies focusing on the effects of energy and CO₂ taxes can be found. It is interesting to note that the situation in the UK differs as the distributional consequences of changes in the water pricing scheme, as well the review of waste pricing policies, has been analysed in detail quite recently (Ekins and Dresner, 2004).

The basic assumption when analysing energy taxes is that they are regressive as lower income households spend a larger share of their disposable income on energy as compared to high income groups. However, the regressive effects are often assessed as being rather moderate and are also dependent on the type of fuel being taxed (Speck, 1999, Baranzini et al.,

2000 and OECD, 2001). For example, Barker and Köhler (1998) came to the conclusion that the taxation of domestic energy products is slightly regressive as compared to the taxation of transport fuels, which has a weakly progressive outcome.

10.5.1 Some theoretical considerations of the equity implications of environmental taxation

At first glance one expects that – and as mentioned in many reports and publications – environmental taxes are regressive, i.e. they fall to a proportionately higher degree on the poor as low-income households spend a larger fraction of their available income on energy than high-income households. However, this initial statement requires some additional, and more detailed analysis, because the distributional implications of any environmental tax are quite complex, since they depend on several factors.

The incidence of an environmental tax (either in the form of an energy tax or a CO₂ tax) is related to consumer behaviour in two ways. Firstly, households purchase fossil fuels and energy, on which the energy tax is levied, directly. Secondly, households also purchase goods, the production of which has entailed the use of energy (for example, the production of motor cars entails a high degree of fossil fuel use in the production process – which to varying degrees is subject to an energy tax – see, for a more detailed discussion, Symons et al., 2002). The former can be described as “direct consumption demand” and the latter as a type of “indirect consumption demand” for energy products (Wier et al., 2005, distinguish between direct and indirect tax payments). However, households belonging to the same income class can be affected quite differently as their expenditure patterns differ, i.e. they spend their income on different products. These two aspects, i.e. the direct and indirect consumption demand for energy products, are the main factors when analysing the distributional implications of energy taxes.

A second factor, which is also of some significance for assessing equity considerations, is the question of “who will effectively bear the burden of the tax”, i.e. whether the energy tax will be fully passed on to the consumers via higher prices for energy and products, or whether the fossil fuel producers and workers will bear the burden in terms of lower profits and salaries, respectively (Baranzini et al., 2000).

A further aspect should also be taken into account when assessing the distributional impacts of environmental taxes, although this task is far from straightforward as the effects are rather complex and difficult to measure in monetary terms and, therefore, to integrate into the analysis. Nevertheless, the distribution of benefits from improved environment quality as a consequence of the implementation of an environmental tax can affect households in different ways. In other words, the overall distri-

butional impacts of an environmental tax depend not only on the distribution of costs, but also on how the environmental benefits are distributed among the households within a country. As pointed out by Baranzini et al. (2000), two environmental benefits can be associated with environmental taxes and, in particular, with an energy or CO₂ tax. In the context of an energy/CO₂ tax, a differentiation should be made between global and long-term benefits, which are probably proportionally distributed among the population of a given country, and short-term and local/regional benefits. These latter benefits are the consequences of a decrease in fossil fuel consumption, which may improve local air quality by reducing the emission of air pollutants, such as particulates, nitrogen oxides and sulphur dioxide. Emissions from these pollutants have a negative impact on human health, ecosystems, visibility, materials, etc. and their reduction will be unevenly distributed among households, in particular between rural and urban households. However, there is a clear lack of studies analysing both the distribution of costs as well as the benefits of environmental taxes. The main reason is that the determination of these benefits is highly uncertain and the whole approach of their assessment and measurement is complex, in particular when such external effects are monetarised (see, for example, the results of the EU funded research programmes ExternE and its successors – cf. Section 10.3 above for a more detailed discussion).

Quite a large number of environmental taxes introduced during the last decade have been part of a wider fiscal reform package, with the result that an analysis of the distributional implications of such taxes must also consider how the fiscal revenues generated from them are being used. This is of particular significance as the recycling measures may be deliberately chosen to counteract the regressive character of energy/CO₂ taxes.

All Nordic countries, with the exception of Iceland, have implemented such environmental tax reform packages, shifting the tax burden from conventional taxes, such as labour, to environmentally damaging activities, such as resource use and pollution. The underlying rationale of this policy move is that the burden of taxes falls more on “bads” than on “goods” and that, simultaneously, the tax burden is distributed better from an environmental perspective. It is, therefore, decisive that such redistribution options – either in the form of a reduction in income tax rates or of social security contributions or an increase in personal tax allowances, i.e. standard deduction – must be integrated if potential regressive effects of environmental taxes are to be studied.

10.5.2 Equity effects and energy taxes – the results of some Nordic studies¹⁸

Several studies have been undertaken exploring the distributional consequences of environmental taxes in the Nordic countries, in particular in Denmark and Sweden. Their results cannot easily be compared as they are largely dependent on the modelling approaches and the underlying assumptions. However, one finding which holds for both countries is that the geographical location of households is of great significance as households living in rural areas face a higher tax burden as a result of CO₂ taxation than households living in urban regions (Brännlund and Nordström, 2002; Wier et al., 2001; Wier et al., 2005 based on Klinge et al., 2005). This is explained by the fact that households from rural areas face higher transportation and energy needs compared with those in urban areas.

The underlying modelling approaches of the two studies are different as the Swedish study (Brännlund and Nordström, 2002) integrates some form of redistribution of revenues raised by CO₂ taxes, either in the form of lowering VAT or subsidising public transport. On the contrary, the Danish study (Wier et al., 2005) does not consider such tax shifting programmes, i.e. no revenue neutral scenarios, although it does analyse the effects of a CO₂ tax on the direct and indirect consumption demand for energy fuels¹⁹. Although both studies examine CO₂ taxes, the starting point of the two analyses is rather different as the Danish study examines “the direct and indirect distributional consequences of Danish CO₂ taxes on industry and households, based on actual tax payments, directly and indirectly paid by households” (Wier et al., 2005, p.240). In contrast the Swedish study is built on a simulation approach examining the equity effects of a doubling of the CO₂ tax. The overall findings are similar as the authors of both studies conclude that CO₂ taxes are regressive.

The conclusions drawn concerning the Swedish situation are particularly interesting when compared with the findings of an evaluation study of the environmental taxes introduced in Sweden made by the Ministry of Finance. This review of Swedish environmental taxes, including the implicit redistribution scheme, comes to contrasting conclusions in that the regressive effects of environmental taxes – regionally as well as between households – have been largely neutralised by the specific redistribution scheme implemented in Sweden, i.e. the raising of the personal income tax allowance. However, these findings must again be seen in the context of the modelling approach chosen. Interesting to note is the fact that the

¹⁸ This review is based only on a limited number of research studies highlighting some differences in the scope and approaches chosen by research institutions when analysing the distributional implications of environmental taxes.

¹⁹ The authors of this study are using other terminology: they distinguish between direct CO₂ tax payments and indirect CO₂ tax payments. The former term describes the tax payment from household consumption of energy products and the latter term notes the tax payment of households when purchasing products and goods whose production is affected by CO₂ taxes imposed on industry.

authors discuss the basis of their findings: “The reason [...] is that the benefit of tax reductions has been almost entirely confined to consumers, whereas tax rises have been borne both by consumers and by the service sector. The result of raising the personal allowance (standard deduction) and transferring a portion of the tax revenues from the service sector to consumers was that very minor, if any, redistributive and regional effects arose during the period 2001–2003 because of the shift towards green taxes. The regressive effect of energy taxes has obviously been neutralised by raising the personal allowance” (Swedish Environmental Protection Agency, 2004, p.8). This means that the favourable outcome, in terms of neutralising the regressive effects of energy taxes, is the result of the deliberately chosen policy approach aiming to counteract these regressive effects.

The result of the most recent Danish study is, in itself, worth discussing as the researchers analysed the equity effects of other environmental taxes in much detail (Klinge et al., 2005). Their findings emphasise the complexity of such an evaluation exercise as they find that energy taxes are regressive, but that taxes levied on transport fuels and vehicles are progressive, meaning that the lower income households pay relatively less than higher income households and that pollution taxes are almost neutral. The electricity tax, as well as the tax on tap water, are singled out as specific regressive. It is also interesting to note the comparison they make of the energy tax with other indirect taxes; the distributional effects of the energy tax are similar to that of VAT, but less pronounced than the effects of the alcohol and tobacco tax in Denmark.

Another interesting study analysing the distributional as well as environmental effects of taxes levied on various transportation modes was carried out by researchers of Statistics Norway (Aasness and Larsen, 2002). The approach of the study differs slightly from the ones discussed above as the authors assess the distributional impacts by distinguishing between six types of transportation modes, categorising them as inexpensive (bus, moped and bicycle) and expensive (air flight, automobile and taxi). Furthermore, revenue recycling measures are not considered. The conclusions drawn from this modelling approach is that “higher taxes on air flights, taxis and automobiles together with lower taxes on bus rides, bicycles and mopeds have both favourable environmental effects and reduce inequality” (Assness and Larsen, 2002, p.17). These findings may be useful for policy-makers as they demonstrate that “differentiating the indirect tax system to account for the environmental effects will at the same time reduce inequality. Gasoline is the exception, in which environmental and distributional effects of the tax system oppose each other” (Assness and Larsen, 2002, p.17).

10.5.3 Summary

Many reports and studies demonstrated that low-income households have to spend a larger share of their income on energy as compared to high-income households, with the result that low-income households would be affected to a larger degree by an energy tax. This finding of regressivity may only describe the first-round distributional effects of an energy tax and, therefore, not tell the full truth, as energy taxes – when introduced in many European countries and in particular in the Nordic countries during the last years – have been part of wider tax shifting programmes. This is clearly demonstrated in the conclusions of the Swedish project as the first-round regressive effects are neutralised by the revenue redistribution effect. The redistribution of the revenues generated by these energy taxes can offset the regressive effects. However, it must be recorded that the financial situation for individual households can still be negatively affected despite that revenues are recycled back to households as the consumption patterns of households can differ widely. Furthermore, it should be mentioned that distributional implications are generally assessed in the context of direct monetary measures and the benefits of a healthier environment are not taken into account. These benefits can lead to financial benefits in the longer term, as the consequential costs of environmental pollution are reducing.

An additional aspect must also be considered when carrying out such an assessment, namely the question of policy objectives lying behind the policy measure to be implemented. Economic instruments, such as an energy or CO₂ tax, are introduced with the objective of reducing energy consumption and improving the environment. It is indisputable that environmental improvement and, more generally, a move to a more sustainable development is associated with some negative implications – either in form of equity implications or in form of loss of international competitiveness (see Section 10.6). However, equity implications cannot be excluded from analysis and their existence should not, in itself, influence the political decision-making process in a way that no action to address environmental issues is taken. If regressive implications do occur, then other policy measures – in the form of social policy measures – have to be used to address and to compensate or mitigate these undesired outcomes.

In general, mitigation and compensation measures can be distinguished as tools for addressing such undesirable outcomes. The former are implemented in an *ex ante* approach and the best known examples are reduction of energy tax rates for specific sectors or in clearly defined geographical regions. Sweden makes use of such mitigation measures as lower electricity tax rates have been introduced for the northern part of Sweden. In contrast, the compensation measures are implemented in the form of *ex post* modification of other policy instruments. Examples could be higher financial transfers to offset higher energy tax bills. These latter

measures are preferable as they do not affect the marginal incentive of an energy tax, i.e. they will not impair the effectiveness of environmental taxes and charges. Mitigation measures in the form of partial tax exemptions or tax reductions defeat the actual purpose of the economic instrument.

10.5.4 Conclusions

Some special measures addressing distributional implications of economic instruments in environmental policy are in place in Nordic countries. However, such measures, in particular concerning environmental taxes, are not numerous. One of the best examples of such mitigation measures is the particular form of electricity tax differentiation in Sweden. This measure does not solely affect households, which are the object of investigation in this chapter, as these tax differentiations are also valid for the industrial sector. Such special tax provisions are widespread in the industrial sector and are implemented with the aim of mitigating potential loss of international competitiveness (see Section 11.6). It can be concluded that distributional implications do not play a major role in environmental policy in the Nordic countries, although academic studies do show that environmental taxes can lead to regressive effects. However, the results of these studies do rely heavily on the underlying assumptions and modelling exercises used and, therefore do not always present the full reality. Furthermore, the evaluation study of environmental taxes carried out by the Swedish Ministry of Finance is of significance as it does not conceal the redistributive implications of environmental taxes. The study shows that environmental taxes are only one component of a broader policy package and that regressive effects are largely neutralised within the overall Swedish fiscal policy package.

10.6 Competitiveness and economic instruments

10.6.1 Introduction

Concerns over the impacts on competitiveness arising in connection with the use of economic instruments have surfaced in virtually all the Nordic countries as market-based instruments have been introduced. The concern has a strong intuitive appeal – although, in reality, most countries have adopted cautious and incremental approaches to increasing environment taxes, while lowering social contributions or labour taxes, as part of a change in the overall taxation framework associated with an environmental or green tax reform (ETR).

In many cases, the arguments evoked for competitiveness concerns refer to the assumed budget-economic implications for individual firms and

on the premises of static efficiency. In order for policy-makers to assess such concerns appropriately, more rigorous analytical approaches, which bring out the competitiveness effects also at the socio-economic level, need to be applied. Clearly a change in relative prices will produce some structural effects, with some companies winning and others losing. Rather than the short-term impact on individual companies, it is the overall impact on a country's competitiveness which should be of concern to the policy-maker.

As noted by Fagerberg (1996), competitiveness is an elusive term. While there are many economic concepts completely unfamiliar to the lay person, when it comes to competitiveness everyone appears to know what this term means – and to have an opinion relating to it.

The European Commission, in its annual competitiveness report, defines competitiveness to mean “a sustained rise in the standards of living of a nation and as low a level of involuntary unemployment as possible” (EC, 2004a, p.17). The OECD less succinctly defines competitiveness as “the degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the longer term” (OECD, 1992, p.237). These definitions direct attention to the socio-economic level, and to the need for a country to sustain its ability to produce goods and services which are competitive.

Some authors argue that “competitiveness” applies to firms rather than to countries, cf. the UK Department of Trade and Commerce (1998)²⁰ and a much quoted essay by Krugman (1994). Thompson (1998) argues that the competitiveness of a country rests on the competitiveness of individual firms, at which level competitiveness may not be evenly distributed. One could have a “leopard spot” economy with islands of strongly competitive sectors or firms, surrounded by declining sectors or firms. There is no particular reason to expect that all firms and sectors in a country should be at the same level of competitiveness. In any case, most countries do however have a fairly large domestic sector, which is not exposed to competition to the same degree as their export-oriented industries. For this reason, most of the analysis on competitiveness is focused on the manufacturing sector, and leaves aside service and welfare provision.

When environmental tax reforms lower labour costs via increases in energy costs it seems appropriate both to calculate and consider trends in unit labour costs and unit energy costs as factors in determining competitiveness, as these are altered by policymakers. If carbon-energy taxes then help companies focus more attention on improving energy efficiency one would expect unit energy costs to decline after the initial price-chock

²⁰ “the ability to produce the right goods and services of the right quality, at the right price, at the right time. It means meeting customer needs more efficiently and more effectively than other firms” (quoted from Budd and Hirmis, 2004)

– and a possible competitive advantage to arise from the initially lowered unit labour costs.

Direct references on simple indicators for competitiveness are tricky. While increasing unit labour costs normally would be interpreted to imply a loss of competitiveness, they may in fact reflect the ability and competitive strength of a country to market its products as a price-setter, so as to allow for higher labour earnings. There would be a need to carefully disentangle the ups and downs in unit labour costs and unit energy costs before conclusions could be drawn on the impact of environmental tax shifts.

10.6.2 Environmental policy and competitiveness

The Porter hypothesis suggests that the use of environmental taxes or adoption of a stringent environmental policy in general, would have a positive effect on overall economic performance (cf. Porter and van der Linde, 1995). Still, the possible loss of competitiveness of domestic industry from the implementation of environmental taxes and emissions trading has emerged repeatedly in the political discussion during the past decade (Ekins and Speck, 1999 and 2000). Environmentally intensive sectors with internationally traded products, which experience significant cost increases through the unilateral imposition of environmental taxes, may indeed face a competitive disadvantage in domestic and foreign markets – at least in the short run compared to their competitors from other countries.

