

Market-based instruments for environmental policy in Europe

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Foreword and acknowledgements

The report *Market-based instruments for environmental policy in Europe* presents an overview and assessment of the main recent developments in the use of market-based instruments in Europe. It is available in parallel with the publication *Using the market for cost-effective policy — Market-based instruments for environmental policy in Europe* (2005) which deals with the same subject though in a more concise way. It is the fourth report by the European Environment Agency (EEA) on market-oriented instruments available to environmental policy-makers. The following are earlier EEA reports published on the use of environmental taxation and charging: *Environmental taxes — Implementation and environmental effectiveness* (1996) and *Environmental taxes — Recent developments in tools for integration* (2000) and on environmental agreements: *Environmental agreements — Environmental effectiveness* (1997).

This report considerably broadens the scope of the EEA's reporting in this area, as it covers a range of instruments. It gives a concise overview of the use and experience of environmental taxes, charges and deposit-refund systems, emissions trading schemes, subsidies, and liability and compensation requirements, as tools to achieve environmental objectives, in the whole European area.

This report was drafted for the EEA by a team comprising the Institute for European Environmental Policy (IEEP), University College, Dublin (UCD), Eunomia, and Stefan Speck, under contract reference 3223/B2003.EEA.51620. The project and report were led by Patrick ten Brink of the IEEP, and there were major contributions by Professor Frank Convery (lead author of Chapter 2 on emissions trading), Stefan Speck (lead author of Chapters 3 and 4 on taxes and charges, and environmental tax reform respectively). Other key authors include Dominic Hogg of Eunomia (waste

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This report was written under the guidance of an expert group with representatives from across Europe. This expert group met twice. Firstly, in December 2003, to explore the issues to be covered by this report, and determine the appropriate structure. Secondly, in December 2004, to discuss the final draft version of the report. During 2004, the members of the expert group commented on earlier drafts of the chapters.

The expert group included Professor Frank Convery (University College, Dublin), Kai Schlegelmilch (German Ministry of the Environment), Bob Davies (Department for Environment, Food and Rural Affairs, the United Kingdom), Manfred Rosenstock and Madeleine Infeld (European Commission), Marina Markovic (consultant), Nils Axel Braathen and Bertrand Le Gallic (Organisation for Economic Co-operation and Development), Professor Mikael Skou Andersen (National Environmental Research Institute, Denmark), Petr Sauer (Prague University), Jan Pieters (Dutch Ministry of the Environment), Professor Thomas Sterner (University of Gothenburg), Frans Oosterhuis (Institute for Environmental Studies, Free University of Amsterdam) and Eduard Interwies (Ecologic).

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Executive summary

1 Why market-based instruments?

Much environmental pollution and natural resource depletion comes from incorrect pricing of the goods and services we produce and consume. 'Market-based instruments' (MBIs) — such as taxes, charges, subsidies and tradable permits help to realise simultaneously environmental, economic and social policy objectives by taking account of the *hidden costs* of production and consumption to people's health and the environment, in a cost-effective way. These hidden costs include damage from air and water pollution, waste disposal, soils and species losses, climate change and the floods, heat waves and storms that it brings, and health costs. These costs are often paid by people who are not even benefiting from the use of these products, such as the next generation of children, the Arctic peoples who are on the receiving end of Europe's pollution, the poor living next to roads and factories, or pensioners without cars in big cities.

Market-based instruments can be particularly effective tools for dealing with the four major areas of action of the EU 6th environmental action programme, namely: tackling climate change, preserving nature and biodiversity, protecting environment and human health, and through the sustainable use of resources and management of wastes. They do so by addressing the sources of environmental pollution most relevant to these areas such as:

- emissions from power stations, industry, cars and aircraft (tradable emission permits, fuel taxes);
- increasing waste generation by households and other actors (waste disposal taxes, taxes on packaging, incentives for recycling);
- emissions resulting from houses and offices (incentives for improved insulation and energy efficient heating systems);
- emissions resulting from agricultural activities (fertiliser and pesticide taxes).

MBIs provide a stimulus to consumers and producers to change their behaviour towards more eco-efficient use of natural resources by reducing consumption per se, by stimulating technological innovation and by encouraging greater transparency on how much we pay for what. MBIs can therefore

also contribute to wider sustainable development objectives in the EU and the goals of the Lisbon agenda.

Last but not least, some MBIs raise revenue that can either be earmarked as environmental expenditures, or can be used to offset taxes on labour and capital.

2 Types of MBIs

For the purposes of this summary, MBIs have been classified into five main types:

1. *Tradable permits* that have been designed to achieve reductions in pollution (such as emissions of CO₂) or use of resources (such as fish quotas) in the most effective way through the provision of market incentives to trade.
2. *Environmental taxes* that have been designed to change prices and thus the behaviour of producers and consumers, as well as raise revenues.
3. *Environmental charges* that have been designed to cover (in part or in full) the costs of environmental services and abatement measures such as waste water treatment and waste disposal.
4. *Environmental subsidies and incentives* that have been designed to stimulate development of new technologies, to help create new markets for environmental goods and services including technologies, to encourage changes in consumer behaviour through green purchasing schemes, and to temporarily support achieving higher levels of environmental protection by companies.
5. *Liability and compensation schemes* that aim at ensuring adequate compensation for damage resulting from activities dangerous to the environment and provide for means of prevention and reinstatement.

Experience in recent years shows that the question of 'which instrument is best' has changed to 'which mix of instruments is best', both in terms of using MBIs alongside other environmental measures such as regulations and in terms of using MBIs to meet environmental objectives e.g. environmental tax reform and subsidy reform.

3 Who is using MBIs?

The use of market based instruments in environmental policy has gained ground substantially in Europe since the mid-1990s, especially in the areas of taxes, charges and tradable permits. Most of the action is taking place within countries, including the new EU-10, accession and transition countries in central and eastern Europe (Bulgaria, Romania, Turkey, Balkan countries). Comprehensive systems of pollution charges for air and water are in place in many of these countries, though the rates tend to be low because of concerns about people's ability and willingness to pay. Several countries have also introduced resource use and waste taxes. One can see progress on the diffusion of taxes and charges on products notably for beverage cans and other packaging.

Within the EU-15, the Scandinavian countries and the Netherlands, who were early starters on environmental tax reform, remain at the forefront of developments. Germany and the United Kingdom have made much progress since the late 1990s. Within countries most applications happen at the national/federal level but increasingly we can see instruments being applied at regional and cities' levels, notable developments being resource taxes in regions like Flanders and Catalonia and congestion charging in some cities.

The use of environmental taxes and charges has widened since 1996, with more taxes on CO₂, on sulphur in fuels, on waste disposal and on raw materials, plus some new product taxes. Only a few tax rates have originally been set on the basis of an assessment of environmental costs: e.g. the landfill tax and the levy on quarrying of sand, gravel and hard rock, both in the United Kingdom.

At the EU level, emissions' trading has become the instrument highest on the political agenda with the adoption of the EU emission trading directive, for reducing CO₂ emissions, its transposition into national laws and the establishment of national emissions allocation plans. The trading system started operation in January 2005. There are a number of other trading schemes already in operation across EU-15 countries including national emissions trading schemes for CO₂ in Denmark and the United Kingdom, and for NO_x in the Netherlands, certificate trading for green electricity in Belgium, and transferable quotas for fisheries management across a range of countries such as Estonia, Iceland, Italy and Portugal.

A range of other instruments are either planned or under serious consideration notably pricing policies

for water by 2010 under the EU water framework directive, road charging systems, and increased use of trading certificates for green electricity. These and other initiatives suggest that the use of market-based instruments is likely to increase further in coming years, possibly as part of wider initiatives on environmental tax and subsidies reforms.

4 How well do MBIs work

Evidence suggests that instruments where they have been applied work better if:

- they are well-designed in themselves and as part of a wider package of instruments
- the reasons for having them and how revenues will be used are clearly communicated
- the levels at which 'prices' are set reflect both an incentive to producers and consumers to change behaviour and a realistic analysis of affordability.

Taking each instrument type in turn and looking at its effectiveness:

1. **Tradable permits:** it is too early to evaluate the success of the EU trading scheme for CO₂ emissions. Nevertheless, the positive reactions in financial markets, the lively trade at times, and the more than tripling of the carbon price (as of September 2005) since the start of the trading scheme, suggest that the scheme is making progress in the right direction. Also, the scheme provides a potential 'first-mover' advantage to European businesses, so possibly enhancing European competitiveness and innovation. Many companies are establishing carbon management systems for the first time. More importantly, now CO₂ has a price, companies under the scheme are looking for new technologies to reduce costs of such pollution. In addition, a whole range of new businesses are emerging – carbon traders, finance specialists and auditors to name a few. The scheme is estimated to allow the EU to achieve its Kyoto target at an annual cost around EUR 3–3 ½ billion compared with nearly EUR 7 billion without it. There are about three decades of experience from trading schemes in the USA. Some European countries have trading schemes in place in the fishery sector since the 1980s and 1990s. US experience confirms that emissions' trading has a large potential for savings on the costs of complying with the objectives and targets set under environmental legislation. It is clear from this and other experiences that trading can be a powerful tool

for delivering environmental objectives in a cost-effective way, but that instrument design and implementation protocols are crucial to success. Emissions trading works better if the number and diversity of sources under the 'cap' is larger, and if technological requirements for individual sources are less stringent. This offers the opportunity to broaden and deepen the EU scheme in the second phase 2008–2012 and also to reconsider the balance between trading and technological fixes at plant level.