However, some key insights from environmental economics are frequently overlooked in the domestic debate among interest groups and policy-makers (Ekins and Speck, 2000). Compared with standard-setting and specified requirements for best available technology, market-based instruments present a more efficient approach to regulation. Over time one would expect that increasing the costs of environmentally intensive economic activities and decreasing those of labour intensive would lead to a shift of investment, economic resources and therefore production from the former to the latter. In an economy with previously unemployed labour resources, this should lead to an increase in output. If a country was to experience a decline in the competitiveness of economically significant traded sectors that occurred faster than the development of other sectors to replace them, the exchange rate would adjust such that overall national competitiveness was restored. While in theory this could lead to inflation and lower domestic incomes, the available empirical evidence rather points in the opposite direction (cf. Section 10.3).

There are various factors which may ease the impact of the environmental taxes: for example, more efficient use of the taxed resource, the stimulus of the tax to innovation in production, or the imposition of environmental policy instruments in other countries. However, all these fac-

tors have in common that they mitigate the impacts on competitiveness in the future, while the taxes impose costs in the present. This is the reason why countries, including the Nordic countries, that have imposed environmental (and in particular energy) taxes on their industry have given either tax rebates or exemptions to those sectors which will be most exposed.

Unfortunately such rebates and exemptions reduce the efficiency of the environmental taxation. To reach the same environmental goal, the cost to the whole economy will be higher than if the rebate or exemption had not been granted, as other sectors of the economy are required to face a larger burden in order for the predefined environmental goal to be achieved. For example, due to these tax provisions, industry would not need to utilise the potential for exploiting cheap emission abatement. Instead, more costly options for emission abatement would have to be utilised in the household sector. The marginal abatement costs among emitters will not be equalised, which leads to “substantial excess costs” (Böhringer, 2002).

It can be argued that such extra costs are justified if such tax provisions ease the pressure on the economy and avoid any economic disruption and dislocation of economic sectors. However, environmentally intensive sectors are in general very well organised and, therefore, these sectors often have considerable political influence. As a consequence of this political influence, it can be expected that these sectors are, in certain cases, granted greater and lengthier exemptions than strictly needed for easing the transition process, or the environmental objectives will be weakened below the level which is socially desirable.

Analysis of environmental, and in particular energy, taxes in the context of the competitiveness debate cannot be carried out in isolation as these taxes have generally, in recent years, been implemented within the framework of an environmental tax reform. This aspect is of significance as revenues generated by environmental, in particular energy, taxes have been used to reduce other distortionary taxes affecting the cost structure of industry in two ways. On the one hand the energy cost burden increases, but on the other hand the costs associated with labour input have been reduced as a consequence of a reduction in labour related taxes, with the result that the overall cost structure can remain stable. Thus, the effect of environmental tax reform is likely to be broadly neutral, or even positive if compared with the effects of adopting alternative policy for achieving these environmental goals. However, these findings are generally valid only at the national level and it cannot be denied that negative effects can emerge at the sectoral level. The approaches adopted by the Nordic countries to address the competitiveness issue vary (see Section 10.6.4 below). However, the countries all have in common that the measures implemented depend more on national political factors than objective economic considerations.

Apart from national policies to mitigate the effects of environmental taxes on competitiveness, other directions are possible, such as the harmonisation of environmental taxes across a group of countries which trade products and goods intensively between them, as is the case in the EU. Although this approach has a certain appeal, it often faces resistance in political circles, as illustrated by the repeated attempts of the European Commission to introduce an EU-wide carbon/energy tax during the 1990s. A number of Member States opposed the idea of such a tax, arguing the possible loss of competitiveness of domestic industry. Nevertheless, this long lasting conflict was solved and the 2003 EU Taxation of Energy Products Directive was unanimously adopted (see Chapter 1 for a detailed discussion of the Directive).

Another potential instrument that could mitigate the effects on competitiveness arising from the imposition of environmental taxes is the implementation of border tax adjustments (BTAs). A BTA would mean that taxes paid by domestic producers would be reimbursed if the products were exported to foreign countries, and a tax would be imposed on foreign products when these products were imported into the domestic market, so that the competitive disadvantage suffered by the domestic product as a result of the environmental tax was neutralised (Van Calster, 2003). BTAs may be the most effective way to maintain international competitiveness by maintaining the efficacy of environmental taxes.

However, there is still a dispute whether BTAs are allowed under international trade rules (i.e. WTO rules). The troublesome issue behind the BTA approach is the question of how to deal with an environmental tax levied on an intermediate product used for the production of a final product which is then internationally traded. The difficulty, therefore, is whether the environmental tax can be reimbursed and how to determine the tax burden. The position of BTAs with regard to international trade rules is still an open question. The OECD considers that: “The rules for applying border tax adjustments to taxes on processes and process inputs need to be clarified. The issue of border tax adjustments is being addressed by the WTO Committee on Trade and Environment” (OECD 1996, p.46).

The controversial issue is based on the fact that WTO law differentiates between product taxes and process taxes. The former are taxes which are levied on a product, such as petrol taxes, and the latter are taxes on inputs used for the production of a product. There is no dispute with regard to BTAs on final products as long as imported products are not taxed more heavily than domestic products. However, the main problem concerns whether process-based BTAs, i.e. in case of a BTA for carbon dioxide taxes, are in compliance with WTO rules, as WTO law further distinguishes between taxing inputs which remain physical components of the final product versus inputs which are not incorporated into the final product, such as energy. A carbon dioxide tax levied on energy products must

equate with a tax on inputs that are not incorporated into the final product. A BTA for a carbon tax would, therefore, be likely to be prohibited – although BTAs for carbon taxes could be ruled legal as trade restrictions for environmental reasons are permitted.

10.6.3 How Nordic countries are dealing with the competitiveness issue – special tax provisions to industry

The Nordic countries with environmental tax reform have also introduced special tax provisions for manufacturing industries, in order not to jeopardise the competitiveness of the domestic energy intensive industries. Table 10.3 lists the exemptions in the different countries. It is interesting to note the fact that changes in national legislation with regard to adjusting such special tax provisions occurred during the past five years – as a consequence of the changes in EU environmental policy, starting with adoption of the Taxation of Energy Products Directive and including the results of infringements of EU regulations on State aid (see Section 10.7 below for a detailed discussion).

Table 10.3 Special energy tax provisions in Nordic countries applicable to manufacturing industry

Country / tax	Special regulation for industrial sector
Denmark	
Energy taxes	no exemption for heating purposes but complete exemption for all other uses
CO ₂ taxes	no exemption (heating purposes) otherwise partial exemption depending on the actual use – differentiation between light and heavy processes
Electricity tax	reduction in tax rate; economic sector is also entitled to a reduction of CO ₂ tax rates levied on electricity
Energy tax burden (ceiling)	not applicable – although an electricity tax ceiling exists as consumption of electricity exceeding 15 million kWh is exempt from electricity tax
Overall development	no changes in energy taxation system with regard to manufacturing industry in the past five years; however CO ₂ tax for companies in EU emission trading scheme abandoned, but EU approval under state aid rules not yet obtained
Finland	
Energy taxes	no special provision applicable
CO ₂ taxes	no special provision applicable
Electricity tax	reduction in tax rate to be payable by the manufacturing industry
Energy tax burden (ceiling)	Applicable
Overall development	no changes in energy taxation system with regard to manufacturing industry in the past five years
Norway	
CO ₂ /energy taxes	no special tax provision applicable with the exception for the petroleum sector on the continental shelf – exempt from energy taxes but subject to higher CO ₂ tax rate (double the amount compared to the tax rate applicable on the mainland) industrial sectors (fish processing and wood processing industry incl. paper and pulp) are entitled to a reduction in CO ₂ tax rates petroleum sector on the continental shelf-sector is subject to CO ₂ tax levied on natural gas; natural gas is generally exempt from CO ₂ tax
Electricity tax	manufacturing industry was complete exempt from electricity tax until December 2004 – since 2005 reduced electricity tax rate is applicable (EU minimum tax level)
Energy tax burden (ceiling)	not applicable
Overall development	changes in total energy/ CO ₂ tax scheme took place in the past five years affecting industry: abolishing of the CO ₂ tax levied on coal (2003); but introduction of electricity tax for industry (exemptions of industrial electricity use was exempt but was ruled as incompatible with EU State aid regulations – repayment of electricity taxes by industry)
Sweden	
Energy taxes	complete exemption
CO ₂ taxes	partial exemption complete exemption until June 2004; since 1st July 2004 industry is subject to electricity tax but complete exemption is applicable if industry participates at a voluntary programme to improve energy efficiency.
Electricity tax	Swedish manufacturing industry has also to repay electricity tax from 1st January 2002 to 30 June 2004 as the Swedish electricity exemption scheme for this sector was rule to be a State aid scheme which is incompatible with the common market.
Energy tax burden (ceiling)	applicable changes with regard to electricity taxation took place during the last five years
Overall development	manufacturing industry did not face the full increases in energy/ CO ₂ taxes during the last five years as the share paid by this sector have been lowered accordingly

Considering these policies adopted in the Nordic countries, it can be summarised that the trend remains an unequal distribution of energy tax burden. A study carried out by the National Statistical Offices of the Nordic countries comes to the same conclusion: “The households pay by far the most in energy taxes and the manufacturing industries are exempted or the taxes are refunded, due to competitive reasons as the OECD countries in general exempt these activities. The service sector pays relatively more than the manufacturing industries but less than the households” (Eurostat, 2003, p.29).

However, the stipulation of special tax regulations, such as complete tax exemptions or partial reductions, is not a phenomenon appearing exclusively in the case of energy taxes. This type of policy can also be found in other environmental areas. For example, industry is exempt from the Danish tap water tax and large farms are exempt from the pesticides tax in Denmark (see also the discussions in the individual country chapters above).

10.6.4 EU emission trading scheme and competitiveness

In order to comply with the Kyoto protocol obligations, the EU and its Member States have established the EU Emission Trading Scheme (ETS) (see Chapter 1 for a more detailed discussion). The choice of this first EU-wide policy instrument is based on the perception that the ETS is a cost-efficient and flexible method for the EU Member States to fulfil their Kyoto obligations by creating a price on CO₂ emissions through the establishment of a common market for emission reductions. It has been estimated that the ETS will allow the EU to meet the Kyoto targets at a cost of approximately 2.9 to 3.7 billion EUR annually. Compliance costs, using other policy instruments, have been estimated to reach up to 6.8 billion EUR. Despite the cost-effective nature of the ETS, the introduction of a “cap-and-trade” emission trading scheme will, compared with a business as usual scenario, lead to an overall increase in the production costs for the sectors falling under the regulation of the scheme. Higher production costs are not restricted to these sectors as increases in these costs are passed on to sectors outside of the ETS sectors. Probably the most crucial example of the passing on of higher production costs is the possible increase in electricity prices economy as a whole is facing.

The “cap”, or limit, on the number of allowances implies a scarcity situation and in turn generates a trading market for emission allowances. Even though Article 10 of the Emission Trading Directive determines that at least 95 percent of the emission allowances are to be allocated free of charge in the first trading period (90 percent in the second trading period), there is still a limit to the total number of allowances and to the number of allowances grandfathered to the emission trading sectors (EC, 2003a). Therefore, the ETS will result in higher production costs, espe-

cially for those goods that are most emission intensive. For example, it has been estimated that a CO₂ permit price of 20 EUR per tonne of CO₂ will result in a unit cost increase of 1.1 percent in the metal industry and a 0.4 percent unit cost increase in the chemical industry (Capros et al., 1999, p.9). These increased production costs have potential to cause a change in the relative prices of goods produced and, thus, cause a change in the competitiveness situation of both individual companies and industrial sectors.

The competitiveness situation of the individual companies or enterprises concerns the ability of each individual enterprise to optimise the production process in order to lower the costs and improve product quality. All companies affected by the ETS face the same challenge of optimising their production process, especially concerning energy efficiency, in order to improve their situation compared with rival companies (Klepper and Peterson, 2003, p.2). However, in a discussion of competitiveness effects caused by the introduction of an emission-trading scheme, industrial sector competitiveness is of greater importance as one of the most important effects of the ETS is the distributional effect of the scheme. Two issues will be addressed in relation to the distributional effects industrial sector competitiveness. The economic burden of the ETS is distributed unevenly for the sectors within the ETS area, but the ETS is also distributing an advantage to sectors outside the ETS area compared to inside the ETS area. Changes in the competitiveness situation and, thereby, in international trade structures take place within the group of ETS regulated countries, and also between the group of regulated countries and countries without emission regulation. The effect of competitiveness distortions between countries with and without emission regulation is often denoted as a form of “carbon leakage”, while competitiveness distortions within the group of ETS countries is a consequence of variation in the national allocation plans (Klepper and Peterson, 2003, p.2 and 7).

The EU emission trading scheme can be characterised as an emission regulation in an open economy where most trading partners have not politically taken steps towards emission regulation. The introduction of an emission trading scheme leads to increases in production costs in the affected countries. Compared with the business as usual situation, where a competitiveness balance is assumed, these additional costs on the affected industries in the ETS countries will, to some extent, shift the comparative advantage from industries under the ETS to industries outside the ETS area. The consequence of this shift in comparative advantage is that energy intensive industries may try to move production to countries outside the ETS area in order to avoid the additional costs caused by the emission regulation.

Several studies have tried to analyse the level of carbon leakage under different competitive assumptions and it has been estimated that the energy price increase in some carbon intensive industries will lead to carbon

leakage between 5–34 percent. A study drawn up by the “German Advisory Council on Global Change” (WBGU) estimated in 1997 that an annual 3 percent reduction in the CO₂ emission (1995 and onwards) in the Annex-I countries would lead to a 19 percent carbon leakage to non-Annex-I countries in 2010 (Klepper and Springer, 2003, p.218).

In order to avoid “unfair international competition” and carbon leakage, it has been proposed that industrial sectors and companies exposed to international competition from companies outside the ETS zone should be subject to a modified ETS scheme. Companies facing international competition from non-regulated countries should only be subject to a relative emission cap/ceiling where emissions stemming from export to non-regulated companies are not included in the emission quota of the regulated company. However, economic scholars have acknowledged that an emission trading system treating different sectors differently is not a realistic option because of the high transaction costs connected with a flexible system (Kuik and Mulder, 2004, p.737–738).

When discussing the competitiveness consequences of the ETS in the Nordic countries, trade intensity needs to be taken into consideration. The competitiveness distortion can only be manifested in situations with high trade intensity between regulated and non-regulated countries. All the Nordic countries have fairly high trade intensity with countries covered by the ETS. Table 10.4 shows the export and import ratio to/from EU25 who are all covered by the ETS. The figures show that the export to EU25 countries constitutes between 58.3 and 77.3 percent of the total export in the five Nordic countries. The import from EU25 countries constitutes between 60.8 and 74 percent of the total import in the Nordic countries. These high export-import ratios to countries covered by the ETS indicate that the carbon leakage problem and problems with competitiveness distortions are only relevant for a limited amount of the total industrial production. However, perhaps a more important question is whether competitors outside the EU will be able to increase their market share in the medium- to long-run as they do not face higher production costs as a consequence of the introduction of stricter environmental regulations, either in form of energy taxes or emission trading schemes.

Table 10.4 Export and import ratio (percentage of total export and import) from/to Nordic countries to/from EU25 in 2003

Country	Export ratio	Import ratio
Denmark	64.2	74.0
Finland	58.3	60.8
Iceland	73.8	63.8
Norway	77.3	70.9
Sweden	58.5	72.9

Source: OECD STAN database

National allocation plans

Despite that all-25 EU Member States this does not mean that competitiveness distortions between these countries have been eliminated completely. In addition to EU-25 the Commission has also been engaged in negotiations with Norway, Iceland and other countries about a possible participation in the scheme. All the participating countries in the emission trading scheme have been obliged to prepare a National Allocation Plan (NAP) identifying the industrial companies appointed to participate in the ETS. The NAPs also set a cap for both the total emissions in each country and caps for the emissions in each individual economic sector and company (EC, 2003a, Article 9). The detailed rules regarding the outline of the national allocation plans are explicitly described in a guidance published by the European Commission (EC, 2003b). In any case, all the national allocation plans are checked by the European Commission before they enter into force, and the EC has the power to reject or, if necessary, require changes in the individual national allocation plans. The EC especially controls whether the national allocation plans reflect the Member States' progress toward meeting their Kyoto targets. It is also of great importance that the NAPs are in line with the EU rules on State aid and competition. For example, to avoid conflicts with State aid regulations, EU Member States are obliged to allocate fewer emission allowances than the projected emissions from a given installation covered by the ETS (EC, 2003a). The rules concerning the national allocation plans are, therefore, not only an instrument to secure the emission reduction targets, but can also be seen as a policy instrument designed to safeguard the industrial sectors from competitiveness distortion. Under the NAP rules, Member States are not allowed to allocate emission allowances in a way that will cause a comparative advantage for the industrial sector in one country compared with other ETS countries.