2. **Environmental taxes:** Evidence on the environmental effectiveness of taxes is broadly positive; in general they work when the tax is sufficiently high to stimulate measures to abate pollution levels. Austria, Denmark and the Netherlands are using different policy packages to reduce CO₂ emissions. The use of market incentives, i.e. both taxes and subsidies, in Denmark has been assessed to be more effective form of policy intervention than other approaches, such as the Dutch mix of long-term voluntary agreements and subsidies, and the relative 'laissez faire' policy in Austria. Taxes on motor fuels, applied in all countries, together with taxes on the sales or registration of motor vehicles, account for over 90% of the total environmental tax take in the EU. Taxes make up 40–60% of the sales price of motor fuels in European countries, which is a considerably larger share than in the US. The European car fleet is consequently more energy efficient with up to 2–3 times lower unit emissions of CO₂ from transport than in the US. Tax differentiations for low sulphur and unleaded fuels have been particularly effective in changing producer and consumer behaviour towards innovation and purchasing decisions that reduce air pollution. Minimum tax rates have been laid down in the 2003 EU energy products taxation directive. Tax rates will rise in many of the new and some of the older EU Member States after transitional periods. Taxes in the areas of waste and resource use include products with notable success seen for the plastic bag tax in Ireland, the nutrient surplus charge in the Netherlands, the Danish waste disposal and batteries taxes, and the Norwegian pesticides tax. Several countries including Austria, Norway and Finland have abolished fertiliser taxes suggesting difficulties with implementation and perceived effectiveness. The Netherlands has also withdrawn its tax on land-filling of sewage sludge as it was deemed ineffective because support was minimal and enforcement difficult.
3. **Environmental charges:** Progressively graduated water prices have been particularly effective in helping to reduce consumption over time in some countries (e.g. Denmark, Hungary). Charging for waste collection at the household level is sometimes based upon combinations of bin size, frequency and weight which helps to increase waste generation awareness and to reduce waste supply. Experience from the Netherlands shows that charges to reduce waste water emissions at source alongside investment in treatment facilities have provided a much more cost effective outcome in terms of meeting pollution reduction targets than in other countries where the primary focus has been on capital investments. Charging systems, such as road pricing, have more potential than the current fixed transport taxes and charges to directly and accurately charge transport users for hidden costs of using infrastructure, such as accidents, and environmental and health impacts, and economic inefficiencies such as congestion. The London congestion charge and other infrastructure charging schemes in Austria, Germany and Switzerland are examples of such charging systems.
4. **Environmental subsidies and incentives (including green purchasing)** are widely used and effective for supporting the development and more rapid diffusion of new cleaner technologies, such as catalytic converters and low CO₂ vehicles, and renewable energies especially wind and solar power. Experience suggests that application of subsidies at an early stage leads to further (non-subsidised) technological developments. EU level subsidies through the Cohesion funds, supported by legislation, have also helped build the infrastructures for environmental services such as water supply, waste water treatment plants and waste treatment services. Evidence suggests though that the environmental and economic effectiveness of these subsidies could be improved through the application of taxes and charges to minimise waste water pollution at source and so help reduce capital investments. Subsidies combined with targets offer another effective instrument mix that is being used to encourage diffusion of renewable energies in many European countries.
5. **Liability and compensation schemes:** a relatively new field of environmental policy strengthened by the adoption of the EU liability directive with which Member States will have to comply by 2007. Liability has started to gain

a more systematic coverage, and important economic players — especially the insurance and reinsurance industries — are moving into the area where the economic threat of having to make pay out major compensation payments is becoming real. Oil spill funds will be enlarged and waste site after-care funds established. Liability obligations will inspire technical improvement (double-hull ships).

5 Political barriers to MBIs and how to overcome them

There are several important political barriers to the implementation of market based instruments. These are:

Perceived impacts on competitiveness

There is no evidence that existing economic instruments have a major adverse effect on competitiveness at the macro and sector level. This is partly due to the design of the instruments (use of low rates of taxes and charges), partly to exemption possibilities to avoid cost impacts and partly due to well designed measures that compensate those affected by recycling revenues (e.g. such as the NO_x charge in Sweden). However, there can be impacts on individual companies as some companies will be more able or willing than others to respond to the signals from taxes, charges and subsidies, or opportunities of emissions trading scheme. Therefore, the issue is not about 'unfair loss of competitiveness', rather increasing willingness and ability to respond will keep companies competitive, whereas polluting companies that cannot adapt have usually had to close. Competitiveness issues have often been given greater weight than is justifiable when selecting or designing instruments or when granting or designing subsidies. Many subsidies have applied for too long. Some of this is based on industries exaggerating the cost of measures and underestimating their ability to react.

Equity concerns

Concerns about unfair burdens on householders have been a key influence when pricing schemes were introduced for the provision of energy supply, water supply, wastewater treatment and waste collection in many countries, notably in central and eastern Europe. This has led to different approaches to taxation on household energy and water consumption, for example, to better reflect people's ability to pay. Applying taxes in full, in combination with compensation for the poorer households would maintain the tax incentive.

Perceptions, rules and legacies

In addition, there are a wide range of perceptions, rules, institutional structures, existing regulations and financial instruments that prevent wider uptake of market based instruments. Chief among these are:

- the perception that taxes have to be high if they are to work which can undermine alternative approaches that take a long-term view over several decades whereby taxes are set at a low, affordable level to begin with and then gradually increased, taking into account inflation, and the target group's ability to adapt and change behaviour;
- the perceived conflict between maintaining revenues and changing behaviour, whereby tax authorities fear that with reform there will be a reduction in overall tax take at least in the short term; experience in Sweden shows that this can be overcome through well-designed measures and long-term, gradual, transparent and well-communicated approaches to reform;
- the perceived (and sometimes actual) conflicts between national, EU and world trade rules whereby countries' room for manoeuvre on either extending the instrument base or reforming taxes and subsidies is limited;
- the legacies of economically and socially desirable subsidies in the energy, transport, agriculture and other sectors that result in environmentally harmful effects and gradually are included in wider ecological fiscal reforms.

Despite progress in some areas, there continues to be substantial economically motivated subsidies in the energy (e.g. on fossil fuels), agriculture (e.g. on production payments) and transport (e.g. tax allowances for commuters) sectors that result in environmentally damaging effects. There is also a continuing lack of sufficient horizontal coordination in many countries that prevents integrated approaches being taken to design and implement measures that combine economic, environmental and social considerations.

How to do better

Most barriers to implementation can be overcome by:

- the progressive removal of subsidies and regulations that contribute to environmental damage;
- the recycling of saved revenues to provide incentives for eco-efficiency and eco-innovation;
- the better design of instruments and mitigation measures to deal with inequities;

- progressive implementation supported by broad consultation and useful information so that people build up trust and confidence in the measures over time;
- the integration of market based instruments for environmental policy with those for economic and social policy so that revenues can be used to support broader tax reforms and in so doing contribute to win-win outcomes.

A closer look at the first and last of these measures is justified here:

Subsidy reform: Results suggest that competitiveness concerns have often been taken too seriously when granting or designing subsidies. There are arguably too many subsidies that apply for too long. In some cases this reflects instrument design that was based on static responses rather than dynamic ones, thus overestimating the costs. Arguments of competitiveness need to be understood and defused and good research is needed early to avoid undue subsidies or inappropriate allocations. Positive financial incentives could play a stronger role in supporting environmentally beneficial technological innovation. This may be seen as a main driver for serving both environmental and economic objectives, and thus achieving the objectives of the Lisbon-agenda. New technologies would be in a better competitive position and hence would require less financial support, if the negative environmental impacts of traditional technologies were better priced. Whereas financial support is usually destined to encourage development of environmental technologies (and to increase market penetration of marketed technologies) venture capital for the purpose of marketing is broadly lacking for such environmental technologies. Based on expected external benefits, governments could play a role here by absorbing part or whole of the financial risks involved in making new technology ripe for the market.