However, the different Kyoto obligations and the outlining of different national allocation plans may cause some changes in the competitiveness situation between the ETS countries. The simple fact that some countries are obliged to reduce CO₂ emission by up to 28 percent (Luxembourg) while other countries are allowed to increase their emissions, will cause some differences in the level, or cap, of emission allowances allocated to the ETS covered industrial sectors. These differences may create distortions in the economic burden on the industries in the different countries and, thereby, create a shift in the comparative advantage between the participating countries. In addition to the differences caused by the Kyoto targets, the NAP rules also open up for some differences in the distribution of emission allowances. State-specific political preferences over how to distribute the emission allowances can, therefore, still affect the competitiveness situation between the ETS countries so long as the distribution of emission allowances accord with the NAP rules set up by the European Commission. Some of the negatively affected industries have

tried to gather political attention on these competitive distortions. The Danish electricity producers claim to be facing a comparative disadvantage caused by the distribution of emission allowances. According to the Danish national allocation plan, the sectors covered by the ETS will, on average, be granted emission allowances equivalent to 85 percent of the projected emissions. However, the Danish electricity producers will only be granted emission allowances corresponding to 67 percent of the projected emissions in the first trading period (2005–2007). In Sweden, the national allocation plan grants emission allowances equivalent to 95.5 percent of the projected emissions in the sectors covered by the ETS, while the electricity sector will be granted emission allowances equivalent to 80 percent of the projected emission level (Hansen, 2004, p.6–7). The differences between Denmark and Sweden partly reflect the higher carbon intensity in the Danish electricity sector, which allow for more and cheaper reduction possibilities. But the differences also reflect a priority to industrial fuel use at the expense of electricity consumers.

The German allocation plan grants 97.5 percent of the projected emissions to the electricity sector (Hansen, 2004, p.6–7). Here the carbon content is more similar to the content in the Danish electricity sector, but as Germany is close to accomplishing its Kyoto target there is more room for manoeuvre. Denmark has a demanding reduction requirement and is currently rather far from meeting its Kyoto target. It is clear that most of the differences between the various sectors in the national allocation plans actually stem from different national obligations under the Kyoto protocol. The nature of the emission trading scheme allows for a shift in comparative advantage between different sectors in affected countries.

10.7 Legal aspects of EU rules with relevance for application of market-based instruments

10.7.1 Introduction

As Member States of the European Union, Denmark, Finland and Sweden must adhere to the obligations of the EU Treaty and to the legal *acquis* of EU law. Norway and Iceland are associated to the European Union via the European Economic Area (EEA) and are by and large obliged by the same regulatory framework, although special procedures apply, e.g. for transposition and for compliance. These circumstances imply that EU law, since 1995, when the other Nordic states accompanied Denmark into the European cooperation process, is an important framework for application of market-based instruments. The profound legal complexities of this regulatory framework have posed uncertainties in the past, as market-based instruments were introduced, but after a new set of state aid rules for environmental protection issued in 2000, the *Adria-Vienna* rul-

ing of the European Court of Justice in 2001, and a series of Commission decisions pertaining to exemption mechanisms in various Member States in subsequent years, more clarity is gradually emerging, providing a more stable framework for decision-making. The most recent development was a ruling of the EFTA-court in 2005, bringing clarity for the EEA area (Norway and Iceland).

The European Union is founded on the principles of economic cooperation enshrined in the Treaty of Rome, and instituted to ensure the development of a single market, without barriers or impediments to free trade. In the decades before the official adoption in 1987 of the environment as an area for cooperation and harmonisation in its own right, the legal basis for environmental rule-making was regarded as an adjunct to free trade and internal market objectives. Environmental regulations were largely justified by the need to secure a level playing field.

The OECD in 1972 formulated the Polluter pays principle as, essentially, a no-subsidy principle, to safeguard free trade from distortions caused by uneven application of subsidies in the field of pollution control. The guidelines were agreed in the midst of a widespread practice to provide public support for pollution control costs, and the guidelines in fact allowed for some provision of subsidies, provided, however, that these would remain temporary.

The European Commission in its 1975 communication on the Polluter pays principle by and large adopted the OECD approach. The Commission also had to deal with member state practices of applying market-based instruments, particularly in the area of water pollution control. Since 1987 the Polluter pays principle has been officially recognised as one of the pillars of European environmental policy in the Treaty (Art 174, 2).

The Polluter pays principle essentially prescribes, that the polluter should pay for the relevant clean-up costs that are imposed. Now, if the regulator in the interest of efficiency abstains from imposing specific “command-and-control” type of regulations, but instead pursues an economic approach with market-based instruments, the imposed costs will not follow from any technical guidelines, but more indirectly from the tax rates imposed. The polluter will take measures to control pollution where these are feasible at a per unit rate lower than the tax, and will pay the tax for the remaining emissions up to the point of decreasing net marginal profits. In both cases, the Polluter pays principle applies – which is along the lines of the EU Treaty.

Problems will arise, however, if policy-makers allow selective exemptions on market-based instruments, so as to allow certain polluters either a revenue return or a lower tax rate. Such discretionary treatment by Member States may very well distort competition, both within the member state and vis-a-vis other Member States. For this reason the EU rules on state aid become of relevance, as the reduced tax payments can be

regarded as an indirect form of state aid. The same applies for grandfathering of emission permits.

10.7.2 EU State aid rules

Article 87 of the Treaty of the European Community takes a rather broad approach to state aid:

‘Save as otherwise provided in this Treaty, any aid granted by a Member State or through state resources in any form whatsoever, which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the common market.’

Article 87 prescribes the general approach in the issue of state aid, whereas some exemptions follow immediately after. The various allowed forms of state aid are listed in the remainder of Art. 87, while Art. 88 prescribes the procedures to be followed, if Member States wish to obtain approval of specific schemes that should be regarded as state aid. In this respect Art. 88, 3, requires that Member States notify the Commission on plans to grant or alter state aid in sufficient time for the Commission to react or to initiate an approval procedure.

Until the end of the 1990s it remained unclear to many tax law specialists whether tax derogations to environmentally related taxes should be regarded as state aid “in any form whatsoever” (cf. Sutter, 2001, p.239). On one hand it was clear from early Court rulings from the 1960s that a “functional” approach prevails, so that not only direct aid, but also indirect types of aid were included under Art. 87. On the other hand it was possible to argue, that Member States which introduced specific energy taxes on industry, with variable rates, would actually put their domestic industry at a disadvantage as compared to the circumstances prior to such taxes. In this way there would be no gain in intra-EU trade vis-à-vis other Member States, only a variable set of losses – and the ban in Art. 87 would consequently not be relevant. Indeed this was the position taken by Advocate-General J. Mischo before the ECJ in the *Adria-Vienna* case (C-143/99) on the Austrian energy tax.

The stakes were somewhat high in the Austrian energy tax case, as the notification procedure in the last sentence of Art. 88 implies that a member state is not allowed to put its state aid measures into effect until the Commission has reacted – but Austria had not notified the Commission. To avoid the risk of being condemned for an illegal measure, with subsequent return of tax revenue, the Danish government had taken a more precautionary approach, and in 1995 notified the Commission of the exemption and reimbursement mechanisms for industries in the Danish CO₂ tax scheme. In its response the Commission declared the Danish scheme as falling under the state aid provisions, but it also granted the desired

exemption, among various reasons with reference to the greenhouse gas reduction commitments made by the EU at Rio (1992). However, the Commission stressed the temporary nature of the Danish exemptions, their degressivity and the circumstance that no Danish industries would incur a net benefit from the scheme (Hemmingsen et. al., 1997, p.28).

In its final ruling in the *Adria-Vienna* case the European Court of Justice overturned the argument by Advocate-General Mischo, and followed the line of reasoning employed also by the Commission in the Danish case. This ruling was reached despite interventions from Denmark and Finland in support of Austria's argument that no net benefit was conferred on Austrian industries by allowing certain exemptions for goods-producing industries vis-a-vis service industries. The Court pointed out, that the Austrian scheme was not temporary and that the environmental considerations did not justify a selective treatment of certain producers. The advantageous terms granted to certain industries were meant to preserve their competitiveness "in particular within the Community" as stated by ECJ, and the tax exemptions hence did constitute state aid, and should have been notified to the Commission.

As summarised by Sutter (2001) in "European Taxation", and as evident after the *Adria-Vienna* ruling, the state aid rules of the EU Treaty do apply as soon as exemptions or recycling mechanisms are introduced in supplement to environmentally relevant taxes. However, in order to qualify as state aid, measures need to be "selective", there must be "economic advantage" with no return delivery of services as well as a "potential distortion" of competition and trade. Finally, the state aid must reach a certain level, above the ceiling of 100.000 EURO over three years prescribed in the "de minimis" rules.

According to Art. 88, 3 the Commission has discretionary powers to grant exemptions, but in order to increase transparency and legitimacy, its decisions follow a set of guidelines on state aid in environmental policy.

Revised guidelines on State aids for environmental protection were agreed in December 2000 and apply from 2001 to 2007. The guidelines address a range of state aid options, including both investment aid and operational aid. Although a great deal of the guidelines address renewables, the special case of environmentally relevant taxes and exemptions from these are addressed too. This case falls under operational aid, for which the most restrictive guidelines apply.

The Commission acknowledges the desirability of exemptions from increases of new or existing taxes in order to mitigate undesired competitiveness effects by allowing for a period of adaptation. However, it distinguishes between the application of taxes as a result of community regulations and as a result of autonomous decisions by the Member States.

In the case of community directives leading to tax measures, only exemptions from taxes that exceed the minimum rates in the mineral oil

directive are deemed generally acceptable, provided that the threshold of the minimum rates is respected. The exemptions can apply for a maximum of 10 years to allow for adaptation. The guidelines also provide the possibility for a 10 year grace period with selective exemptions from the minimum rates, provided that commitments are made to reduce the environmental burden, e.g. via binding or voluntary agreements. These measures should secure that the environmental objectives are met and the implementation is subject to both monitoring and potential penalties for non-compliance.

In the case of purely domestic taxes, for which no community minimum has been agreed, exemption mechanisms are conditional on firms nevertheless paying a significant proportion of the national tax, so here the guidelines are in fact more restrictive. They also prescribe that derogations from increases of existing domestic taxes, in the case of deteriorating competitiveness, may not at any time exceed the additional burdens inflicted.

Exemptions should not undermine the environmental objectives; this is because integration of environmental objectives in Community competitiveness policy is a priority.

10.7.3 Recent development on EU rules and environmentally related taxes

Besides the Nordic countries a number of other EU Member States have introduced environmentally-related taxes in the form of carbon-energy taxation – these include UK, Germany, Netherlands, Slovenia Estonia and Latvia.

Germany reached a decision on its ecological tax reform in 1998 and subsequently in 1999 obtained approval under the state aid rules by the European Commission for the special treatment of energy-intensive industries. Manufacturing industry, as well as agriculture, forestry and railways, obtained exemptions at a rate of 80 per cent from the new energy taxes, subject to binding agreements on energy efficiency improvements. The European Commission initially approved these exemptions as state aid under the provision that they were limited to a period of 3 years. At this time there were considerations to restrict the exemption period to just 5 years in the state aid guidelines, and although in the final guidelines the possibility for a 10 year exemption period was fixed, Germany subsequently in 2000 obtained approval for a 5 year exemption. In 2004 the special arrangement for energy-intensive users, the “Spitzenausgleich”, was approved for a period until 2006. In this case the effective tax rates remained above the minimum rates of the Mineral Oil Directive.

The UK in 2001 introduced a climate change levy, which is equivalent to a carbon-energy tax. As part of the scheme over 40 industrial sectors have negotiated energy efficiency agreements, so as to obtain an 80 per

cent reduction of the tax rate. The Commission gave its approval of the exemption mechanisms for a period of 10 years.

Sweden

In 2003 the European Commission reviewed the entire Swedish system of energy and CO₂ taxation, which exempts manufacturing industry from energy taxes and reduces CO₂ taxes with 75 per cent. It decided that the burden of energy and CO₂ taxes on fuels for industries could be assessed jointly, and despite reductions for industries, it found that the combined tax level remained with an effective tax rate of 23 percent as compared to the standard rates, and could be considered as “substantial”, cf. the requirements for approval of exemptions from taxes introduced as a domestic and autonomous measure. The Commission also took note of the fact that the system had been introduced prior to Swedish EU membership, but that as a result of the revised guidelines on state aid for environmental protection it was since 2002 in need of notification and approval. At the same time the Commission did not approve a Swedish application for extension of the 100 percent electricity tax exemptions to the manufacturing sector. While the minimum tax rate for electricity established in the Mineral Oil Directive came to apply from 1.7.2004 in Sweden, the Commission considered the previous 100 percent exemption arrangement incompatible with the state aid rules from the time of the notification required by the revised guidelines (2002) – and ordered a reclaim arrangement of the tax for the period since August 2003, when a first warning was raised. The Commission’s communication on the Swedish energy taxes seems also to indicate a need to phase out the exemptions to fuel taxes for industries, but it is not clear whether another 10 year grace period has been obtained (EC, 2004c).

Denmark

In January 2005 the Commission approved the Danish phosphorous tax for agriculture by stating that it did not consider it as state aid. No exemptions were introduced, but the revenue was recycled via a lowering of property taxes for farmers. While the tax would fall especially on intensive livestock-farmers, the reduced property taxes would benefit all farms, also crop growers. The phosphorous tax case seems to indicate that a tax shift is more feasible than an exemption scheme, in particular if the environmental considerations are supportive.

Norway

In July 2005 the EFTA Court ruled that the exemptions for mining and manufacturing industries from the electricity tax in Norway constituted state aid, and would only have been permissible with approval from the ESA authority. Consequently the electricity tax exempted for the period February 6, 2003 until December 21, 2003 has to be reclaimed. There

were many parallels to the *Adria-Vienna* ruling of the ECJ, and it is slightly surprising that the Norwegian authorities did not early on address the electricity tax exemptions as a state aid issue requiring approval from the ESA authority, e.g. when considering the transposition of the EU state aid guidelines into EFTA regulations. The ESA authority ordered a repayment equal to the tax rate for electricity in the EU directive, so as to net out the competitiveness effects. This approach was approved by the EFTA court, although the energy taxation directive is not part of the EEA agreement.

Finland

Finland in 1995 introduced an electricity tax which, different from the output taxation principle favoured in the subsequent Taxation of Energy Products Directive, actually taxed electricity according to the carbon-energy content of the fuels applied for its generation. The main complication to this otherwise environmentally efficient scheme was the treatment of imported electricity, where the fuel source could not easily be controlled. The Finnish electricity tax scheme hence imposed an uniform tax on all imported electricity, similar to the level of electricity taxation on coal. This approach was soon met with objections from electricity companies and subsequently from the European Commission. The objections addressed the possible distortion of the electricity market, which the Nordic countries with the creation of Nordpool were the first to liberalize in accordance with the policies for the internal energy market developed by the EU. The fuel based electricity tax was deemed as a potential distortion to free trade, in so far as imported electricity was not treated in a similar way as domestically produced electricity, and the scheme was abandoned and replaced with a more conventional output-based electricity tax from 1997. Still, one might speculate whether the original Finnish scheme would have been permissible, if certificates had been used to declare the carbon-content of the imported electricity.

The Commission in 2005 proposed a new set of general guidelines on state aid. In turn, these will form the basis for the revision of the guidelines for state aid with regard to the environment that remain in force until 2007.

10.7.4 Emissions trading sectors and carbon-energy taxation seen from the state aid perspective

With the introduction of emissions trading at the European level a number of energy-intensive sectors have been grandfathered emission permits, and are required to purchase additional permits if the emissions are to be increased. This has raised the question of whether such sectors should continue to be liable to taxes, since it might be argued that the imposition of both emissions trading and carbon-energy taxation consti-

tutes a double regulatory burden for these sectors – at least for the marginal emissions for which both taxes and quotas are required.