Environmental tax reform: MBIs that generate revenues can contribute to reforming taxes on labour and capital that have distorting effects on the market. This is even more useful because as Europe's population ages, and the available workforce dwindles, people will need increased incentives to stay in work longer. At the same time reforming taxes and subsidies could release funds for promoting technological innovations in face of global competition. In order to stop the total burden of taxes rising, the revenues from the green taxes (on the things we don't like, i.e. the creation of pollution and the inefficient use of resources) should be used to reduce taxes on

the things we do like i.e. on incomes, on profits and on investments. Pollution gradually gets reduced because the more realistic market price will be acting as an incentive on both producers and consumers to use the higher priced goods and services more efficiently.

6 A checklist for effective MBIs

There are many things we can learn from the latest analysis of environmental MBIs that together could provide a useful checklist of factors against which potential future successful MBIs could be assessed. These include:

1. Having an instrument champion who is willing to take the risk to make it work, for example, the London Mayor introducing the congestion charge.
2. 'Picking winners'. Focus on the issues for which there is agreement and pressure to have them addressed, such as congestion problems or litter.
3. Making optimal use of added value of MBIs. in policy mixes. Combinations of MBIs with e.g. information instruments increases environmental effectiveness. Mixes may also reduce monitoring and enforcement costs, as well as compliance cost uncertainty.
4. Keeping it simple and understandable. Make it easier to implement. Where possible, use IT to simplify schemes. Make charges easily understood and clearly communicated.
5. Keeping it realistic. Don't set charge rates higher than what is affordable.
6. Giving advanced notice of the introduction of a new instrument. Use Phasing-in schemes to give people time to adapt and fine-tune the working of the system.
7. Minimising changes. Both regulators and industry benefit from stability in the regulatory environment. Allow time for lessons to be learnt from the first instrument (or mix of instruments) before making unavoidable changes.
8. Understanding the potential of trade-offs (e.g. across the three pillars of sustainable development and for different stakeholders), and work out which tradeoffs are unacceptable. This requires good impact assessments.
9. Keeping stakeholders on board. Early consultation and public participation as well as real understanding of their positions is critical. For example, the transparent use of revenues can defuse potential opposition to a tax charge.
10. Maintaining equity in implementation. Make sure the poor are not unduly affected or devise appropriate compensation schemes for them.

11. Making sure that people can respond.
Substitutes should be available where possible. High taxes for private motorised transport, as e.g. targeted through fuel duty escalators in the United Kingdom and Germany, would be more successful if there had been appropriate substitutes, such as better public transport.
12. Indexing of tax/charge rates to inflation to avoid the erosion of value over time as has happened with some environmental taxes.
13. Consistency. Plan compatibility. Emissions trading works better the larger the market is. Schemes that emerge nationally should aim for international compatibility.

1 Introduction

1.1 Aims and context

Europe puts great emphasis on economic and social goals, as well as on 'a high level of protection and improvement of the quality of the environment' ⁽¹⁾. These three objectives need to be pursued alongside each other, but each requires its own adequate set of policy tools.

Environmental assets — the atmosphere, oceans, water, the air we breathe, our landscapes and ecosystems — are part of the endowment that we share. The same applies to social assets such as cultural heritage. But by the very nature of this commonly shared characteristic, the market fails to conserve these assets.

The aim of this report is to inform those involved in making environmental policy across Europe and beyond, as well as all those who are otherwise interested in this area, about market-based instruments (MBIs ⁽²⁾), a category of policy tools that is increasingly used to achieve environmental objectives. Specific examples from countries as well as the wider range of interesting applications, lessons and future challenges aim to help generate ideas and inform the decisions that will be made in the coming years.

The report summarises the wide-ranging choice of market-based instruments available to environmental policy-makers in Europe, and reports results from their use. It covers all European countries: the recently enlarged EU-25, the candidate countries, the Balkan countries, EFTA countries and the eastern European countries ⁽³⁾.

The particular though not exclusive focus is on recent policy developments and what has been achieved over the past few years. It includes, for example, the introduction of the EU emissions trading scheme for greenhouse gases, the continuing success of environmental tax and charge schemes such as the Danish CO₂ and waste tax and the Swedish NO_x charge, and the permanent high level of taxes on motor fuels.

The analysis builds on a wide range of existing data sources, but the coverage in this report is wider than any of the existing compilations — both in geographic scope and in coverage of different types of market-based instruments. An important source of information was the database on economic instruments and voluntary approaches, jointly managed by the EEA and the OECD ⁽⁴⁾.

The EEA has previously published reports on the use and impacts of environmental taxes and charges (EEA, 1996 and 2000) and on environmental agreements (EEA, 1997). This report expands the scope of these reports by including emissions trading, environmental tax and fiscal reform, subsidies and subsidy reform and green procurement, as well as liability and compensation issues. It also explores the issue of the instrument mix to underline the reality that policies tend to work best within a mix of complementary rather than as competing instruments.

The report occasionally addresses other instruments such as environmental management systems, labelling, self-commitments, negotiated environmental agreements or conventional permitting and command and control when they are part of packages of instruments. It offers a balance between overview, insight and interesting practice, with reference throughout to other sources for further details.

1.2 Why market-based instruments for the environment?

Environmental assets are public goods which are not exchanged on markets, and therefore no price emerges to signal relative scarcity. As population and (especially) technological capacity to transform these assets grow, the destruction of these endowments is inevitable and inexorable unless there is proper government intervention. Thus, we are seeing the atmospheric commons being used as a free sink to dispose of greenhouse and acid-rain-inducing gases, marine fisheries being diminished to

⁽¹⁾ European Commission (2005).

⁽²⁾ See Annex 1 for a full list of abbreviations and acronyms.

⁽³⁾ For the full list of country abbreviations, see Annex 2.

⁽⁴⁾ Freely available via www.oecd.org and www.eea.eu.int.

the point of extinction, ecosystems destroyed, water polluted, cultural heritage eroded and ugliness prevailing over beauty.

In addition, economic activities generate pollution that leads to costs to others — 'externalities'. Currently, polluters do not generally pay for the costs borne by others, though there are increasing commitments, not just rhetorical, but also legal and practical, to the 'polluter pays' principle (see Box 1.1).

One key option for implementing the 'polluter pays' principle is the use of market-based instruments. The introduction of such instruments results in pricing mechanisms that better reflect the total value of environmental goods and services and the costs of polluting production (thereby improving economic efficiency), as well as generating revenues that can be used for environmental improvement or for the national budget (see Box 1.2 for a brief discussion of the theoretical underpinnings of MBIs).

MBIs such as taxes, charges and emissions trading can encourage a more efficient allocation of natural resources. Their price effects will reduce pollution levels. Reduced pollution in turn can reduce the need for and costs of cleaning up contaminated land, reduce the costs of production that result from contaminated inputs, and help reduce other

economic and social losses from the impacts of pollution on production and health. MBIs, through their lasting impact, can also play an important role in encouraging technological innovation and offer support for the EU's environmental technologies action plan (ETAP) and national mirror programmes. Furthermore, where revenues from the use of MBIs are used to offset other tax revenues, as in some ecological tax or fiscal reform programmes (see Chapter 4), there is a potential to alleviate some tax pressures on labour markets.

The efficient functioning of the market can also be supported through the development of appropriate liability and compensation instruments. Together, used appropriately, they can help in moving away from environmental problems being created by the market towards engaging the market in avoiding environmental problems and indeed even cleaning up or compensating for these problems. Box 1.3 lists the other benefits of MBIs and how they compare with other instruments.

It is unlikely that we will ever achieve a situation where all prices are 'right' and the economy optimally allocates all resources. Some distortions will always persist, whether through subsidies, market structures (monopoly buyers or sellers) or limited information (due to asymmetry or

Box 1.1 The 'polluter pays' principle and economic instruments

The Treaty establishing the European Community (Article 174(2)) provides that Community environmental policy should be based upon certain basic principles — among which is the 'polluter pays' principle. In Article 3 of the sixth environment action programme of the European Community, strategic approaches to meet environmental objectives include 'the promotion of the 'polluter pays' principle, through the use of market-based instruments, including the use of emissions trading, environmental taxes, charges and subsidies, to internalise the negative as well as the positive impacts on the environment'.

Box 1.2 The theory of externalities

Economists argue that, in cases where the market fails to properly price environmental goods and services, creating a price that reflects the value of these goods and services would efficiently regulate their use. Pigou (1932) made the theoretical case for the use of environmental or 'green' taxes to adjust for market failure. His case was that the 'optimum' level of pollution abatement occurs where the marginal cost of abatement just equals the marginal benefit yielded, and a tax per unit of pollution emitted that induces abatement to this point would be the socially optimal outcome. In effect, government should take ownership of shared assets on behalf of the people, and charge for their use by means of a Pigouvian levy or tax — with the aim of 'internalising the external costs' in the price. Coase (1960) argued that the same effect could be achieved by assigning property rights to the environment, and then facilitating transactions between the parties. They would then trade until all the potential gains from exchange had been exhausted.