The Danish government decided to exempt the energy-intensive sectors subject to emissions trading completely from the fuel based CO₂ taxes as from 1.1.2005, and the Swedish government has recently proposed a similar change to its scheme. However, such changes fall under the state aid rules and require approval from the Commission. On basis of the regulations reviewed above, it seems unlikely that the ETS-sectors would be allowed to escape the minimum tax rates agreed in the Energy Tax Directive. Although the Danish government has exempted the sectors from the CO₂ tax since the beginning of 2005, the first application for approval was turned down by the Commission, but negotiations are still pending.

Sammenfatning

Summary in Danish

Del I: Anvendelse af økonomiske styringsmidler i miljøpolitikken i de Nordiske og Baltiske lande

EU's kvoteordning (ETS) er den seneste og mest markante udvikling i brugen af økonomiske styringsmidler på miljøområdet i perioden 2001 – 2005. Indførelsen af kvoteordningen er af stor betydning fordi den er det første fælleseuropæiske økonomiske styringsmiddel og den første internationale kvoteordning i verden. Kvoteordningen er primært blevet indført som et politisk værktøj, der skal medvirke til at EU landene kan opfylde Kyoto-protokollens emissionsmålsætninger. En anden markant udvikling i brugen af økonomiske styringsinstrumenter er vedtagelsen i 2003 af EU direktivet om beskatning af energiprodukter. Direktivet blev vedtaget efter 10 års diskussioner og forhandlinger, og adskillige forslag til fælles regler for energi og CO₂ beskatning. Det nye direktiv om energibeskatning er en udvidelse af rammerne for energibeskatning i forhold til Mineralolie-direktivet fra 1992, idet det nye direktiv fastsætter minimums-afgiftssatser for en række energiprodukter (kul, naturgas og elektricitet), som ikke var omfattet af den eksisterende EU energibeskatning.

Direktivet om kvotehandel og direktivet om energibeskatning har begge haft betydning for brugen af økonomiske styringsinstrumenter i de nordiske og baltiske lande. ETS direktivet forpligter både de Nordiske og de Baltiske lande til at implementere kvotehandel. Allerede i perioden 2000–2003 fik de danske myndigheder de første erfaringer med kvotehandel, omend i mindre målestok, da Danmark indførte et nationalt CO₂ kvotesystem. Implementeringen i de Nordiske og Baltiske lande af 2003 direktivet om minimums energibeskatning har haft forskellige implikationer, idet de Nordiske lande allerede havde omfattende nationale energibeskatningssystemer, som ikke krævede større ændringer – om end Sverige og Norge var tvunget til at opgive den hidtidige afgiftspolitik, hvor industrien var undtaget for elektricitetsafgifterne. I de Baltiske lande har implementeringen af direktivet om energibeskatning haft væsentlig større betydning og har medført introduktion af en hel række energiafgifter på energiprodukter, som tidligere har været undtaget for afgifter. De tre Baltiske lande har dog, ligesom de øvrige nye EU medlemslande, fået en overgangsperiode til gradvist at indføre de nye afgifter.

I de Nordiske lande er der i løbet af de sidste fem år sket en del ændringer i støtteordningerne til vedvarende energi. For eksempel har Sverige indført et certifikat system, som forpligter forbrugerne af elektricitet

til at købe ”grøn el”-certifikater svarende til en bestemt andel af forbrugers samlede elforbrug. Revision af støtteordningerne fra et fast prissystem til et kvotebaseret system bliver også diskuteret i andre Nordiske lande. Ydermere er et fælles svensk-norsk grøn el certifikat system, der eventuelt skal indføres i 2007, under overvejelse.

Det må bemærkes, at de Baltiske lande har indført et større antal luftforureningsafgifter end de Nordiske lande. Ydermere afviger de Baltiske landes udformning af disse afgifter sig fra designet i de Nordiske lande. De Baltiske lande anvender relativt komplekse afgifts-satser, med såvel en grundrate som en højere rate for emissioner, der overskrider det fastsatte niveau. Denne form for komplekse afgiftsordninger er også blevet indført for forskellige typer udledninger til vandmiljøet i de Baltiske lande. Danmark og Norge har indført nye miljøafgifter på en række (ikke energi relaterede) drivhusgasser (GHG). I 2001 introducerede Danmark afgifter på perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) og hydroflourocarbons (HFCs). Disse tiltag havde til formål at bremse udledningen af GHG emissioner og de nye afgifter var på denne måde et supplement til de eksisterende CFC afgifter, som har været i kraft siden 1989. Den norske drivhusgas afgift trådte i kraft 1.1.2003 og opkræves ved emissioner af perfluorocarbons (PFCs) og hydroflourocarbons (HFCs).

Selvom EU-beslutninger er blevet mere vigtige for brugen af økonomiske styringsmidler, både i Nordisk og Baltisk miljøpolitik, så har der også være bemærkelsesværdige udviklinger som led i rent nationale beslutninger. Sverige foretager i disse år en omfattende grøn skattereform, hvorved indkomstskatter erstattes med øgede afgifter på energi, transport og forurening for flere milliarder kroner. Estland besluttede i 2005 at sænke indkomstskatten med 6 % og erstattede i et vist omfang provenuet med nye miljøafgifter.

Der er ikke sket store forandringer i de Nordiske landes afgiftsordninger på vand og affaldsområdet. I visse lande er de eksisterende afgiftsordninger dog blevet revideret. Norge indførte i 2003 en differentiering af afgiften for deponering af affald afhængig af miljøstandarden på det enkelte affaldsdeponi. Et andet centralt element i den norske revision af affaldsafgifterne var det nye design af afgiften på affald til forbrænding. Indtil 2003 blev affald til forbrændingsanlæg beskattet med en basis afgift og en variabel afgift afhængig af den opnåede mængde energi frigivet ved forbrændingen. I den nye afgiftsstruktur er afgiften på affald til forbrænding baseret på luftemissioner, hvorved den nye afgiftsordning har skabt et klart incitament på forbrændingsanlæggene til at sikre en minimering af luftforureningen.

Nye tiltag med økonomiske styringsinstrumenter på affaldsområdet er især et resultat af den nationale implementering af EU direktivet om affald af elektrisk og elektronisk udstyr (WEEE) samt EU direktivet om udrangerede køretøjer (ELV), som begge fokuserer på producentansvar.

En yderligere innovation i den danske afgiftslovgivning er afgiften på fosfor i dyrefoder. Afgiften på fosfor i dyrefoder blev implementeret i 2005 og har til formål at begrænse udledningen af fosfor fra husdyrhold til vandløb og søer.

Miljømæssige overvejelser i forbindelse med beskatningen af motor-køretøjer i de Nordiske lande er i stigning. Den norske registreringsafgift er nu baseret på kriterier som vægt og motorstørrelse i modsætning til Danmark, hvor registreringsafgiften stadig er baseret på bilens værdi. Registreringsafgifterne er stadig af stor fiskal betydning i Danmark, Finland og Norge idet afgifterne generer et betydningsfuldt provenu til statskassen. Også på dette afgiftsområde er forskellene mellem de Nordiske og Baltiske afgiftssystemer betydelige. Estland og Letland har ophævet afgifterne på private motorkøretøjer i de senere år men har fastholdt afgifterne på tunge køretøjer. Tiltag vedrørende vej-afgifter (road-pricing) har samlet nogen støtte i de nordiske lande. Specielt efter den succesfulde introduktion i 2003 af vejafgiftssystemet i London (London congestion charge) har diskussioner omkring lignende tiltag i de nordiske lande igen været en fast del af den politiske dagsorden. For eksempel besluttede de svenske myndigheder i maj måned 2005 at introducere en syv måneders forsøgsordning med vejafgifter i Stockholm.

Del 2: Vurdering af muligheder og problemer ved anvendelse af økonomiske styringsmidler

Dette specialafsnit behandler muligheder og problemer ved brugen af økonomiske styringsmidler. Debatten om fordele og ulemper ved brugen af markedsbaserede styringsmidler bliver også behandlet, suppleret med indsigter fra økonomisk litteratur og forskningsresultater fra de Nordiske lande. De tidligere rapporter i denne serie har behandlet økonomiske styringsmidler ved at rapportere om udformningen, men kompleksiteten i udviklingen af økonomiske styringsmidler har ført til tilføjelsen af dette specialafsnit til den samlede rapport.

Miljø-effekt

De Nordiske lande har næsten to årtiers erfaring med økonomiske styringsmidler på miljøområdet, og miljøeffekten af forskellige miljøafgifter er lejlighedsvis blevet underkastet grundige undersøgelser. Specielt i de senere år, hvor der har været mulighed for at undersøge længere tidsserier. Udredning af specifikke emissionseffekter for forskellige forurenende stoffer pga. ændringer i skatter og afgifter kræver imidlertid anvendelse af avancerede økonometriske teknikker.

De Nordiske lande var foregangslande i forbindelse med introduktionen af energi og CO₂ afgifter, og nyere undersøgelser har fokuseret på disse afgifters betydning for CO₂ udledningerne. På trods af forskellige

metodiske tilgange i de forskellige undersøgelser er det overordnede resultat af undersøgelserne, at miljøafgifterne har væsentlig betydning for emissionsniveauerne. I Finland ville CO₂ emissionerne have været 7 procent højere i slutningen af 1990'erne hvis ikke CO₂ afgifterne var blevet indført, mens afgifts- og tilskuds ordningerne for industrien i Danmark har medført, at CO₂ emissionerne på syv år er reduceret med 23 procent til et niveau, som er estimeret til at være 31 procent lavere end business-as-usual scenariet. I Norge og Sverige er energi forsyningen mindre CO₂-intensiv og undersøgelserne påpeger derfor nogle mere begrænsede effekter for specifikke industrier.

På et mere traditionelt miljøområde har afgiften på affald i Finland ført til en 15 procents reduktion af fast affald sammenlignet med et scenarie uden politiske tiltag på området. I Sverige, hvor en affaldsafgift blev introduceret i 2001, har foreløbige undersøgelser indikeret en reduktion på 20–30 kg affald per indbygger i det første år efter afgiften blev indført. Erfaringerne fra Danmark, som viser at affaldsafgifterne er specielt effektive overfor tunge affalds fraktioner, hvilket primært vil sige affald fra nedbrydning, er blevet bekræftet af finske erfaringer. I Norge beskattes affald efter en differentieret formel, og det norske afgiftssystem på affaldsområdet har dermed en bedre sammenhæng mellem afgiftstrykket og miljøbelastningen end de øvrige lande.

Det er vanskeligt at adskille de konkrete miljøeffekter af en afgift i forhold til miljøeffekten fra andre faktorer og den potentielle omkostningseffektivitet er mindst lige så vanskelig at udrede. De forskellige studier af miljøafgifterne påpeger dog også en række bløde mekanismer forbundet med miljøafgifter. Således har miljøafgifter en generel signal- og opmærksomhedseffekt, og der kan også konstateres et stort potentiale for adfærdssændringer når synergieffekten af kombinationen mellem afgiftssystemer og mere eller mindre frivillige selvforpligtigelser udnyttes.

Økonomisk effektivitet – findes der en dobbelt dividende?

Efficiente miljøforbedringer udgør ifølge teorien den primære og relativt ukontroversielle "dividende", der opnås, når markedsbaserede styringsinstrumenter anvendes. Den anden "dividende" i teorien om den dobbelte dividende forudsætter, at brugen af markedsbaserede styringsinstrumenter til miljøregulering i kraft af lavere skatter på arbejde, vil føre til øget beskæftigelse og forbedret konkurrenceevne, og denne anden del af teorien er blevet tildelt en del opmærksomhed. Både miljøafgifter og bortauktionerede emissionskvoter vil kunne generere midler til de offentlige finanser, som i sidste ende åbner mulighed for en sænkning af skat på arbejde.

Problematikken om den dobbelte dividende kræver grundige overvejelser og analyser af hvordan provenuet fra miljøafgifterne "genanvendes"/øremærkes til at sænke skatten på arbejde. En sænkning af sociale arbejdsgiverbidrag er den mest direkte metode hvormed provenuet fra

miljøafgifter kan anvendes til at sænke skatten på arbejde. Der er ellers risiko for en uhensigtsmæssig interaktion mellem forskellige skatter idet skatter på energi fører til højere energipriser som igen enten kan medføre at lønmodtagerne reducerer mængden af udbudt arbejdskraft eller kræver højere lønninger. De senere års forskning har vist, at skattesamspilseffekten kan mindskes eller helt undgås, hvis miljøafgiftsprovenuet genanvendes med omtanke. Den negative skattesamspilseffekt forekommer oftest i stiliserede analyser, hvor mangler i det eksisterende skattesystem ikke tages i betragtning. Nordiske studier har ydermere ikke kunnet påvise antagelsen om en negativ elasticitet for udbuddet af arbejdskraft.

I løbet af 1990'erne blev der foretaget mange simuleringer i generelle ligevægtsmodeller for at undersøge den dobbelte dividende, men de seneste fem år er kun udgivet ganske få analyser af den type. Problemet med analyser i de generelle ligevægtsmodeller er, at analyseresultaterne er meget afhængige af hvilke antagelser, der ligger til grund for parametrene i den enkelte model. Specielt teknologiudvikling er en nøgleparameter, som ikke behandles optimalt i disse modeller. Muligheden for effektivitetsforbedringer via ændringer i sammensætningen af produktionsfaktorer bliver også ofte antaget at være meget lav eller ikke eksisterende i de generelle ligevægtsmodeller med henvisning til neoklassiske teorier og disses antagelser om fuld rationalitet og optimal management af virksomheder. Hvis hensigten med de markedsbaserede styringsinstrumenter er at skabe incitamenter for en mere optimal sammensætningen af produktionsfaktorer, frem for en forbedret fordelings effektivitet, så vil "X-efficiency" begrebet kunne bidrage til forståelsen af mulighederne for en dobbelt dividende, jf. afsnit 10.3

Muligheder for yderligere anvendelse af markedsbaserede styringsmidler

Mulighederne for yderligere anvendelse af markedsbaserede styringsmidler i de Nordiske lande er mere og mere afhængig af udviklingen på EU niveau. Kvoteordningen for energisektoren har skabt forventning om lignende EU-tiltag i andre sektorer bl.a. luftfart og skibsfart. Ligeledes har overvejelser og drøftelser om road-pricing og afgifter på luftfart været i gang i adskillige år, og for nylig er der blevet fremsat et EU-forslag om at ændre registreringsafgifterne til en miljørelateret afgift.

Afgifter og kvoteordninger er ikke de eneste markedsbaserede styringsmidler, som anvendes i de Nordiske lande. Specielt i forbindelse med støtten til vedvarende energikilder er der sket fremskridt i brugen af grønne certifikater i de Nordiske lande. Sverige har introduceret en certifikat ordning, mens Danmark foreløbigt har opgivet planer for en sådan ordning fordi det forventes, at de høje oliepriser vil være i stand til at sikre brugen af vedvarende energikilder. Hidtil har antagelsen været, at certifikatordninger understøtter en omkostningseffektiv udvidelse af forbruget af vedvarende energikilder, men grundige undersøgelser, der sammenligner certifikatordninger og en fast prisstøtte, har vist, at forskel-

len mellem omkostningseffektiviteten ved de to metoder er ganske lille, idet certifikatordningen introducerer en præmie eller overpris for den usikkerhed som investorerne i vedvarende energi må acceptere.

Brugen af markedsbaserede styringsmidler er veletableret i de Nordiske lande, men en oversigtstabel viser, at de fleste lande stadig har til gode at indføre sådanne styringsmidler på vandforureningsområdet.

Fordelingsmæssige konsekvenser

Når nye skatter og afgifter introduceres er der overvejelser om de fordelingsmæssige konsekvenser. Dette er også tilfældet for miljøafgifter, og miljøafgifter er ofte blevet vurderet at være regressive. Forskellige undersøgelser fra Sverige og Danmark, som gennemgås i denne rapport, redegør grundigt og præcist for de fordelingsmæssige konsekvenser. Disse undersøgelser tager højde for både direkte og indirekte effekter, idet indirekte effekter, som følge af ændringer i forbrugerpriserne, har væsentlig betydning for den samlede effekt.

Resultaterne viser, at landdistrikter bærer en uforholdsmæssig stor del af byrden ved miljøafgifterne. Undersøgelserne viser også at mens energiafgifter er fordelingsmæssigt regressive, så er afgifter på transport/brændstof og forurening henholdsvis progressiv og neutral. Lavindkomsthusholdninger bruger i gennemsnit en større andel af deres disponible indkomst på varme, elektricitet og vand end husholdninger med høje indkomster, mens det modsatte er tilfældet i forhold til forbruget af køretøjer og transport. Med andre ord kører personer med højere indkomster længere ture i større biler.

I Danmark er den regressive effekt af energiafgifter mere eller mindre på højde med den regressive effekt af momsen, når de to typer skatter sammenlignes på et Gini-indeks. Sammenlignet med alkohol og tobaksafgifter er energiafgifterne dog mindre regressive.

Der har været anvendt forskellige tiltag for at opveje fordelingsmæssige konsekvenser. En svensk analyse, som tog højde for dæmpende og fordelingsmæssige neutraliserende tiltag, har vist, at en ændring i personlig indkomst pga. et standard fradrag vil være tilstrækkelig til at neutralisere den regressive effekt af miljøafgifter.

Konkurrenceevne

De negative konkurrencemæssige effekter, som ofte forbindes med indførelsen af markedsbaserede styringsmidler kan imødegås på en række forskellige måder. De dominerende tilgange er at tildele energiintensive virksomheder afgiftsreduktioner eller gratis at tildele ("grandfather") virksomhederne emissionskvoter. Der er betænkeligheder ved disse metoder, herunder den gratis tildeling af emissionskvoter, idet den skævvrider incitamenterne til at reducere CO₂ udledning på en efficient måde og samtidig pålægges forskellige sektorer i samfundet forskellig omkostningsbyrde. Gode alternativer til disse mekanismer er svære at finde, men

mekanismer som øremærket anvendelse af afgiftsprovenuet i den betalende sektor og grænseafgifts tilpasning ("border tax adjustment") kan nævnes som alternativer, der kan sikre konkurrenceevnen i forbindelse med indførelsen af økonomiske styringsmidler. Det skal bemærkes at EU's konkurrenceregler begrænser muligheden for nationale tiltag, som rammer eksporten fra andre EU lande. En bedre fremgangsmåde vil derfor være at undgå nationale tiltag og i stedet gennemføre koordinerede EU-tiltag.

På trods af mange virksomheders udtrykte bekymringer for konkurrenceevnen findes der endnu kun begrænset viden om de markedsbaserede styringsmidlers betydning for denne. – sågar indikatorerne for konkurrenceevne er ikke fuldt udviklede. Idet en af de konventionelle indikatorer for konkurrenceevne er udviklingen i arbejdskraft omkostningerne (unit labour cost) vil en fokusering på energiafgifter naturligt føre til overvejelser om energiomkostninger (unit energy cost) som indikator for konkurrenceevnen. Erfaringerne med markedsbaserede styringsinstrumenter i de Nordiske lande understøtter kun i meget begrænset omfang forventningen om tab af markedsandele som følge af de økonomiske styringsinstrumenter.

Bekymringer vedrørende konkurrenceevnen er kommet frem i forbindelse med introduktionen af EU's kvoteordning. Den gratis fordeling af emissionskvoter baseret på de enkelte landes forpligtelser i henhold til den interne byrdefordeling i EU har tildelt enkelte sektorer betydelige værdier. Specielt i elektricitetssektoren har den gratis tildeling af emissionskvoter skabt bekymring og givet grundlag for at overveje om ordningen med gratis kvoter også skal benyttes i den næste fase af kvotehandelsordningen. De Nordiske lande har en høj grad af samhandel med lande uden for EU – visse sektorer har imidlertid kun en meget begrænset samhandel med udlandet mens andre sektorer primært eksporterer og importerer indenfor EU-området. For disse sektorer, som kun har en begrænset samhandel med lande uden for EU, forventes de konkurrencemæssige effekter af kvoteordningen at være begrænset.

Juridiske konsekvenser af EU lovgivningen

Nylige afgørelser fra EU kommissionen og EU/EFTA domstolen, som gennemgås i denne rapport, understreger, at de Nordiske landes miljøpolitik udformes indenfor rammerne af EU-samarbejdet og Unionens grundlæggende retlige principper. Disse retsprincipper har, ofte på en overraskende måde, påvirket både foreslåede og implementerede ændringer i afgiftsbasen og afgiftsstørrelsen i de Nordiske lande.

Den mest betydningsfulde påvirkning af de nationale regler stammer fra EU's regler om statsstøtte. Statsstøttereglerne forpligter medlemslandene til at ansøge om tilladelse fra EU Kommissionen i forbindelse med alle typer politiske tiltag, der kan betragtes som statsstøtte. Specielt afgiftsnedsættelser og afgiftsundtagelser tiltrækker opmærksomhed idet

denne typer afvigelser potentielt fungerer som de facto statsstøtte. Selvom det er et legalt motiv at sikre konkurrenceevnen, så må konkurrenceevnen kun beskyttes på en ikke diskriminerende måde. For eksempel har flere lande overvejet selektivt at fjerne CO₂ afgiften for sektorer, som er faldet ind under kvotehandelsordningen, men denne afgiftsundtagelse er indtil videre ikke godkendt af Kommissionen. Ydermere er de nationale myndigheder forpligtet til at opfylde bestemmelserne i direktivet om beskatning af energiprodukter, hvilket indebærer en overholdelse af minimums skattesatserne fastsat i direktivet.

Part I

- Andersen, M.S., Dengsøe, N., Pedersen, A.B. (2001), An Evaluation of the Impact of Green Taxes in the Nordic Countries, Nordic Council of Ministers, TemaNord 2001:566, Copenhagen, Denmark.
- Batteriretur (2005) Batteriretur reports from Norway, Environmental Report in English <http://www.batteriretur.no/>
- Center for International Climate and Environmental Research (2004), Oslo <http://www.cicero.uio.no/fulltext.asp?id=2931&lang=en>
- Christensen, J.G. (2001), Affaldssektorens politiske organisering, Dansk Entreprenører, Miljøsektionen, p.41.
- Customs Authority (2005) [http://www.tulli.fi/se/03_Privat personer/02 Bilbeskattning/index.jsp](http://www.tulli.fi/se/03_Privat_personer/02_Bilbeskattning/index.jsp)
- Danish Energy Authority (1999), The Electricity Reform http://www.ens.dk/graphics/Energipolitik/dansk_energipolitik/politiske_aftaler/3marts1999_elreformen.pdf
- Danish Energy Authority (2005a), Hvad siger elreformen fra 1999 om CO₂ kvoter <http://www.ens.dk/sw19839.asp>
- Danish Energy Authority (2005b) <http://www.ens.dk/sw13754.asp>
- Danish Energy Authority (2005c) <http://www.ens.dk/sw15282.asp?usepf=true>
- Danish Energy Authority (2005d) <http://www.energistyrelsen.dk/sw11648.asp>
- Danish Environmental Protection Agency (DEPA) (1999), Economic Instruments in Environmental Protection in Denmark, Ministry of Environment and Energy, Copenhagen, Denmark.
- Danish Environmental Protection Agency (2002), Forundersøgelse af forudsætninger for og konsekvenser af en liberaliseret affaldssektor, Miljøprojekt nr. 709
- Danish Environmental Protection Agency (2003), Grundvandsforbruget er reduceret med 40 procent, 22/10/03 <http://www.mst.dk/default.asp?Sub=presse/13420000.htm>
- Danish Environmental Protection Agency (2003a), Affaldsstrategi 2005–2008 <http://www.mst.dk/default.asp?Sub=http://www.mst.dk/udgiv/publikationer/2004/87-7614-113-6/html/kap05.htm>
- Danish Environmental Protection Agency (2003b), "Notat om producentansvar" – 17 September 2003, Erhvervsaffaldskontoret <http://www.mst.dk/affald/affald/producentansvar.doc>
- Danish Environmental Protection Agency (2004), Samfundsøkonomisk analyse af spildevandsafgiften, Miljøprojekt nr. 956, 2004 <http://www.mst.dk/default.asp?Sub=http://www.mst.dk/udgiv/publikationer/2004/87-7614-400-3/html/>
- Danish Environmental Protection Agency (2004a), Erfaringer med økonomiske virkemidler i Danmark – chapter 5 in, Økonomiske virkemidler på natur- og miljøområdet, Miljøprojekt nr. 887, 2004 www.mst.dk/udgiv/publikationer/2004/87-7614-113-6/html/kap05.htm
- Danish Environmental Protection Agency (2004b), Gennemsigthed i kommunale affaldsgebyrer, Miljøprojekt nr. 950, 2004 <http://www.mst.dk/udgiv/publikationer/2004/87-7614-370-8/html/kap07.htm>
- Danish Environmental Protection Agency (2005), "Notat om økonomisk analyse i forbindelse med basisanalyse 2005" <http://www.mst.dk/vand/Vandrammedir/notat%20om%20økonomisk%20analyse%20ifm%20basisanalysen%20rev1.doc>
- Danish Ministry of Taxation (2004a), Punktafgiftsvejledning 2004 punkt.

- F6.1.2: <http://www.erhverv.toldskat.dk/ToldSkat.aspx?oID=111116&vID=200430&i=409&action=open#i111116>
- Danish Ministry of Taxation (2004b), Punktafgiftsvejledning 2004 punkt. F6.1 og F6.5: <http://www.erhverv.toldskat.dk/ToldSkat.aspx?oID=111116&vID=200430&i=409&action=open#i111116>
- Danish Ministry of Taxation (2004c), Section F3 <http://www.erhverv.toldskat.dk/ToldSkat.aspx?oID=111049&vID=200430&i=363&action=open#i111049>
- Danish Ministry of Taxation (2004d), “Emballageafgiftsloven”, Tal-statistik > Satser og beløbsgrænser, 01/11/2004 http://www.skat.dk/tal_statistik/satser_og_beloeb/207.html
- Danish Ministry of Taxation (2004e), “Opløsningsmiddelafgiftsloven”, Tal-statistik > Satser og beløbsgrænser, 01/11/2004 http://www.skat.dk/tal_statistik/satser_og_beloeb/226.html
- Danish Ministry of Taxation (2004f), “CFC-afgift og afgift af industrielle drivhusgasser”, Tal-statistik > Satser og beløbsgrænser, 01/11/2004 http://www.skat.dk/tal_statistik/satser_og_beloeb/184.html
- Danish Ministry of Taxation (2005a) www.erhverv.toldskat.dk/ToldSkat.aspx?oID=111081&vID=200430&action=open
- Danish Ministry of Taxation (2005b), Carbon dioxide tax http://www.skat.dk/tal_statistik/satser_og_beloeb/216.html
- Danish Ministry of Taxation (2005c), Mineral oil tax http://www.skat.dk/tal_statistik/satser_og_beloeb/222.html
- Danish Ministry of Taxation (2005d) www.skat.dk/tal_statistik/satser_og_beloeb/228.html?mode=print
- Danish Ministry of Taxation (2005e) www.skat.dk/tal_statistik/tidsserie-oversigter/679.html
- Danish Ministry of Taxation (2005f) www.skat.dk/tal_statistik/satser_og_beloeb/242.html
- Danish Ministry of Taxation (2005g) www.skat.dk/tal_statistik/satser_og_beloeb/183.html
- Danish Ministry of Taxation (2005h), Affalds- og råstofafgiftsloven http://www.skat.dk/tal_statistik/satser_og_beloeb/166.html
- Danmarks Statistik (2004), Skatter og afgifter, Copenhagen, Denmark.
- Dansk Retursystem, Pantsatser, <http://www.pantinfo.dk/composite-22.htm>
- Dansk Retursystem (2005), Dansk Retursystem Årsreport 2004 <http://www.danskretursystem.dk/Files/Filer/2004-aarsrapport.pdf>
- DANVA (2003), Grundvand og vandforsyning, Uddrag fra Vandstatistik – Drikkevand og spildevand 2003 <http://www.danva.dk/sw160.asp>
- Ecotec, CESAM, CLM, University of Gothenburg, UCD and IEEP (2001), Study on the Economic and Environmental Implications of the Use of Environmental Taxes and Charges in the European Union and Member States, A Report for the European Commission, DG Environment, Brussels http://europa.eu.int/comm/enviroment/enveco/taxation/environmental_taxes.htm
- Ekopullo, Pullojen ja juomakorien pantit) <http://www.ekopullo.fi/default.asp?docId=12385>
- Ekroos Ari (2004), Product Related Environmental Legislation and Policy in Finland, Avosetta meeting, Brussels 16–17 January 2004, Helsinki University of Technology, Finland.
- Electrowatt-Ekono Jaakko Pöyry Group (2002), Pre-study on the Possibilities and Obstacles for Establishing Nordic Cooperation on Green Certificates, a report for the Nordic Council of Ministers, Copenhagen, Denmark.
- ENDS Environment Daily (2003), Norway fine-tunes waste burning tax system – ISSUE 1394 – Thursday 27 February 2003.
- ENDS Environment Daily (2004a), Danish institute backs waste co-incineration – ISSUE 1612 – Wednesday 18 February 2004.
- ENDS Environment Daily (2004b), Strong Norwegian electroscrap take-back – ISSUE 1705 – Monday 19 July 2004.
- ENDS Environment Daily (2004c), Norway moves to end all organic waste dumping – ISSUE 1685 – Friday 11 June 2004.
- Endurvinnslan hf., <http://www.endurvinnslan.is/skilagj.htm>

- Endurvinnslan hf. (2002), REGLU-GERÐ nr. 368 um söfnun, endurvinnslu og skilagjald á einnota umbúðir fyrir drykkjarvörur <http://www.endurvinnslan.is/reglug368.htm>
- Enova (2005a) <http://www.enova.no/?pageid=2194>
- Enova (2005b) <http://www.enova.no/?pageid=2187>
- Enova (2005c) <http://www.enova.no/?itemid=711>
- Enova (2005d) <http://www.enova.no/?itemid=146>, <http://www.enova.no/?itemid=138>
- EU (2002), Sweden – Water Industry Sector Profile http://europa.eu.int/comm/competition/publications/studies/annex_final.pdf#search='WRc%20Ref.%20662/130760;'
- European Commission (EC) (2000), Accounts for subsoil assets – Results of pilot studies in European countries, Office for Official Publications of the European Communities, Luxembourg.
- European Commission (EC) (2004), The Share of Renewable Energy in the EU, Commission Staff Working Document, SEC(2004)547, 26.5.2004, Brussels, Belgium.
- European Commission (EC) (2005), VAT Rates applied in the Member States of the European Community – Situation at 1st July 2005, DG Taxation and Customs Union, Tax Policy, DOC/1636/2005-EN, Brussels, Belgium.
- European Environment Agency (EEA) (2000), Environmental Taxes: Recent Developments in Tools for Integration, Copenhagen, Denmark.
- European Environment Agency (EEA) (2004), Briefing – Energy subsidies and renewables http://reports.eea.eu.int/briefing_2004_2/en/Briefing_energy_EN_web.pdf
- European Environment Agency (EEA) (2005a), Market-based Instruments for Environmental Policy in Europe, EEA Technical report No 8/2005, Copenhagen, Denmark.
- European Environment Agency (EEA) (2005b), Effectiveness of urban wastewater treatment policies in selected countries: an EEA pilot study, EEA Report No. 2/2005, Copenhagen, Denmark.
- Eurostat (2001), Environmental taxes – A statistical guide, Office for Official Publications of the European Communities, Luxembourg.
- Eurostat (2004), Structures of the taxation systems in the European Union Data 1995–2002, Office for Official Publications of the European Communities, Luxembourg.
- Finansdepartementet (2005), Afgiftssatser 2004 og 2005, http://odin.dep.no/fin/norsk/tema/skatter_avgifter/006071-230118/dok-bu.html
- Finsk Däckåtervinning Ab <http://www.rengaskierratys.com/swe/index.php/tilastaja/>
- Finsk Däckåtervinning Ab, Finansieringen <http://www.rengaskierratys.com/swe/index.php/rahoitus>
- Finnish Vehicle Administration (2005) www.ake.fi/uudistuva_ajoneuvovero/default.asp?lang=2
- Finnish Vehicle Administration (2005b) <http://www.ake.fi/pdf/fordonsskatt.pdf>
- Gasforeningen (2003), Skatter på miljö och energi, www.gasforeningen.se/26b/26b_51.html
- Government Offices of Sweden (2005), Vad är bilskrotningspremier och vad gäller för bilskrotning? <http://www.regeringen.se/sb/d/3015/a/17856#17856>
- Government of Finland (2003), The Government Programme of Prime Minister Matti Vanhanen's Government on 24 June 2003, Chap 10. Environmental Policy <http://www.government.fi/vn/liston/base.lsp?r=36379&k=en&page=4&old=754>
- Government of Norway, Stortingets skattevedtak for inntektsåret 2005 http://odin.dep.no/filarkiv/229121/Stortingssvedtak_2005_Lovdata.pdf
- Gregor Louisöder Umweltstiftung (GLU), Förderverein Ökologische Steuerreform und Naturschutzbund Deutschland 2004, Ökologische Finanzreform in der Landwirtschaft, Naturschutzbund Deutschland, Bonn, Germany.
- Government Offices of Iceland (2005), Fjóla Agnarsdóttir, personal communication (e-mail)
- Government Offices of Sweden (2005) – Vad är bilskrotningspremier och