These theoretical frameworks have found practical expression today in the use of market-based instruments such as green taxes and emissions trading. When properly applied, they are cost-effective, encourage efficiency, create dynamic incentives and hence encourage innovation (OECD, 2001).

Box 1.3 Market-based instruments — General strengths and weaknesses

Market-based instruments offer dynamic incentives not generally available through the use of standards or other direct regulation instruments ⁽⁵⁾. The strengths and weaknesses of different instruments are explored in the main body of the report. Some are clearly context dependent, including questions as to what other instruments exist in the package. However, some broad generalisations can be made.

- Emissions trading (ET) offers a dynamic incentive and can help ensure that a given target is met, if combined with appropriate allocation of emission allowances. The price of allowances, is, however, uncertain and determined by the market. ET can lead to significant additional administrative tasks and burdens and greater needs for monitoring, verification and enforcement, the costs of which need to be taken into account in any consideration of whether ET schemes are the sensible solution. See Chapter 2.
- Taxes and charges offer a dynamic incentive to reduce pollution or natural resource use. The extent of this incentive depends on the scale of the tax or charge, its point of application, possible exemptions, and the availability of substitutes to allow a response. They provide clear cost signals, but are less effective in guaranteeing a given environmental outcome and hence ensuring that targets are met. Taxes and charges can also be valuable for capacity building as they help provide information not otherwise available on activities, pollution levels and responses to cost signals. See Chapters 3 and 4.
- Subsidies can be both constructive and destructive tools for the environment. They can be useful in getting new technologies onto the market and making them competitive. They run the risk of being in place for too long and can create vested interests that are difficult to address later. They can be unhelpful by supporting environmentally unsound practices that respond to economic or social concerns. Green procurement offers a route for interested parties to take environmental issues into account in public procurement decisions. This allows a more sophisticated and flexible use of public funds and can ensure that 'value for money' is less often interpreted as 'cheapest', and environmental benefits being an important factor in purchase decisions. See Chapter 5.
- The use of liability as an economic instrument offers great potential, and promises to become an important complement to the set of economic instruments currently available. Experience, however, underlines some limitations in the use of the instrument and the danger of the increasing need for recourse to often expensive and time-consuming legal processes. See Chapter 6.

MBIs are not always the policy tools of choice. In many cases, other instruments, or relevant mixes of instruments, may be more appropriate.

- 'Command and control' measures, through the use of emission limit values and environmental quality standards, are a key aspect of environmental legislation and help ensure that emissions fall and that the quality of the environment is respected. They help guarantee a certain performance, barring non-compliance of course.
- 'Command and control' through the use of bans (e.g. on placing products on the market) may be the only means of fully ensuring that the environment is not compromised.
- Labelling can be a key tool in ensuring that consumers have the information needed to help them play a responsible role.
- Voluntary schemes — environmental management systems or voluntary agreements — can be useful optional routes to capacity building and progress in selected areas, contributing to a move towards shared responsibility.

insufficiency). The key is therefore to move in the right direction (making the market work better and using it to improve the environment), taking pragmatic, realistic and feasible steps, and using

environmental challenges, the need for solutions, and examples of practical solutions to guide the choice and design of new instruments.

⁽⁵⁾ 'Command and control' is a term often used to indicate types of environmental policy instruments that directly impose certain measures on those regulated, without leaving a certain freedom of reaction that is an important characteristic of MBIs. Therefore, the term 'direct regulation' is also frequently used.

1.3 Content

This report presents and explores key practice with and lessons from the use of market-based instruments, and helps identify how the market can be made to work for the environment and efficient environmental policies, rather than against it. Complementing the interesting practice and useful lessons, the report also looks at where there may already be plans for the use of MBIs, where there are expectations that they may be used or at least seriously considered, and where there is a need, given the various environmental challenges facing Europeans in the coming years.

This report does not go into the theoretical arguments about the reasons for and benefits of the use of economic instruments in depth, as these are already widely available elsewhere. Where relevant, reference is made to the theory behind the instruments and their effects.

Chapter 2 explores the relatively new instrument in Europe of emissions trading, covering trading of carbon dioxide, and possible applications in other areas, such as air pollution and waste management. Chapter 3 presents practices, lessons and future insights into the use of environmental taxes and charges, as well as deposit-refund schemes. Chapter 4 looks at the macro picture of environmental tax reform/ecological fiscal reform. Chapter 5 then moves on to look at subsidies, subsidy reform, support schemes and green procurement. Chapter 6 deals with liability and compensation issues. Finally, Chapter 7 gives a summary of practice, lessons and where we are or may be heading.

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2 Emissions trading in Europe — From follower to leader

2.1 Introduction

'Man is the only animal that makes bargains; one dog does not change bones with another dog', Adam Smith.

How does a society respond when it faces a difficult environmental challenge which is potentially expensive to meet, and where the stakeholders most responsible for emissions are economically and politically powerful? Emissions trading (ET) has emerged as an important mechanism for meeting these challenges. It is a relatively new instrument, rooted intellectually in the literature of public goods, market failure and assignment of property rights. It found its early practical application in the United States of America, and subsequently crossed the Atlantic to find expression in Europe for a number of purposes.

Emissions trading is an instrument which builds on mobilising the impulse to trade in order to conserve environmental and natural resource endowments. Emissions trading is now a working reality in Europe and is actively being considered as a potential instrument for a range of environmental challenges. Practice and plans in Europe have come a long way since early experience with emissions trading in the United States. This chapter ⁽⁶⁾ ⁽⁷⁾ explains emissions trading and its history, outlines the key elements in designing and implementing trading schemes, presents a number of examples where trading is being mobilised to address a range of environmental and resource issues in Europe and elsewhere, and assesses their impact. The application of trading to addressing greenhouse gas emissions and specifically the European Union emissions trading scheme (EUETS) are given more detailed attention. The report concludes with an outline of what should characterise the design and implementation of trading schemes generally, and more specifically the issues to be considered for the second phase of the EUETS, scheduled to begin implementation from 2008.

2.2 What is emissions trading and how does it work?

Emissions trading is an instrument for managing harmful emissions whereby a regulatory agent specifies an overall level of emissions that will be tolerated, either in absolute terms ('cap and trade'), or relative to some environmental parameter of the sources responsible for the emissions' ('baseline and credit') (see Box 2.1). Emission allowances (the term 'permits' is also used) are initially allocated to all the sources involved in the scheme. These sources must then be able to cover all emissions with allowances per designated time unit (normally a year) in the further course of the scheme. A market for emission allowances will then emerge as sources in the scheme are free to buy or sell allowances based on their own costs of control and the price of the allowances ⁽⁸⁾.

The key merit of emissions trading is that it facilitates and encourages abatement to take place wherever it is cheapest to do so.

Emissions trading provides great flexibility to polluters as to how to respond to the requirement to reduce emissions. The flexibility comes from the fact that emitters can buy and sell allowances. This allows those for whom abating emissions is very expensive to buy allowances from those for whom it is very inexpensive to do so. The burden of compliance is thereby borne in a least-cost fashion — the objective is reached with minimum burden on the economy. The price signal that emerges from these trades also induces innovation, as anyone who can find a way to abate emissions more cheaply will not only benefit themselves, by generating allowances to sell, but others will be interested in adopting this innovation if it costs less than the value of the allowances generated by its implementation. The evidence from the (mainly) US experience is that compliance with a given standard costs much less than it would if conventional command and control policies regulating every emitter had been followed (see, for example,

⁽⁶⁾ The drafting of this chapter has been led by Frank Convery, with input from Louise Dunne and Luke Redmond (all of UCD), and from Dominic Hogg (Eunomia) and Patrick ten Brink and Ian Skinner (IEEP).

⁽⁷⁾ This chapter is informed by the work of the concerted action on tradable emissions permits (CATEP). Papers are available on www.emissionstradingnetwork.com — and the ensuing policy briefs (Bohm and Convery, 2003; Buchner and Carraro, 2003; Convery, 2003; Egenhofer and Fujiwara, 2003; Klepper, and Peterson, 2003; Lefevere, 2003).

⁽⁸⁾ Adapted from 'Energy research and development' (<http://energytrends.pnl.gov/>).

Box 2.1 Definitions

Cap and trade: An overall absolute cap, target or envelope of emissions per time unit and geographical area (which may be global, as in the case of greenhouse gases) is fixed, and this cap is then allocated to various parties who can then trade. Cap and trade ensures that the target is achieved.

Baseline and credit: The baseline establishes a standard, for example grams of lead per gallon of petrol, against which allowances are generated. If emissions by the source in question are lower than the benchmark, then the difference can be traded. If — as in the case of the phase-out of lead in petrol — the benchmark becomes zero, then an absolute objective is achieved. Baseline and credit of this nature is sometimes called **rate-based**; for example, the Dutch NO_x emissions trading scheme, which sets the benchmark at 65 mg/GJ of energy input in 2004 declining to 40 mg/GJ in 2010. There is no absolute cap implied in this case; if firms continue to increase their energy input at a faster rate than the baseline declines, then overall emissions will increase.

Banking is a provision whereby an installation can 'store' allowances gained through emission reductions or trade for use in a future period.

Borrowing allows installations to exceed their allowances on the basis that they make up the difference in a future period.

Market failure arises when conditions for well-functioning, competitive markets are not in place. One such condition is that those involved in a market own the assets that are being traded. For example, if there is continuing uncertainty as regards the title deeds to a property, it will be very difficult to achieve a sale — the market will fail to function. Environmental endowments are often not 'owned' and therefore can be exploited, sometimes to the point of extinction.

Property right assignment describes a situation where an individual, group or company is allocated the rights to use the asset in question, often under specified conditions. Such assignment may have formal legal standing, or may be the result of tradition and accepted mores.

Public goods are goods or services which, if made available to one, are automatically available to all. National defence is often cited as an example. Clean air, under certain circumstances, is another — if it is provided to one resident in a city, it is automatically available to all.

evidence in Ellerman *et al.*, 2000, Tietenberg, 1996, and Stavins, 2002).

A short history ⁽⁹⁾

The conceptual and practical potential of trading as an instrument for addressing environmental dysfunction was first outlined by Dales (1968). In the mid 1970s, the US Environmental Protection Agency (USEPA) was faced with the situation that some parts of the country, notably southern California, were 'non-attainment' areas as regards meeting air quality standards. In such areas, new sources of air pollution, and existing sources that wanted to expand their facilities, were required to offset additional emissions in the area by acquiring emission allowances from existing sources. This pragmatic response to the need to allow economic development while also

addressing the air quality constraint was gradually widened. Box 2.2 briefly describes some of the features that characterise three programmes — lead in petrol, acid rain, and air quality in the Los Angeles basin — that capture the evolution of the concept.

In considering whether and how to implement emissions trading, the following questions have to be addressed:

- Is it better (and under what conditions) than other policy instrument options, including other market-based instruments, such as environmental taxes and direct regulation ('command and control' policies)?
- If so, should 'baseline and credit' or 'cap and trade' be used (see Box 2.1)?

⁽⁹⁾ Tietenberg (1996), Hahn (1989) and National Centre for Environmental Economics (2002) review the early experience in the United States. A key insight therefrom is the importance of keeping transaction costs under control — to keep the scheme as simple and transparent as possible (Stavins, 1995).

Box 2.2 Selected emissions trading experiences in the United States

Phasing out lead in petrol: As part of a programme to phase out the use of lead in petrol, the USEPA set a limit of an average level of 1.1 mg/gallon beginning in 1982, falling to 0.5 mg/gallon in 1985 and 0.1 mg/gallon in 1987. To facilitate the phase-down, the USEPA allowed two forms of trading — inter-refinery averaging during each quarter, and banking for future use. Inter-refinery averaging allowed a refinery that was on average exceeding the specified thresholds to buy credits from one that was doing better than the thresholds. Banking allowed refineries that reduced the level below the thresholds in one quarter to hold on to these credits and use them in later quarter(s), when they exceeded the thresholds. In addition to its economic efficiency benefits, the programme also had an interesting equity dimension, in that most of the trades were undertaken by small refineries, which allowed them to reduce compliance costs. The larger refineries incorporated technological and process changes more quickly. The transaction costs of this scheme were quite high, estimated at 10–20 % of the potential economic gain, a result in part of the baseline and credit nature of the scheme (Godard, 2003).

Controlling acid rain: A variety of emissions trading schemes were in effect authorised in the 1990 Clean Air Act amendments. This provided the institutional and statutory framework for the US acid rain programme, which in 1990 established the first large-scale, long-term US environmental programme to rely on emissions permits, which was directed at reducing sulphur emissions from power plants in the United States. The programme was very successful, exceeding the target at a cost much lower than predicted (Ellerman *et al.*, 1999, 2000; Ellerman, 2004). Its success was due to a number of features, notably the fact that it was cap and trade, thereby limiting complexity, it was nationwide, providing much scope for abatement, and there was no requirement for government to approve transactions. It showed the simple power of having a market price to indicate the real marginal cost of achieving improvement. It also demonstrated the value of 'learning by doing'. In the first phase (1995–1999), bonus allowances were made to plants that had installed flue gas desulphurisation devices, which resulted in overinvestment in such devices, and there were provisions to allow substitution of other facilities for those obligated under the programme, which resulted in opportunistic behaviour aimed at maximising the allocation of permits. Both of these performance-inhibiting deficiencies no longer apply (Godard, 2003). Others strike a more critical note, stating that there were overgenerous allocations of initial allowances, and, with no limits placed on where these could be sold, there were some cases of 'hot spots', i.e. loss of local environmental quality through more acid rain on the forests than before⁽¹⁰⁾. This can be argued as being part of 'learning by doing' and is clearly important for future European practice to learn without doing it oneself.

The regional clean air incentives market (Reclaim): This was established in Los Angeles to help control point source emissions of SO₂ and NO_x. Between 1994 and 1999, the total amount of allowances exceeded the quantity demanded; most transfers were made without being priced (Godard, 2003) — indeed, at one point, 85 % of allowances were being given away free of charge. The programme became binding in 1999, with a rapid escalation in prices, a product of increased emissions resulting from a rising supply of emissions from 'old' electricity plants brought back online in response to rising prices in the Californian electricity market, the absence of provision for banking and borrowing and the geographic limitations of the scheme. Harrison (2003) argues that, 'notwithstanding the relatively lenient early caps and the extreme pressure on prices that increased tenfold in the course of a few months in 2000, Reclaim has been successful in achieving the caps that were set in 1993 when the programme was passed'⁽¹¹⁾. Others argue that the caps were more than 'relatively lenient', indeed far too high, partly because the initial allocation of credits was based on historical levels that were higher than the actual emissions at the time the programme began and reductions were not properly factored in. As noted by the Centre for Progressive Regulation, in the first three years of its operation, the programme resulted in a very modest decrease in actual emissions of about 3 %.

The scheme had another strength, i.e. it was linked to another scheme: the California's South Coast Air Quality Management District (SCAQMD) Rule 1610 car-scrapping programme. Emission reduction equivalents from early scrapping of cars could be counted as allowances if bought by operators. However, this link led to unwanted environmental results, with very high take-up of this opportunity by certain companies leading to a number of air pollution hot spots. This was compounded by cases of fraud, where cars were scrapped but their motors reused in other vehicles — with no environmental benefit at all. This underlines the importance of giving proper consideration to perverse incentives and possible unwanted effects, and ensuring that the system is properly monitored and enforced, with suitable penalties and potential criminal follow-up in place.

⁽¹⁰⁾ <http://progressiveregulation.org/perspectives/emissions.html>.

⁽¹¹⁾ Tietenberg (1996), Stavins (2002), Sorrell and Skea (1999) and OECD (1999) provide further details on these and other schemes.

- To what extent should it be applied (scope)?
- What units should be traded and over what period?
- How should allowances be allocated, and to whom?
- How should compliance be monitored and enforced?

Choice of instrument

In choosing between the use of taxation and emissions trading to conserve environmental endowments, the relative gains depend in part on the uncertainties and the costs and benefits of further abating the pollution in question (Weitzman, 1974). If the costs at the margin of missing a particular target are very low, then taxation is likely to be more appropriate, as it is less expensive to implement and enforce. Also, taxation and charging generate funding, while trading with free allocation does not. Such funding can be used for some combination of the following: to reduce other taxes, to compensate losers from taxation, to reinforce the effectiveness of the tax, and to increase public expenditure. Conversely, if the costs of missing a target are likely to be very high, then a cap and trade version of emissions trading is likely to have the advantage, because of the greater certainty of meeting the target. Emissions trading is particularly appropriate where the emission has the same effect regardless of source or location. Greenhouse gases have this quality. However, as we have seen, differential impacts, which are characteristic of acid rain precursors, do not preclude its effective use. An emission tax, charge or levy of the same amount as the emission allowance price should have approximately the same incentive effects, so that taxing instead of emissions trading is an option. Political viability is a key reason for choosing trading. In some jurisdictions, it can be very difficult to introduce a tax. This was true of the (failed) efforts to introduce a carbon energy tax in the European Union in the 1990s, and taxation has always been politically difficult at the federal level in the United States.