- vad gäller för bilskrötning?
<http://www.regeringen.se/sb/d/3015/a/17856#17856>
- Hiltunen, Marjukka (2004), Economic environmental policy instruments in Finland, Finnish Environment Institute, Helsinki 2004,
<http://www.environment.fi/download.asp?contentid=20725&lan=EN>
- Hornum H. (2000), Environmental taxes and subsidies in the Danish NAMEA, Working paper 2/2000/B/12, Luxembourg.
- Iceland Recycling Fund (2005), Lög nr. 162/2002 um úrvinnslugjald. –
http://www.urvinnslusjodur.is/Starfsemi/log_um_urvinnslusjod.htm
- Icelandic Ministry of Finance (2004),
<http://eng.fjarmalaraduneyti.is/media/Taxes/Taxesonmotorvehicles.pdf>
- Icelandic Parliament (2002), Lög um úrvinnslugjald. <http://www.althingi.is/altext/stjt/2002.162.PDf>
- Icelandic Recycling Fund (2002), SPILLIEFNANEFND
 Ársskýrsla – 2002
http://www.urvinnslusjodur.is/Starfsemi/spilliefnanefnd_2002.pdf
- Internal Revenue, Iceland (2004), Skilagjaldsskýrsla Skýrsla um skilagjald og umsýsluþóknun á drykkjarvörur í einnota umbúðum http://www.rsk.is/eydublod/rsk_1048.pdf#search='Skilagjald%20drykkjarvörur'
- International Energy Agency (IEA) (2003), Energy Balances of OECD Countries, Paris, France.
- International Energy Agency (IEA) (2004), Energy Prices and Taxes, 4.th Quarter 2004, Paris, France.
- International Energy Agency (IEA) (2004b), Energy Policies in IEA Countries Finland, Paris, France.
- International Energy Agency (IEA) (2005a), Johannesburg renewable energy coalition, Green certificate scheme, <http://library.iea.org/dbtw-wpd/textbase/pamsdb/detail.aspx?mode=jr&id=1144>
- International Energy Agency (IEA) (2005b), Johannesburg renewable energy coalition, Energy research and development,
www.iea.org/textbase/pamsdb/detail.aspx?mode=jr&id=1582
- Itä-Uudenmaan Jätehuolto, ”Service åt Kommuninvånaren med Ekoavgiften”, Pressmeddelanden 28.1.2005 –
www.ita-uudenmaanjatehuolto.fi/svenska/Tiedottet/ekomaksu2005.html
- Kan Energi/forskningsrådet (2003),
http://program.forskningsradet.no/empa/english/NFR_NO.pdf
- Klok J., A. Larsen, A. Dahl and K. Hansen (forthcoming), Ecological Tax Reform in Denmark: history and social acceptability, Energy Policy.
- Malaska P., J. Luukkanen, J. Vehmas and J. Kaivo-oja (1997), Environment-based energy taxation in the Nordic countries, Ministry of Environment, Helsinki, Finland.
- Ministry of Economic Affairs and Communications (2003), Estonian Energy, <http://www.mkm.ee/index.php?id=1787>.
- Ministry of the Environment, Finland (no date), Recycling of beverage packaging –
<http://www.environment.fi/download.asp?contentid=16253&lan=en>
- Ministry of the Environment, Finland (2002), “Revised National Waste Plan for the Period up to 2005”
<http://www.environment.fi/download.asp?contentid=6695&lan=en>
- Ministry of the Environment, Finland (2003), National Strategi för att Minska Mängden Biologiskt Nedbrytbart Avfall På Avstältningsplatserna, 2.12.2004 <http://www.environment.fi/download.asp?contentid=27160&lan=sv>
- Ministry of the Environment, Finland (2004), “Nationell Strategy för Att Minska Mängden Biologiskt Nedbrytbart Avfall På Avstältningsplatserna” – 02.12.04 <http://www.environment.fi/download.asp?contentid=27160&lan=sv>
- Ministry of the Environment, Finland (2005), Economic environmental policy instruments
<http://www.environment.fi/default.asp?contentid=117517&lan=EN>
- Ministry of the Environment, Finland (2005a), Förordning effektiviserar återvinning av dryckesförpackningar
<http://www.environment.fi/default.asp?contentid=124677&lan=SV>
- Ministry of the Environment, Finland (2005b), Producentansvar inom avfallshanteringen,
<http://www.environment.fi/default.asp?contentid=122146&lan=SV> updated 4.3.2005

- Ministry of the Environment, Norway (not dated), "Mye er gjort – dagens virkemidler – <http://odin.dep.no/md/norsk/tema/forurensning/p30000093/avfallspolitik/p10001197/bn.html>
- Ministry of the Environment, Norway (1995), Kapittel 29 Avfall og gjenvinning, Norges Offentlige Utredninger NOU NOU 1995: 4.
- Virkemidler i miljøpolitikken – http://odin.dep.no/md/norsk/dok/andre_dok/nou/022005-020001-dok-bn.html
- Ministry of the Environment, Norway (2001), "Stortingets skatte-, avgifts- og tollvedtak for budsjetterminen 2001", <http://odin.dep.no/fin/norsk/tema/budsjett/budsjett2001/006031-990331/dok-bn.html>
- Ministry of the Environment, Norway (2004), "Ny kvotelov vil begrense kilmatgassutslippene", 05.11.04 – <http://odin.dep.no/md/norsk/tema/klima/nyheter/022051-070139/dok-bu.html>
- Ministry of the Environment, Norway (2004a), Tilskot og låneordninger til forurensningsområde, Tilskotsordninger for 2005 – <http://odin.dep.no/md/norsk/dok/regelverk/rundskriv/022001-250039/hov003-bn.html>
- Ministry of Finance, Estonia, <http://www.fin.ee/?id=9141>.
- Ministry of Finance, Norway (1997), St prp nr 1 Tillegg nr 3 FOR BUDSJETTERMINEN 1998 (1997–98) – <http://odin.dep.no/fin/%20%20http://odin.dep.no/odinarkiv/norsk/dep/fin/1997/publ/006005-991503/dok-bn.html>
- Ministry of Finance (1997a), St prp nr 1 (1997–98) FOR BUDSJETTERMINEN 1998
- Finans- og tolldepartementet Skatte-, avgifts- og tollvedtak – <http://odin.dep.no/fin/norsk/dok/regpubl/stprp/006005-991562/dok-bn.html>
- Ministry of Finance, Norway (1998) Norwegian Government proposes New Green Taxes, Press Release, 18/98, 23.04.98.
- Ministry of Finance, Norway (2000), Avgiftssatser 2001 – <http://odin.dep.no/odinarkiv/norsk/dep/fin/2000/annet/006031-990333/dok-bn.html>
- Ministry of Finance, Norway (2001), <http://odin.dep.no/odinarkiv/norsk/dep/fin/2001/annet/006031-200151/dok-bn.html#smøreolje> Stortingets vedtak om særavgifter til statskassen for budsjetterminen 2002
- Ministry of Finance, Norway (2003), Stortingets skattevedtak for inntektsåret 2003 – <http://odin.dep.no/fin/norsk/dok/regelverk/lover/006081-200042/dok-bn.html>
- Ministry of Finance, Norway (2004), Table 1 Green taxes in Norway. Year 2004 – <http://odin.dep.no/fin/engelsk/p4500279/p4500285/006041-990407/dok-bn.html>
- Ministry of Finance, Norway (2004a) – Avgiftssatser 2004 og 2005 http://odin.dep.no/fin/norsk/tema/skatte_avgifter/006071-230118/dok-bn.html
- Ministry of Finance, Norway (2005), Fordelingsvirkninger av skatte- og avgiftsopplegget 2005 – <http://odin.dep.no/fin/norsk/dok/regpubl/stprp/006001-030052/hov005-bn.html>
- Ministry of Finance, Sweden (2002), Skatt på avfall minskar miljøproblem www.regeringen.se/sb/d/684/a/4847
- Ministry of Industry, Employment and Communication (2004), Sweden's national allocation plan, <http://www.regeringen.se/content/1/c6/01/90/18/e9286dc2.pdf>
- Ministry of Petroleum and Energy (2005), <http://odin.dep.no/oed/norsk/dok/statsbudsjett/bn.html>
- Ministry of sustainable Development, Sweden (2004), "Miljöministrarna beslutade om nytt batteridirektiv", Pressmeddelande, 20 december 2004, Miljödepartementet, <http://www.regeringen.se/sb/d/4848/a/35817>
- Ministry of Trade and Industry (2004), National Allocation Plan, http://www.ktm.fi/chapter_files/National_allocation_plan190804.pdf
- Naturvårdsverket (1997), Miljöskatter i Sverige, Stockholm.
- Naturvårdsverket (2005), Trafikskatter/avgifter, Stockholm, www.naturvardverket.se/dokument/hallbar/miljoeko/trafik/trafik.htm

- Nordic Council of Ministers (1994), The Use of Economic Instruments in Nordic Environmental Policy, TemaNord 1994:561, Copenhagen, Denmark.
- Nordic Council of Ministers (1996), The Use of Economic Instruments in Nordic Environmental Policy, TemaNord 1996:568, Copenhagen, Denmark.
- Nordic Council of Ministers (1999), The Use of Economic Instruments in Nordic Environmental Policy 1997–1998, TemaNord 1999:524, Copenhagen, Denmark.
- Nordic Council of Ministers (2002), The Use of Economic Instruments in Nordic Environmental Policy 1999–2001, TemaNord 2001:581, Copenhagen, Denmark.
- Nordic Council of Ministers (2004), Nordic Statistical Yearbook, Copenhagen, Denmark.
- Nordic Council of Ministers – www.nordic-waste.info/ – <http://www.nordic-waste.info/index.php?id=43>
- Norsk GlassGjenvinning and Norsk Metall – Gjenvinning <http://www.glassmetall.no/cgi-bin/apeland/imaker?id=3529> <http://odin.dep.no/md/norsk/tema/forurensning/p30000093/avfallspolitikk/p10001197/022051-990019/dok-bn.html> - Batteries, etc.
- North Sweden European Office (2004), EU:s miljölågstiftning i Sverige – en fallstudie av avloppsdirektivet – <http://www.northsweden.org/dokument/aktuella/Avloppsdirektivet.htm>
- Norwegian Agricultural Inspection Service (2003), Evaluering av avgiftssystemet for plantevernmidler, http://landbrukstilsynet.mattilsynet.no/vedlegg/Rapport_eval_plvmavg2003.doc
- Norwegian Brewers and Soft Drink Producers (2004), Facts and Figures on beer, soft drinks and water in Norway – http://www.brom.no/graphics/Trykksaker/tall_fakta_2004.pdf
- Norwegian Energy Authority (2005), http://www.nve.no/modules/module_109/forbrukerinfo.asp
- Norwegian Ministry of Petroleum and Energy (2005), Fact Sheet 2005 Norwegian Petroleum Activity, <http://odin.dep.no/oed/english/doc/reports/026031-120027/dok-bn.html>
- Norwegian Pollution Control Authority (2004), <http://www.sft.no/nyheter/dbafile13031.html>
- Norwegian Public Roads Administration (2005a), Information folder on road toll system, http://www.vegvesen.no/SVVvedlegg/Turistfolder_ENG1.pdf
- Norwegian Public Roads Administration (2005b), Tollroads from 2005 <http://www.vegvesen.no/SVVvedlegg/Bompengetakster2005.pdf>
- Organisation for Economic Co-operation and Development (OECD) (1972), The Polluter Pays Principle: Analysis and Recommendations, Paris, France.
- Organisation for Economic Co-operation and Development (OECD) (1989), Economic Instruments for Environmental Protection, Paris, France.
- Organisation for Economic Co-operation and Development (OECD) (1999), The Price of Water Trends in OECD Countries, Paris, France.
- Organisation for Economic Co-operation and Development (OECD) (2001), Environmentally Related Taxes in OECD Countries: Issues and Strategies, Paris, France.
- Organisation for Economic Co-operation and Development (OECD) (2003), Environmentally Harmful Subsidies: Policy Issues and Challenges, Paris, France.
- Organisation for Economic Co-operation and Development (OECD) (2004), OECD Environmental Performance Reviews Sweden, Paris, France.
- Organisation for Economic Co-operation and Development (OECD) (2005), Environmentally Harmful Subsidies Challenges for Reform, Paris, France.
- Organisation for Economic Co-operation and Development (OECD) (2005a), The Political Economy of the Norwegian Aviation Fuel Tax, COM/ENV/EPOC/CTPA/CFA(2005) 18/FINAL, Paris, France.
- Palpa (2004), Development, The recycling of beverage cans in 2004 –

- <http://www.palpa.fi/default.asp?docId=11979&rnd=-422982183288911>
- Palpa (www.palpa.fi) - Recycle beverage cans through shops – <http://www.palpa.fi/default.asp?docId=11923&rnd=52109567129510>
- Prime Minister's Office (2000), Environmental and energy taxation in Finland – Preparing for the Kyoto challenge, section 4.2, www.vn.fi/vnk/english/publications/vnk20004e/index.html
- Rättsnätet (2005), Lag (1994:1776) om skatt på energi, www.notisum.se/rnp/sls/lag/19941776.htm
- Resirk (2003), Årsmelding – http://www.resirk.no/graphics/Resirk/Aarsrapport/resirk_aarsrapport_web.pdf
- Returkartong – Facts about Norsk Returkartong AS – <http://www.returkartong.no/index.cfm?id=71>
- RVF (2003), Swedish Waste Management 2003 <http://www.rvf.se/m4n?oid=english& locale=1>
- RVF (2004), Avfallsmängder 2003 – <http://www.rvf.se/m4n?oid=331& locale=1>
- RVF (2004a) Avfallsekonomi <http://www.rvf.se/m4n?oid=368& locale=1>
- RVF (2004b), Skatteutredningen ökar takten, RVF-nyheterna nr 14/04 – 29 October <http://www.rvf.se/m4n?oid=500& locale=1>
- RVF (2005), BRAS-utredaren föreslår skatt på fossila delen av avfall som förbränns, RVF-nyheterna nr 4/05 – March 2005 – <http://www.rvf.se/m4n?oid=708& locale=1>
- RVF (2005a), Skärpt producentansvar, stöd för återvinning av matavfall och el-certifikat bättre styrmedel än skatt på förbränning, RVF-nyheterna nr 8/05 – May 2005 – <http://www.rvf.se/m4n?oid=767& locale=1>
- RVF (2005b), 30 procent av hushållens säck- och kärllavfall utgörs av förpackningar och returpapper <http://www.rvf.se/m4n?oid=738& locale=1>
- SFT (2002), Ny forskrift om bilvrak, 04.07.02 - <http://www.sft.no/nyheter/dbafile7263.html>
- SFT (2003), Refusjonsordningen for Spillolje, http://www.sft.no/nyheter/dokumenter/spilleolje_refusjonsordning2003.pdf
- SFT (2003a), Biloppsamlingssystemet i Norge 25 år, 16.10.03 <http://www.sft.no/nyheter/dbafile9984.html>
- SFT (2004), Kilder til avfall, Miljøstatus i Norge http://www.miljostatus.no/templates/PageWithRightListing_3267.aspx
- SFT (2004a), Veileder om beregning av kommunale avfallsgebyr <http://www.sft.no/publikasjoner/avfall/2001/ta2001.pdf>
- SFT (2004b), Klima og ozon, Avgifter, HFK og PFK, Miljøstatus i Norge http://www.miljostatus.no/templates/PageWithRightListing_4287.aspx
- SFT (2004c), Avfall, Bilvrak http://www.miljostatus.no/templates/PageWithRightListing_3271.aspx
- SFT (2004d), Konsekvenser av implementering av EUs RoHS-direktiv i Norge http://www.sft.no/nyheter/dokumenter/produktforskriften_eeku270804.pdf
- SFS 1970:244 <http://www.notisum.se/rnp/sls/lag/19700244.HTM>
- Skatteverket (2005a), Historik Skattesatser http://skatteverket.se/pdf/sskinfo_2005.pdf
- Skatteverket (2005b), Fordonskatte tabeller <http://www.skatteverket.se/skatte/fordonsskatt/fordonsskatte tabeller05.pdf>
- Skatteverket (2005c), Road user charges (tolls) for foreign heavy goods vehicles http://skatteverket.se/skatte/vagavgifter_utl.html
- Sopor (not dated) Rena Fakta, Miljömål och avgifter www.sopor.nu
- Söderholm P. (2004), Extending the Environmental Tax Base Prerequisites for Increased Taxation of Natural Resources and Chemical Compounds, Swedish Environmental Protection Agency, Stockholm, Sweden.
- Speck S. (2005), Overview of Environmental Tax Reforms in EU Member States, Working paper of the EU funded research project 'COMETR – Competitiveness effects of environmental tax reform', National Environmental Research Institute, Denmark.
- Speck S. and E. Özdemiroğlu (2004), Economic Instruments for the Protec-