For reasons of political expediency, environmental taxes are typically set at a level below what is optimal to induce the desired behavioural change and achieve the environmental objective. Sterner (2003) makes the point that this constraint can be overcome if the tax is recycled back to those who pay it. The NO_x charge in Sweden is very high, and

therefore has strong environmental effectiveness; industry is willing to pay such a high rate because the funds generated are recycled back to the industry which pays the tax, with those producing the most energy relative to their NO_x emissions being the greatest winners. A wide variation in abatement costs at the margin is helpful because it increases the prospects for trading and the ensuing gains. This means that it does not combine well with individual facility permit licensing, where every installation is required to install best available technology. Such a requirement eliminates many of the potential gains from trading. Other criteria, including information requirements, enforceability, long-run effects and dynamic efficiency, are germane to the choice of instruments.

Baseline and credit or cap and trade?

Because the baseline and credit model does not guarantee that a specific target will be met, if meeting a target is crucial, then — if an emissions trading scheme offers sufficient benefits⁽¹²⁾ — cap and trade is likely to be preferable. Thus, in the EU, where legally binding national caps for both greenhouse gases and acid precursors have been fixed, if emissions trading is the policy instrument of choice, then, other things being equal, cap and trade would be preferred to baseline and credit. Also, the process of setting the baseline — the standard to be bettered in order to generate credits — can be complex and time consuming to design and administer; this can also favour cap and trade. However, industry generally favours the rate-based approach because, if it meets the standard, it can expand indefinitely without having to buy allowances. This is especially important for firms that face international competitors which are not in an emissions trading scheme⁽¹³⁾. Based on an analysis of the early USEPA experience in the United States, which was predominantly based on baseline and credit, uncertainty due to baseline setting and emission reduction certification led to higher transaction costs which subsequently discouraged trades (Stavins, 1995). According to Norregard and Reppelin-Hill (2000), ill-defined property rights associated with baseline and credit schemes also discouraged trade in some of the early US schemes, partly because the precise definition of the baseline itself can in some situations be a source of contention. This problem would be further compounded in the case of transfrontier schemes.

⁽¹²⁾ Not forgetting the alternative sure means of guaranteeing that a target is met — through direct command and control.

⁽¹³⁾ The Netherlands is implementing a national acid precursor emissions trading scheme that is rate-based, even though the country faces an absolute cap on such emissions (Directive 2001/81/EC of the European Parliament and Council of 23 October 2001 on national emissions ceilings for certain atmospheric pollutants). We discuss the details of this scheme later. This is a product of the competitive pressures that the firms involved perceive. See Section 2.3.1 on Dutch NO_x trading.

Scope

What emissions should be covered by the scheme, and over what geographical area? Any market is better than no market. As Dales (1968) puts it, 'if it is feasible to establish a market to implement a policy, no policy-maker can afford to do without one'. To exploit the key merit of emissions trading (that it facilitates and encourages abatement to take place where it is cheapest to do so), it is important to have firms with a wide variety of abatement costs, and the more firms and installations there are involved, the more likely this is. Also, the effectiveness of the market will be enhanced to the extent that it involves a large number of buyers and sellers who individually lack sufficient market power to influence prices. Because enforcement is important, national boundaries provide a natural limitation on widening the scope, unless enforceable transfrontier provisions are in place — as in the EU — or can be agreed.

Hot spots

The potential creation of hot spots is another factor that can shape both coverage and scope. This does not arise in the case of emissions to the global commons such as greenhouse gases or ozone-depleting substances. It does arise in regard to most forms of emissions to water, and emissions to air, such as particulates and acid precursors. However, Ellerman *et al.* (2000) and Ellerman (2004) argue, with regard to the US acid rain programme, that in this case such concerns turned out to be unfounded, because the worst emitters had the most profitable abatement opportunities, and therefore did the most in this regard. Others⁽¹⁴⁾ note that in some cases worse local environmental conditions resulted from choices under the scheme and hence there are grounds for caution about the optimistic conclusion that emissions trading does not lead to hot spots. In the case of the Reclaim trading scheme that addressed NO_x emissions in southern California, concerns regarding the source and incidence of emissions resulted in differential arrangements, depending on whether sources were upwind or downwind (Harrison, 2003). The Centre for Progressive Regulation notes that there were cases of hot spots being created by the scheme.

Units and period

The allowances need to be expressed per unit time, typically a year. Where different emissions can be combined as regards their environmental impact, for example acidification pressure, global warming potential — the latter usually expressed in CO₂ equivalents — this should be done. Where

there is wide oscillation from year to year, the units can be expressed as shares of the total applying for the year in question. This is what is done in regard to individual tradable quotas (ITQs) in the case of fisheries (See Box 2.3), and water trading (Borregaard *et al.*, 2001).

Allowing **banking** (see Box 2.1) has many merits. It provides flexibility for the firms involved, and typically achieves early action, as most firms abate more, or buy more allowances than they need, in order to be sure to avoid non-compliance. A potential disadvantage is that all firms may 'cash in' their banked allowances at the same time in a future period, to such an extent that the assimilative capacity of the environment in that period is damaged. This does not arise with greenhouse gas emissions, but could be an issue with acid precursors or other pollutants. In practice, this has not happened. There is an additional concern in that, if and when a target is to be met, a company may use banked emission reductions to 'achieve' the target. Clearly, the target is not met in the strict sense, and if the target is serious, conditions may have to be included to avoid the use of banked credits in key target years.

Borrowing (see Box 2.1) is not allowed under any scheme. This lack of flexibility for the future may be costly in the event of a price 'spike'. This happened in California with NO_x allowances: old, relatively inefficient power plants were brought back into production to take advantage of escalating electricity prices, and sharply increased the demand for NO_x allowances. The rise in the allowance price was so sharp that the price was capped, whereby the authorities sold new permits at that price once the threshold was reached. An ability to borrow forward would have smoothed the price rise. There are, however, arguments against borrowing for the future, at least for certain years: in target years, it is clearly not sensible to allow borrowing if the target is a serious one. There is also a risk associated with borrowing against future periods, since if this is possible, and the future periods are not defined, the borrowers run the risk that the future conditions may be harsher than the current ones and that retrospectively they should not have borrowed.

Allocation of allowances

A key issue to be decided early on is the size of the total allocation to be allowed, i.e. what the overall envelope is within which trading is to take place. Economic theory says that it should be set at the point where the marginal costs of abatement just

⁽¹⁴⁾ See <http://progressiveregulation.org/perspectives/emissions.html>.

equal the marginal environmental benefits yielded. In practice, the overall target amount typically emerges as a political decision, which may or may not be based on any public debate, scientific input or estimation of marginal gains and losses.

There are two broad choices for allocating allowances⁽¹⁵⁾: auction them off, or give them away free of charge. Chile auctioned individual transferable quotas (ITQs) for fisheries but the allowances for other existing trading schemes — mainly in the United States — have been given away free of charge. Auctioning generates funding which can be used to compensate losers from the trading scheme, and to reduce other distorting taxes (Bohm, 1999, 2000). Free allocation⁽¹⁶⁾, on the other hand, is strongly favoured by most of the sectoral interests involved, and is likely to be crucial in securing their support in many cases. An overriding issue in allocation is equity or fairness — who gains and who pays, and the kind of distributional outcome that is required.

There is also the possibility of a hybrid scheme — some auctioning and some free allocation. This allows some of the efficiency gains of the former, and some of the political 'buy-in' characteristics of the latter. The allocation of allowances is always going to be contentious since each allowance represents a real tradable financial asset.

There is a very strong case made in the literature for auctioning allowances rather than giving them away free of charge to existing polluters. Bohm (1999) puts the case as follows: auctioning the whole volume of allowances provides government revenue that allows for a reduction in pre-existing distortionary taxes (in other words, the revenues from auctioned allowances can be part of a wider environmental fiscal reform; see also Chapter 4). Bohm also argues that grandfathering (see footnote 16) allows benefiting firms that can barely survive to remain in business, when, if they had to buy allowances, they would have gone out of business⁽¹⁷⁾. The increase in the wealth of benefiting firms also allows more self-financing, relative to other firms, for example of R & D activities, and/or access to bank loans and capital markets. Free allocation to existing firms is likely to be economically inefficient because it slows

productivity growth by favouring 'incumbents' over new innovative entrants.

Fitz Gerald (2004) draws attention to the potentially unfavourable effects of free allocation when there is more than one round of allocation. If countries apply a 'use it or lose it' policy, whereby installations that close lose their allocation of allowances, this encourages plants to stay in operation in order to hold on to their allowances. If allocations in further rounds are made on the basis of emissions during the first round, this further exacerbates the tendency for companies to continue to operate undesirable facilities in the first round so as to capture an allocation in subsequent rounds. Costs will then be higher, environmental effectiveness reduced, and the price of allowances higher as a consequence of the additional demand generated by these policies.

Another reason for favouring auctioning is the transaction costs involved in allocating free allowances. These allowances are valuable, and so the potential beneficiaries have every reason to maximise their negotiating position, and this takes time and other resources to act upon.

The case for giving the allowances away free of charge is based on three arguments. The first was made initially by Coase (1960). As Tietenberg (2001) puts it: 'Whatever the initial allocation, the transferability of the allowances allows them to ultimately flow to their highest valued uses. Since those uses do not depend on the initial allocation, all initial allocations result in the same outcome and that outcome is cost-effective.' It implies that with tradable allowances the resource manager can use the initial allocation to meet other goals such as political feasibility or ethical concerns without sacrificing cost-effectiveness.

The second argument is pragmatic — the need, in effect, to pay the participants via free allocations to get their political support for the implementation of the scheme. It is likely that this is the more salient reason why, with a few exceptions⁽¹⁸⁾, the practice with emissions trading to date has been to give them away free of charge. It is not surprising that this is favoured by industry. Several studies have shown that free allocation of CO₂ allowances to fossil fuel

⁽¹⁵⁾ The allocation issue is addressed in some detail in Bohm and Convery (2003).

⁽¹⁶⁾ If based on historical emission levels, free allocation is called 'grandfathering' (what my grandfather was allowed to emit, I may as well emit).

⁽¹⁷⁾ The same firm, if so sensitive to the allowance price, is likely to have similar problems in subsequent years if the cap is tightened. Moreover, the firm is so fragile that it will fold under normal economic pressure. The argument is therefore the traditional one of 'don't tax us or we'll have to close'. The choice of free allocation versus auctioning would lead to different caps, since emissions trading with grandfathering can 'accept' a more demanding cap than with auctioning.

⁽¹⁸⁾ Notably the allocation by auction of fishing quotas in the individual tradable quota scheme implemented in Chile (Borregaard *et al.*, 2001).

firms in the United States would leave them better off (Bovenberg and Goulder, 2000; US Congressional Budget Office, 2000; Burtraw *et al.*, 2001). Of course, for any individual firm, the extent of the gain, if any, will depend on particular circumstances. The biggest winners will be the firms that would have reduced emissions as a normal commercial decision, for example from 1 million to 0.5 million tonnes. If now they are given a free allocation of 0.5 million tonnes, and this turns out in the market place to be worth EUR 10 per tonne, they will have received an annual capital gain of EUR 5 million for as long as the permits last. Conversely, a firm that must incur substantial costs to reduce emissions to 0.5 million tonnes will still show an increase in the underlying asset value of EUR 5 million annually, but will also have to spend money on some combination of abatement and purchases of allowances, to bring its allowances into line with its emissions.

The third argument is that free allocation encourages those previously not known to the authorities as emitters to come forward and claim their allowance. This occurred in Chile in the particulates emission case (Borregaard *et al.*, 2001) but is less relevant to the case of carbon dioxide trading in the EU, where flows of fuel are well documented, being already in the tax 'net'.

As regards the bases for making free allocations, three approaches can be identified: historical (grandfathering), projected sectoral emissions, and benchmarking (where standards that apply equally to all installations are set). Where not all emissions are included in the scheme, then a decision has to be made on how much of the total to include⁽¹⁹⁾. Economists favour estimating the marginal costs of abatement of all the sources in the economy, ranking them, beginning with the least costly, and then identifying the set of sources that will meet the overall target. The abatement opportunities within this envelope then comprise the allowances to be allocated to the sources that together will form the trading sector. The same equi-marginal abatement cost principle can then be used to actually allocate the allowances to the sectors included in the emissions trading scheme. In practice, negotiating skills and political influence are likely to be salient factors in shaping which amounts are allocated and to whom.

Target group

A decision has to be made as to the point in the production and consumption cycle to which the

allowances are allocated. In the case of carbon dioxide, 'upstream' typically is taken to refer to the producers and importers of fossil fuels, while 'downstream' refers to the users: electricity producers, smelters, steelworks, etc. The extreme version of downstream is where the final consumers, i.e. householders or motorists, are granted the permits. In the case of greenhouse gases, inclusion of all carbon-based fuel producers and importers would capture most of the CO₂ emitted in any economy, and so would be very inclusive. But granting allowances free of charge would also yield windfall gains for these interests as the price of fuel will rise, and this is unlikely to secure popular or political support. In particular, the price of transport fuel would rise, yielding gains to oil and gas supply companies at the expense of motorists and freight movers which would be difficult to defend politically and on equity grounds. Partly for this reason, free allocation is generally undertaken further downstream. With regard to greenhouse gases, this too will give rise to equity challenges as electricity and other prices will rise. The equity issue can be addressed, for example, by the regulator (in the case of electricity) requiring that householders benefit from demand-side management subventions provided by the utilities.

Monitoring, reporting and enforcement

For any trading scheme to work effectively, the holders of allowances must have confidence in the 'product' they are buying and selling. This requires that the integrity of the system is maintained, and is seen to be so; emitters must have sufficient allowances to cover their emissions, and, if they do not, that they incur a substantial penalty. Ellerman *et al.* (2000) point out that in the case of the acid rain programme in the United States, emission monitoring requirements were very demanding, and compliance was close to 100 %. In the case of the EU greenhouse gas emissions trading scheme, each Member State will have a local 'agent' to maintain registries and monitor performance. The European Commission has responsibility for ensuring full implementation of EU law, and there are substantial fines for non-compliance.

2.3 Practice of trading schemes

Klaassen (1997) provided the first comprehensive review of the potential for the instrument in the EU. But it was the signing of the Kyoto Protocol in 1997 that first brought emissions trading as a market-

⁽¹⁹⁾ In the first pilot phase (2005–2007) of the EU greenhouse gas emissions trading scheme, trading is confined to selected sectors (see Section 2.3.2).

based instrument to be applied on a larger scale to the attention of senior policy-makers in Europe. However, we first address European practice with trading schemes in other areas and turn later to the use of this instrument in climate change policy.

2.3.1 Trading in Europe (excluding greenhouse gases)

Tradable renewable energy certificates

Some countries, including Italy, the Netherlands, Sweden and the United Kingdom — have created tradable renewable energy certificates (TRECs); these are 'green certificates' whereby obligations — called a 'portfolio standard' in some jurisdictions — on the part of utilities to meet a certain proportion of their electricity output from renewable sources can be purchased from others. The idea is to support the development of renewable energy, but in such a way that it is produced by those who can do so most cheaply.

A local drawback of the system in the Netherlands was that the subsidy for the production of renewable energy resulted mainly in more import of 'green electricity' and hardly resulted in any additional production.

Kåberger *et al.* (2004) analysed the Swedish programme. They compare the green certificate approach as implemented in Sweden with other instruments such as a carbon tax, emissions trading, regulation and subsidy. They conclude that if carbon abatement is the key objective, the certificate approach is likely to be more expensive than a carbon tax or emissions trading because these instruments will stimulate both energy conservation and the introduction of renewables, while the certificate approach depends on increased use of renewables alone to achieve this objective. They also note that if stimulation of renewables is the objective, the Swedish programme is likely to be ineffective because 'a large share of the effective support goes to technologies that are already profitable (such as bioenergy-fuelled combined heat and power) rather than the marginal technologies such as wind (and solar) that are really in need of support and where the potential for future cost reductions is largest'. Because the certificate approach does not apply to heavy energy-using sectors, the potential gains in efficiency that it could yield in these sectors are forgone, and the transaction costs of implementation seem high — the net benefit to renewable energy producers is likely to be about 50 % of what the consumer pays. There are also considerable uncertainties — the programme is planned to continue to 2010, and may

end sooner. Since the total costs of wind, hydro and solar installation are dominated by the investment cost, uncertainties can inhibit investment flows. Kåberger *et al.* (2004) note that there has been a considerable volume of trade over the June 2003 to April 2004 period, that the programme has the considerable merit of political feasibility, and that many of the defects can be addressed over time.

A limitation which applies by definition to domestic schemes that address global warming, abatement and innovation is that the scope of the market is confined within national frontiers. The scope of any policy instrument, however, is related to the nature of the pollutant. A local problem, for example ozone pollution, needs to be addressed with a 'local' instrument.

Controlling acid precursors — Slovakia and the Netherlands

Countries in Europe have a legally binding cap for emissions of acid precursors. The Netherlands and Slovakia have introduced trading schemes to help meet the targets.

Slovakia

Slovakia faces difficulties in meeting its EU and international obligations as regards acid rain precursors. To help address this problem, an emissions trading scheme focused on SO₂ emissions has been introduced. An overall envelope for Slovakia, broken down into districts, is decided by the Ministry of the Environment. The district office then decides on the allocations to installations using a combination of historical emissions, future plans and programmes. It applies to sources of more than 50 MW, representing about 90 % of emissions in 1998. The information on allocations is available on the Internet. Quotas are allocated on an annual basis. Districts with unused quota may under certain circumstances transfer the surplus to other districts. The system came into operation in 2002. So far, there have been very few trades, but this is expected to change as the quotas issued are reduced from year to year.