- tion of the Black Sea, a report for the Black Sea Ecosystem Recovery Project (BSERP), Istanbul, Turkey.
- Statistics Iceland (*not dated*)
http://www.hagstofa.is/template_db_frame.asp?PageID=1282&ifrmsrc=/uploads/files/LH04/L040115.xls
- Statistics Norway (1999), Kommunalt avfall, 1998. Gebyrer Store forskjeller i renovasjonsgebyrene
<http://www.ssb.no/emner/01/05/10/avfgebyr/>
- Statistics Norway (2003), – Natural Resources and the Environment, Chapter 8, Water
http://www.ssb.no/english/subjects/01/sa_nrm/arkiv/nrm2003/kap8-water.pdf
- Statistics Norway (2003a), Municipal residential charges
http://www.ssb.no/english/subjects/05/03/kommgebe_en/
- Statistics Norway (2003b), – Natural Resources and the Environment, Chapter 7, Waste
http://www.ssb.no/english/subjects/01/sa_nrm/arkiv/nrm2003/kap7-waste.pdf
- Statistics Norway (2004), KOSTRA VAR, The municipal waste sector 2004
http://www.ssb.no/english/subjects/01/04/20/var_kostra_en/
- Statistics Norway (2004a), KOSTRA, Municipal water supply 2004
http://www.ssb.no/vann_kostra_en/
- Statistics Norway (2004b), Municipal water supply – KOSTRA, 2 Water fees, for a private dwelling of 120 m², by county figures. 2004. NOK
http://www.ssb.no/vann_kostra_en/arkiv/tab-2004-06-22-02-en.html
- Statistics Norway, 2004c. Avfallshåndtering, 2003, Avfallsforbrenning doblett på 10 år <http://www.ssb.no/emner/01/05/avfhand/>
- Statistisk Sentralbyrå (2005)
- Statistics Norway (2004d), Utvalgte nøkkeltall, kommuner – nivå 1
<http://www.ssb.no/kostra/>
- Statistics Sweden (2003), Environmental Subsidies – a Review of Subsidies in Sweden between 1993 and 2000, Rapport 2003:4, Stockholm, Sweden.
- Steenblik R.P. (2003), Subsidy Measurement and Classification: Developing a Common Framework, in: OECD, Environmentally Harmful Subsidies: Policy Issues and Challenges, Paris, France.
- Sterner T. (2003), Policy Instruments for Environmental and Natural Resource Management, Resources for the Future Press, Washington DC, USA.
- Svensk författningssamling (2001), Förordning om ändring i förordningen (2000:208) om producentansvar för elektriska och elektroniska produkter
<http://62.95.69.3/SFSDOC/01/011077.PDF>
- Svenskvatten (2001) [Facts on Water Supply and Sanitation in Sweden](http://www.svenskvatten.se/main/bin/aryLoader.asp?objectID=378&propertyID=File1&binaryType=2)
<http://www.svenskvatten.se/main/bin/aryLoader.asp?objectID=378&propertyID=File1&binaryType=2>
- Svenskvatten (2004), Kranvatten – ett bra och billigt livsmedel.
<http://www.svenskvatten.se/main/bin/aryLoader.asp?objectID=803&propertyID=File1&binaryType=2>
- Svenskvatten (2005), Vårt viktigaste livsmedel – kranvattnet
- Taxestatistik för 2005
<http://www.svenskvatten.se/main/bin/aryLoader.asp?objectID=1085&propertyID=File1&binaryType=2>
- Svenska Naturskyddsföreningen (2005), Koldioxidskatten
www.snf.se/verksamhet/miljopolitik/val98/9.htm
- Swedish Energy Agency (2004), The Energy Market 2004, Sweden
- Swedish Energy Authority (2003), Ekonomiska styrmedel inom energiområdet [http://www.stem.se/web/biblshop.nsf/FilAtkomst/StyrmIVA.pdf/\\$FILE/StyrmIVA.pdf?OpenElement](http://www.stem.se/web/biblshop.nsf/FilAtkomst/StyrmIVA.pdf/$FILE/StyrmIVA.pdf?OpenElement)
- Swedish Environmental Protection Agency (SEPA) (1997), Environmental Taxes in Sweden, Stockholm.
- Swedish Environmental Protection Agency (Swedish EPA) (2003a), Samla in, återvinn! Uppföljning av producentansvaret för 2002; Rapport 5299 <http://www.naturvardsverket.se/bokhandeln/pdf/620-5299-3.pdf#search='Återfyllnad%20dryckesf&rp&ackningar'>
- Swedish Environmental Protection Agency (Swedish EPA) (2004), “Samla in, återvinn! Uppföljning av producentansvaret för 2003”, Rapport 5380 June 2004

- <http://www.naturvardsverket.se/bokhandeln/pdf/620-5380-9.pdf>
- Swedish Environmental Protection Agency (Swedish EPA) (2004a), Pro-
ducentansvar för returpapper
<http://www.naturvardsverket.se>
- Swedish Environmental Protection Agency (Swedish EPA) (2005), Pro-
ducentansvar
<http://www.naturvardsverket.se/index.php3?main=/dokument/teknik/producent/produktok/forp.htm>
- Swedish Tax Agency (2005), Avfalls-
skatt
<http://www.rsv.se/skatter/punktskatter/avfallsskatt.html>
- The Association of Local Authorities in
Iceland (2001), Tafla 11. Útsvar-
sprósentu og álagningarreglur fasteig-
nagjalda árið 2001 í
kaupstöðum/bæjum og hreppum með
1.000 íbúa og fleiri
http://www.samband.is/files/{48E4F2B7-BE54-43B9-A925-67D3F9EEBFF0}_bls129.pdf#search='fasteignagjalda%20Á;ri%202001'
- The Association of Local Authorities in
Iceland (2004), Tafla 19. Útsvar-
sprósentu og álagningarreglur fasteig-
nagjalda árið 2004 í sveitarfélögum
með 1.000 íbúa og fleiri
http://www.samband.is/files/702834537Bls_178.pdf
- The Secretariat for Legal Information –
www.retsinfo.dk – Bekendtgørelse af
lov om miljøbeskyttelse
http://www.retsinfo.dk/GETDOC/_ACCN/A20010075329-regl
- Toll- og Avgiftsdirektoratet (2004a),
Særvavgifter i Norge.
- Toll- og Avgiftsdirektoratet (2004b),
Stortingets avgiftsvedtag for 2005,
lov om særvavgifter og forskrift om
særvavgifte.
- Toll- og Avgiftsdirektoratet (2004c),
Engangsavgift på motorvogn mv.
2005.
- Toll- og Avgiftsdirektoratet (2004d),
Årsavgift 2005.
- Vehmas J. (2005), Energy-related taxa-
tion as an environmental policy tool –
the Finnish experience 1990–2003,
Energy Policy, Vol. 33, pp.2178–
2179.
- Vehmas J. (2005) personal communica-
tion
- Waste Centre Denmark (2004), Øko-
nomiske styringsmidler
<http://www.affaldsinfo.dk/default.asp?side=898>
- World Bank (1993), Road User Taxa-
tion in selected OECD Countries
<http://www.worldbank.org/afr/ssatp/Work-ing%20Papers/SSATPWP03.pdf>

Estonia

- Estonian Energy (2003), Ministry of
Economic Affairs and Communica-
tions <http://www.mkm.ee/index.php?id=1787>
- Act on Alcohol, Tobacco and Fuel
Excise <https://www.riigiteataja.ee/ert/act.jsp?id=828525>
- Electricity Market Act
<http://www.mkm.ee/failid/ElectricityMarketAct.doc>
- Web page of Estonian Ministry of the
Environment <http://www.envir.ee/valisohukaitse/RJK.pdf>
- Sum of allowances and their allocation
plan for greenhouse gases emitted
from stationary pollution sources
<https://www.riigiteataja.ee/ert/act.jsp?id=844600>
- Pollution Charge Act
<https://www.riigiteataja.ee/ert/act.jsp?id=780277>
- Act Amending Pollution Charge Act
<http://www.riigiteataja.ee/ert/act.jsp?id=73411&replstring=33>
- Explanation Letter for Pollution Charge
Act Proposal http://www.envir.ee/oigusaktid/eelnoud/keskkonnatasude_seletuskiri.pdf
- Water Law
<https://www.riigiteataja.ee/ert/act.jsp?id=874375>
- Municipal Water Supply and Canalisa-
tion Act
<https://www.riigiteataja.ee/ert/act.jsp?id=254280>
- Homepage of Tallinna Vesi
<http://www.tallinnavesi.ee>
- Homepage of Tartu Veevärk
<http://www2.tartuveesi.ee>
- Overview of Estonian Waste Treatment
http://www.keskkonnainfo.ee/jaatmed/aruanded/toimetis_2003_v02.pdf
- Explanation letter to Pollution Charge
Act proposal

http://www.envir.ee/oigusaktid/eelno/ud/keskkonnatasude_seletuskiri.pdf

Waste Act

<https://www.riigiteataja.ee/ert/act.jsp?id=873572>

Package Act

<https://www.riigiteataja.ee/ert/act.jsp?id=833958>

Obligations, set-up, targets and implementation deadlines for collection, returning to producer, recycling and disposal of motor vehicles and their parts

<https://www.riigiteataja.ee/ert/act.jsp?id=826344>

Obligations, set-up, targets and implementation deadlines for collection, returning to producer, recycling and disposal of WEEE

<https://www.riigiteataja.ee/ert/act.jsp?id=832156>

Heavy Motor Vehicle Act

<https://www.riigiteataja.ee/ert/act.jsp?id=693680>

Package Act

<https://www.riigiteataja.ee/ert/act.jsp?id=833958>

Estonian Environment Investment

Centre. Annual Report 2003

<http://213.180.19.90/static/body/files/161.kik2003.pdf>

Web page of Estonian Environment

Investment Centre <http://www.kik.ee>

Latvia

Legislation

Cabinet of Ministers regulation No 414 on Application of deposit system to reusable packaging (22.06.2003, in force since 01.01.2004) [English translation available at

<http://www.ttc.lv/New/lv/tulkojumi/E0549.doc>]

Law on Annual Vehicle Tax adopted in 22.11.2001 (in force 01.01.2002) with amendments till 30.10.2003

Law on Electricity adopted in 03.09.1998 (in force since 06.10.1998) with amendments till 15.04.2005 [English translation available at

<http://www.ttc.lv/New/lv/tulkojumi/E0464.doc>]

Law on Excise Duties for Petroleum Products adopted in 13.11.1997 (in force from 01.01.1998 till 01.05.2004) with amendments till 30.10.2003

Law on Excise Duties adopted in 30.10.2003 (in force since 01.05.2004) with amendments till 14.04.2005. [English translation available at

<http://www.ttc.lv/New/lv/tulkojumi/E0656.doc>]

Law on Motorcar and Motorbike Tax adopted in 30.10.2003 (in force 30.10.2003) with amendments on 22.04.2004

Law on Natural Resources Tax adopted in 14.09.1995 (in force since 01.01.1996) with amendments till 07.04.2004 [English translation available at

<http://www.ttc.lv/New/lv/tulkojumi/E0074.doc>]

Law on Regulators of Public Utilities adopted in 19.10.2000 (in force since 01.06.2001) with amendments till 27.09.2001 [English translation available at

<http://www.ttc.lv/New/lv/tulkojumi/E0145.doc>]

Other reports and publications

Annual reports of State Revenue Service for 2002 and 2003

<http://www.vid.gov.lv/user/view.asp?CId=4>

Characterisation Report of River Basin Districts, human activity and economic analysis, Latvian Environmental, Geological and Meteorological Agency in 2004

http://www.lva.gov.lv/zinojumi/wfd2005_lv

National Allocation Plan 2005–2007, Latvian Ministry of the Environment <http://www.vidm.gov.lv/varam/not/not/1040302.htm>

Proposal for a COUNCIL DIRECTIVE amending Directive 2003/96/EC as regards the possibility for certain Member States to apply, in respect of energy products and electricity, temporary exemptions or reductions in the levels of taxation, Brussels, 28.1.2004 COM(2004) 42 final 2004/0016 (CNS)

Renewable Energy Sources in Estonia,
Latvia and Lithuania, Baltic Envi-
ronmental Forum, 2003
Statistical Yearbook of Latvia, 2004

Lithuania

Legislation

Decision of State National Control
Commission for prices and energy on
the methodology for setting price for
cold water supply and wastewater
management (2001 11 30, Nr. 119,
2004 09 30 Nr. O3-96, as amended in
2004 12 14 d. O3-135)
Governmental decision on packaging,
for which deposit must be collected,
deposit level and deposit-refund sys-
tem implementation (2002 09 25,
No. 1506)
Governmental decision on the imple-
mentation of the Law on Environ-
mental Pollution Tax (No. 1445,
2002-09-17, No. 1675, 2003-12-24)
Governmental decision on the taxes on
state natural resources (No 1320,
1995 10 10; as amended 1997 05 24,
1998 03 05, 2002 04 30)
Law of financing road maintenance and
development programme, No VIII-
2032, 2000 10 12, IX-2546,
2004 11 09
Law on Energy (IX-884, 2002 05 16,
IX-1644, 2003 06 24)
Law on Environmental Pollution Char-
ge, 1999 05 13 VIII-1183, in force
from 2000 01 01 (VIII-2027, 2000 10
12; new revision IX-720, 2002 01 22;
amendments IX-1265, 2002 12 10;
IX-1547, 2003 04 29; IX-1608, 2003
06 10; IX-1970, 2004 01 22, IX-2139,
2004 04 15, IX-152, 2005 03 31)
Law on Environmental Protection
Support Programme, No VIII-2025,
2000 10 12, (IX-1092, 2002 09 19,
IX-1611, 2003 06 10, IX-2380,
2004 07 15)
Law on Excise duty (No I-VIII-556,
1997 12 09, IX-170, 2001 01 26, No
IX-569, 2001 10 30, No IX-569, 2001
10 30, as amended by IX-1987,
2004 01 29)
Law on Taxes of State Natural Resour-
ces (11-I-1313, 1996 04 30, VIII-

2028, 2000 10 12, IX-1093, 2002-09-
19, IX-1609, 2003-06-10)

Law on Taxes on Petroleum and Natu-
ral Gas Resources (1996 04 30,
amended in 2003 05 20 (in force from
2003 07 01)

Lithuania's National Allocation Plan
for Greenhouse Gas Emission Allo-
wances for the Period 2005 to 2007
approved by MoE order of 2004 12
27, order No. D1-686

National Energy Strategy (IXP-
1773(4SP)/2002 10 07)

Order of promotion of production and
purchasing of electricity from rene-
wable sources and waste, Govern-
mental decision approval of legal
acts, required for implementation of
the Law on Electricity, No 1447,
2001 12 05, as amended by govern-
mental decisions 25, 2004 01 12, 627,
2005 06 08)

Order of the MoE on order of financing
and supervision of investment pro-
jects of public institution Environ-
mental Protection Investments fund
(No 437, 2003 08 29, D1-402, 2004
07 16)

State Strategic Waste Management Plan
(approved by Governmental decision
No. 519, 2002 04 12, as amended No
185 2003 02 03, No 96 2004 01 29,
No. 577 2004 05 14, No 1252, 2004
10 05, No 290, 2005 03 16)

Other reports and publications

Annual report for 2004, National
Control Commission for Prices and
Energy, Vilnius, 2005

Enhancement of Use of Local and
Renewable Energy Sources – Lithua-
nia, Final Report, Danish Energy Ma-
nagement A/S, 2003, www.avei.lt

Report on Articles and 6 of the Directi-
ve 2000/60/EC of the European Par-
liament and the Council of 23 Octo-
ber 2000 establishing a framework for
Community action in the field of wa-
ter policy, Lithuanian environmental
Protection Agency, 2005,
www.aaa.am.lt

Review of Economic and Social status
of the Economy of the Republic of
Lithuania, Ministry of Economy,
2004, February 2005, in Lithuanian
(Lietuvos Respublikos ūkio

ekonominės ir socialinės būklės 2004 metais apžvalga, Lietuvos ūkio ministerija, 2005 vasaris)

Statistical information:

Department of Statistics to the Government of the Republic of Lithuania (Statistics Lithuania), www.std.lt
Lithuanian Tax Inspection – www.vmi.lt

References – Part II

- Aasness J. and E.R. Larson (2002), Distributional and Environmental Effects of Taxes on Transportation, Statistics Norway, Research Department, Discussion Paper No. 321, Oslo, Norway.
- Agenor P.R. (1997), Competitiveness and external trade performance of the French manufacturing industry, *Weltwirtschaftliches Archiv* 133:1, pp.103–133.
- Amendola G. et al. (1993), The dynamics of international competitiveness, *Weltwirtschaftliches Archiv* 129 (3): pp. 451–471
- Andersen M.S. (1999), Governance by green taxes: implementing clean water policies in Europe, *Environmental Economics and Policy Studies* 2:1, pp. 39–63.
- Andersen M. S. (2000), The Danish waste tax: the role of institutions for the implementation and effectiveness of economic instruments. In: Andersen, M.S. and R.-U. Sprenger (eds). *Market-based instruments for environmental management: policies and institutions*. Cheltenham: Edward Elgar
- Andersen M. S. (2005), Do green taxes work? Decoupling environmental pressures and economic growth. *Public Policy Research*, June–August 2005: 79–84.
- Andersen M.S. et al. (2005), Effectiveness of urban wastewater treatment policies in selected countries: an EEA pilot study, EEA Report 2, Copenhagen: European Environment Agency.
- Baranzini A., J. Goldemberg and S. Speck (2000), A Future for Carbon Taxes, *Ecological Economics*, Vol. 32, pp. 395–412
- Barker T. and J. Köhler (1998), Equity and ecotax reform in the EU: achieving a 10% reduction in CO₂ emissions using excise duties. *Environmental Fiscal Reform Working Paper No. 10*, University of Cambridge, Cambridge, UK.
- Böhringer C. (2002), *Environmental Tax Differentiation Between Industries and Households*, Discussion Paper No. 02–08, Centre for European Economic Research, Mannheim, Germany
- Bovenberg A.L. and R.A. de Mooij (1994), Environmental levies and distortionary taxation, *American Economic Review*, 94, pp. 1085–89.
- Bovenberg A.L. and R.A. de Mooij (1997), Environmental tax reform and endogenous growth, *Journal of Public Economics*, 63, pp. 207–237.
- Bovenberg A.L. and van der Ploeg (1998), Consequences of environmental tax reform for unemployment and welfare, *Environment and Resource Economics* vol. 12(2), 137–150.
- Brännlund R. and J. Nordström (2004), Carbon tax simulations using a household demand model, *European Economic Review*, Vol. 48, pp. 211–233.
- Bruvoll A. and B. M. Larsen (2004), Greenhouse gas emissions in Norway: do carbon taxes work. *Energy Policy* 32: 493–505.
- Budd L. and A.K. Hirmis (2004), Conceptual framework for regional competitiveness, *Regional Studies* 38:9, pp.1015–1028.
- Bye B., S. Kverndokk and K. E. Rosendahl (2002), Mitigation costs, distributional effects and ancillary benefits of carbon policies in the Nordic Countries, the UK and Ireland: A survey of model results, *Mitigation and Adaptation Strategies for Global Change* 7, 2002, 339–366.
- Capros P. et al. (1999), Analysis of energy system changes to reduce CO₂ emissions in 2010 for Europe-14. National University of Athens, Greece. http://www.europa.eu.int/comm/environment/enveco/capros_en_model/euco2out.pdf.

- DeCanio S. (1998), The efficiency paradox: bureaucratic and organizational barriers to profitable energy-saving investments, *Energy Policy*, 26:5, pp. 441–454.
- CE (2005), Giving wings to emission trading Inclusion of aviation under the European emission trading scheme (ETS): design and impacts, a report commissioned by the European Commission, DG Environment, Delft, the Netherlands.
- DIW (German Institute for Economic Research) (2005), Erneuerbare Energien: Weitere Förderungen unverzichtbar, Pressemitteilung des DIW Berlin vom 20.07.2005, Berlin, Germany.
- Durand M. and C. Giorno (1987), Indicators of international competitiveness: conceptual aspects and evaluation, OECD.
- Durand M., J. Simon, C. Webb (1992), OECD's indicators of international trade and competitiveness, Working Papers 120, GD(92)138, OECD: Economics Dept.
- ECON (2004), Evaluering av miljøavgifter. Rapport 2004-123.
- EFTA Court, 2005, Judgement 21. July 2005 in joined cases E-5/04 E-6/04 and E-7/04.
- Ekins P. and S. Dresner (2004), Green taxes and charges Reducing their impact on low-income households, Joseph Rowntree Foundation, York, UK.
- Ekins P. and S. Speck (1999), Competitiveness and Exemptions from Environmental Taxes in Europe *Environmental and Resource Economics*, Vol. 13, pp. 369–396.
- Ekins P. and S. Speck (2000), Proposal of Environmental Fiscal Reforms and the Obstacles to their Implementations, *Journal of Environmental Policy and Planning*, Vol. 2, pp. 93–114.
- ENDS Daily (2005), Denmark to rely on the market for renewables, 22. June 2005.
- Enevoldsen M. (2005), *The Theory of Environmental Agreements and Taxes*. London: Edward Elgar
- European Commission (EC) (2001), Community guidelines on state aid for environmental protection, Official Journal C37/03-15.
- European Commission (EC) (2002), Benefits table database: estimates of the marginal external costs of air pollution in Europe, Version E1.02a, Bruxelles. http://europa.eu.int/comm/environment/enveco/air/betaec02_aforprinting.pdf
- European Commission (EC) (2003a), Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_275/l_27520031025en00320046.pdf.
- European Commission (EC) (2003b), Commission communication COM(2003)830 of 7 January 2004 on guidance to assist Member states in the implementation of the criteria listed in Annex III to Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, and on the circumstances under which force majeure is demonstrated, http://europa.eu.int/eur-lex/en/com/cnc/2003/com2003_0830en01.pdf.
- European Commission (EC) (2004a), European Competitiveness Report, SEC(2004)1397, Brussels.
- European Commission (EC) (2004b), EU emission trading: An open scheme promoting global innovation to combat climate change, http://europa.eu.int/comm/environment/climat/pdf/emission_trading2_en.pdf.
- European Commission (EC) (2004c), Commission decides on the Swedish energy tax system 2002 to 2005, IP/04/833, Bruxelles: RAPID.
- European Commission (EC) (2005), The Commission approves Danish introduction of new tax on phosphorous in feed, IP/05/69, Bruxelles: RAPID.
- European Environment Agency (EEA) (2005), Market-based Instruments for Environmental Policy in Europe, EEA Technical report No 8/2005, Copenhagen, Denmark.
- Eurostat (2003), Energy Taxes in the Nordic Countries – Does the polluter

- pay? A report prepared by the National Statistical Offices in Norway, Sweden, Finland & Denmark, Luxembourg.
- Fagerberg J. (1996), Technology and competitiveness, *Oxford Review of Economic Policy*, 12:3, pp. 39–51.
- Golombek, R. and M. Hoel (2005), *Pliktige elsertifikater*, Ragnar Frisch Centre for Economic Research, www.frisch.uio.no/pdf/rapp05_01.pdf
- Goulder L. (1995), Environmental taxation and the double dividend: A reader's guide, *International Tax and Public Finance*, 2, pp. 155–182.
- Goodstein E. (2003), The death of the Pigovian tax? Policy implications from the Double-Dividend debate, *Land Economics* 79(3) pp. 402–414.
- Hansen L. (2004), EU's klimapolitik forvrider konkurrencen, *El & energi: Elværkernes blad*, vol. 100, 2004, pp. 6–8.
- Hildén, M. et al (2002), Evaluation of environmental policy instruments – a case study of the Finnish pulp&paper and chemical industries, Helsinki: Finnish Environment Institute.
- Hiltunen M. (2004), *Economic Environmental policy instruments in Finland*, Helsinki: Finnish Environment Institute.
- Holland M., Berry J. and Forster, D. (eds.) (1999), *ExternE Externalities of Energy Volume 7: Methodology 1998 Update*. European Commission, Directorate-General XII, Science, Research and Development. Brussels. <http://www.externe.info/>
- Kåberger, T., T. Sterner, M. Zamanian and A. Jürgensen (2004), *Economic Efficiency of Compulsory Green Quotas in Sweden*, as quoted in EEA 2005a, Copenhagen, Denmark.
- Kautto P. and J. Similä (2005), Recently introduced policy instruments and intervention theories. Evaluation. Vol II (I), pp. 55–68.
- Klepper G. and S. Peterson (2003), *International trade and competitiveness effects, Emission trading policy briefs*, University College Dublin <http://www.ucd.ie/pepweb/publications/policybriefs/pb-et-06.pdf>.
- Klepper G. and K. Springer (2003), *Climate protection strategies: International allocation and distribution effects*, Climate change volume 56, 2003, pp. 211–226.
- Klinge J., K. Birr-Pedersen and M. Wier (2005), *Fordeæingsvirkninger af energi- og miljøafgifter*, Risø National Laboratory, Roskilde, Denmark.
- Krugman P. (1994), *Competitiveness: A Dangerous Obsession*, *Foreign Affairs* 73(2), pp. 28–44.
- Kuik O. and M. Mulder (2004), *Emission trading and competitiveness: pros and cons of relative and absolute schemes*, *Energy Policy Volume* 32, 2204, pp. 737–745.
- Leibenstein H. (1966), *Allocative efficiency vs. "X-efficiency"*, *American Economic Review*, 56:3, pp. 392–415.
- Melanen M. et al. (2002), *Finnish Waste Policy – effects and effectiveness*, Resources, conservation and recycling, 35: 1–15.
- Miljøstyrelsen (1997), *Affaldsafgiften 1987–1996*. Arbejdsrapport nr. 96 fra Miljøstyrelsen.
- Miljøstyrelsen (1999), *Effekter af den forhøjede affaldsafgift – med særlig fokus på erhvervsaffald*. Arbejdsrapport nr. 22 fra Miljøstyrelsen.
- Miljøstyrelsen (2004), *Økonomiske virkemidler på natur og miljøområdet*. Miljøprojekt nr. 887 2004. (Danish EPA: Economic policy instruments regarding nature and environment).
- Miljøstyrelsen (2005), *Danmarks udledning af CO₂-indsatsen i perioden 1990–2001 og omkostningerne derved*. Hovedrapport. Redegørelse fra Miljøstyrelsen Nr.2 2005.
- Ministry of the Environment (Finland), *Revised national waste plan for the period up to 2005*. Approved by the Finnish Government on 14 August 2002
- Ministry of Finance (Sweden) (2005), *The Budget Bill for 2006*, <http://www.sweden.gov.se/sb/d/5931/a/50049.jsessionid=ahA4WmiLVoA8>.
- Naturvårdsverket and The Swedish Energy Agency (2004), *Swedish climate strategy – a basis for the evaluation of Swedish Climate Work*, checkpoint 2004.
- Naturvårdsverket (2003), *Ekonomiska styrmedel inom miljöområdet – en sammanställning*. Rapport 5333-November 2003.

- NERA (2004), Evaluation of the Feasibility of Alternative Market-Based Mechanisms to Promote Low-Emission Shipping in European Union Sea Areas, A report for the European Commission, DG Environment, London, UK.
- NERA (2005), Economic Instruments for Reducing Ship Emissions in the European Union, A report for the European Commission, DG Environment, London, UK.
- Nordic Council of Ministers (2002). The use of economic instruments in Nordic environmental policy, 1999–2001. TemaNord 2002: 581
- NOU (1996), Grønne skatter – en politikk for bedre miljø og høy sysselsetting, Oslo.
- Parry I. (1995), Pollution taxes and revenue recycling, *Journal of Environmental Economics and Management*, 29, pp. 64–77.
- Pearce D. (1991), The role of carbon taxes in adjusting to global warming, *The Economic Journal* 101, pp. 938–948.
- Plancenter Ltd. (2005), A study of the efficiency of the waste tax in Finland. English summary of report commissioned by Finland's Ministry of Environment. Helsinki: Plancenter Ltd.
- Porter M. and C. van der Linde (1995), Toward a new conception of the environment-competitiveness relationship, *Journal of Economic Perspectives* 9:4, pp. 97–118.
- Porter M. (1991), America's green strategy, *Scientific American*, p. 96.
- Pricewaterhouse Coopers (2005), DEMO Project Monitoring and verification of NO_x and SO₂ emissions at sea, <http://www.seaat.org/DemoProject/>
- Organisation for Economic Co-operation and Development (OECD) (1992), *Technology and the Economy: the Key Relationships*, Paris, France.
- Organisation for Economic Co-operation and Development (OECD) (1996), *Implementation Strategies for Environmental Taxes*, Paris, France.
- Organisation for Economic Co-operation and Development (OECD) (2001), *Environmentally related taxes in OECD countries – issues and strategies*, Paris, France.
- Symons E., S. Speck and J. Proops (2002), The Distributional Effects of Carbon and Energy Taxes: The Cases of France, Spain, Italy, Germany and UK, *European Environment*, Vol. 12, pp. 203–212.
- Swedish Environmental Protection Agency (2004), *Developing Green Taxation Summary of a Government Assignment Report*, Report Summary 8190, Stockholm, Sweden.
- tenBrink, P. (ed.) (2002), *Voluntary Environmental Agreements – Process, Practice and Future Use*, Greenleaf Publishing Ltd., Sheffield, UK.
- Thompson G. (1998), International competitiveness and globalization: frameworks for analysis, connections and critiques, in: T. Barker and J. Köhler (eds.), *International competitiveness and environmental policies*, pp. 13–32, Edward Elgar, London.
- UK Department of Trade and Commerce (1998), quoted by Budd L. and A.K. Hirmis (2004), Conceptual framework for regional competitiveness, *Regional Studies*, Vol. 38:9, pp. 1015–1028.
- Van Calster G. (2003), Topsy-turvy: the European Court of Justice and Border (Energy) Tax Adjustments – Should the World Trade Organization follow suit?, in: J. Milne, K. Deketelaere, L. Kreiser and H. Ashiabor (eds.) *Critical Issues in Environmental Taxation International and Comparative Perspectives: Volume I*, Richmond Law&Tax, Richmond, United Kingdom.
- Weinbrenner D. (1999), *Ökologische Steuerreform: Wirkungszusammenhänge zwischen Emissions- und Fiskalsteuern*, Wiesbaden: Deutscher Universitätsverlag.
- Wier M., M. Lenzen, J. Munksgaard and S. Smed (2001), Effects of households consumption pattern on CO₂ requirements. *Economic System Research*, Vol. 13, pp. 259–273.
- Wier M., K. Birr-Pedersen, H. K. Jacobsen and J. Klok (2005), Are CO₂ taxes regressive? Evidence from the Danish experience, *Ecological Economics*, Vol. 52, pp. 239–251.