NO_x emissions trading in the Netherlands

The Dutch NO_x reduction target, set in Directive 2001/81/EC on national emissions ceilings (NECs) for certain atmospheric pollutants (NEC directive), limits emissions of NO_x in 2010 to 260 000 tonnes. On the basis of this national target, the Netherlands government has set a target of a maximum of 55 000 tonnes of NO_x emissions per year by 2010 for its large industry sectors (emissions from these sectors in 1995 were 120 000 tonnes).

The Netherlands government implemented NO_x emissions trading for large stationary installations in 2005. The scheme will apply to all industrial facilities with installed total thermal capacity of more than 20 MW. This involves approximately 250 facilities whose NO_x output in 2000 was approximately 87 000 tonnes. The aim is to reach the increasingly more stringent targets by flexible means; command and control was predicted to be too costly for certain sectors, and a voluntary scheme was judged to be ineffective. All large combustion plants can sell emissions 'saved' if they emit less than the standard allows. Emissions are calculated by multiplying the emission factor (g/GJ) by actual energy input over the year (Nentjes, 2003). The scheme has a 55 000 tonne target for 2010 and uses a decreasing standard up to 2010 (68 g/GJ in 2005 to 40 g/GJ in 2010)⁽²⁰⁾. The performance standard rate (PSR) may subsequently drop further – from 40 mg/GJ in 2010 to 25 mg/GJ or even as low as 20 mg/GJ later (date not defined). An update on the Dutch proposals is provided by Dekkers (2004).

The Dutch NO_x programme allows participating sources to borrow and bank credits. Each facility may borrow a limited number of credits from its next year's allocation or bank a limited number of credits for use in the following year. Borrowing and banking are limited to 10 % of the 2004 NO_x allocation of each source, 7 % of the 2005 allocation and 5 % of the allocation for subsequent years.

This scheme differs from the EU tradable permit scheme since baseline emissions are allowed to increase if output expands and energy input increases – the emissions ceiling is relative rather than absolute. This compromise, and the presumption that it would be possible to implement it without changing the existing environmental management law, made the scheme more acceptable to industry. This presumption subsequently proved erroneous as the law did need to be changed. The emissions trading scheme – in its full form – was found to conflict with the ALARA (as low as reasonably achievable) principle of Dutch environmental law as well as integrated pollution prevention and control (IPPC) standards. The national compromise was to amend the law with the introduction of a two-tier system of regulation – firms can only participate in trading if they have a licence to do so. Even if a firm wants to buy credits to increase its emissions, it cannot do so beyond the standards set by the IPPC directive and ALARA.

This means that the cost savings will be less than they would be in a freer trading market (44 % savings over standards alone in the free-market scenario (Nentjes, 2003)). To avoid conflict with the IPPC directive, and notably the requirement for best available techniques (BATs) at installations, the system will initially be set up to allow trading above (an acceptable interpretation⁽²¹⁾ of) BAT. At the same time, it will argue in European forums for a right to 'experiment' under adequate conditions or for a future amendment to the IPPC directive, in other words with phase 1 being a constrained system and phase 2 being a more complete trading system, though still safeguarding local environmental conditions and the philosophy of the 'integrated approach' that is the core of the IPPC directive.

Another disadvantage of the Dutch scheme is that it does not encourage firms to reduce their emissions by increasing their energy efficiency, as lowering their input would also lower their baseline emissions.

Packaging waste and deliveries to landfill in the United Kingdom

Considerable experience has already been gained in the application of environmental taxes and charges in the field of waste. There has been relatively little experience, however, with tradable allowances in this area. This is beginning to change.

Practical experience relates to two schemes in the United Kingdom. The rationale for the use of tradable allowances and/or credits has been motivated mainly by EU legislation. However, the schemes had quite different histories.

UK packaging recovery notes

The history of the development of this instrument is somewhat convoluted. In the wake of the EU packaging and packaging waste directive, the UK government tasked industry with devising mechanisms through which packaging recycling and recovery targets would be met. When it became clear that this process was too fractious to lead to a clear outcome, the government stepped in and implemented a system in which the companies obligated under the relevant legislation (the UK packaging waste (producer responsibility) regulations) would have to provide evidence to the Environment Agency/Scottish Environmental Protection Agency (SEPA) that they had recycled

⁽²⁰⁾ See ENAP Hungary workshop presentation by Chris Dekkers (www.vrom.nl/ENAP).

⁽²¹⁾ Note that the BAT reference notes, BREFS, while comprehensive and regularly updated, allow for a range of BAT interpretations and in some cases these are less today's best available techniques than yesterday's. Considerable efforts are, of course, continuously made to avoid BREFS being quickly outdated.

and recovered the required amount of packaging waste. The form of evidence is known as the packaging recovery note (PRN).

There is some dispute about whether the system which emerged was designed to be a tradable credit system. In practice, what has emerged is a de facto trading system in which PRNs are traded as a form of evidence of meeting packaging obligations, to be presented to the relevant agency.

The PRNs are issued by reprocessors when material is actually recycled or recovered. The right to hold PRNs is effectively restricted to those enterprises obligated under the regulations and a number of so-called compliance schemes. These are organisations set up with the explicit intention of delivering compliance on the part of obligated companies. Effectively, membership of a compliance scheme, for which a financial sum is paid, transfers the legal responsibility for discharging compliance from the obligated party to the compliance scheme itself. Compliance schemes have therefore become organisations that achieve compliance on behalf of a number of obligated companies.

The degree to which the UK system can be considered successful is a matter of some debate.

- The legal status of the PRN was not made clear from an early stage. Other forms of evidence were allowed, though over time, the agencies have clamped down on this.
- The penalties for obligated companies and compliance schemes (those discharging the legal obligations of member companies) were not made clear. Consequently, in the first target year of the packaging directive, a major compliance scheme failed to purchase the required number of PRNs to discharge its obligation, but received little more than a reprimand from SEPA.
- The degree to which the mechanism itself has led to major changes in the quantity of material recycled and recovered is questionable. In quantitative terms, the material for which recycling has increased most rapidly has been wood, though there are doubts about the quality of data here. A significant increase in glass recycling has occurred. Much of this has been for lower-value uses, such as road construction, while some new materials markets are opening up (such as the use of ground cullet for water filtration).
- The fact that operators of incinerators from which energy is recovered (in practice, all

incinerators now operational which treat packaging material) were allowed to issue 'recovery PRNs' was criticised as being a straightforward subsidy to incinerator operators.

That said, the system does, in essence, work. Its shortcomings, and the criticisms which have been raised, relate to design issues rather than to fundamental flaws in the system. In particular, the absence of sanctions for those that fail to meet their obligation in terms of PRN purchases must be considered a major flaw.

Supporters of the approach point to its impact on 'light-weighting' of packaging (as a means of reducing the tonnage obligation), its impact in terms of encouraging reusable packaging, and its low cost.

However, the claim with respect to cost requires closer scrutiny. The costs of packaging recovery and recycling in the UK system, as measured through the price paid for PRNs, cannot be compared to the much higher costs of systems such as those in Germany. It is clear that in the latter, the costs of the DSD (Duales System Deutschland) system cover the costs of collection, separation and reprocessing/recovery. In the UK system, the PRN price effectively covers the marginal costs of collecting and reprocessing additional tonnes to meet the prevailing targets. The German system achieves very high rates of packaging recycling and recovery from the household stream. The UK system does not. Effectively, the two systems have different objectives — the UK system attempts to 'just comply' with the EU directive, while the German approach is to set targets which go well beyond what is required under the directive.

It should be emphasised that the price of PRNs has followed the evolution that would be expected of them. Hence, as stated above, in essence, the system 'works'. Much of the criticism relates to its design and its applicability in the domain of household waste management. The system has ensured that what is achieved is done so at a low cost to industry, but it is worth keeping in mind that the achievement has not been great and that the costs of packaging recycling and recovery are not all borne by industry, and hence are not measurable through the aggregated cost of PRNs alone ⁽²²⁾.

Allowances for landfilling biodegradable municipal waste
Article 5 of the landfill directive sets Member States the target of reducing the quantity of biodegradable municipal waste (BMW) being landfilled to 75 % of

⁽²²⁾ Errors of this nature have been made, both explicitly and implicitly, in assessments of the scheme undertaken by the Department of Trade and Industry (DTI) and in work for the House of Lords Select Committee.

1995 levels by 2006, 50 % by 2009 and 35 % by 2016. Countries that were landfilling more than 80 % of municipal waste in 1995 are able to take up a four-year derogation. The UK is likely to take up this derogation.

In 1999, the UK government issued a consultation paper, 'Limiting landfill', which looked at mechanisms for delivering these targets. The responses to the paper indicated that, of the options presented, there was support for a system of tradable landfill allowances issued to waste-disposal authorities (in the UK, some local authorities have a two-tier structure of governance, the lower tier having responsibility for waste collection, the upper tier – the waste-disposal authorities (WDAs) – being responsible for waste disposal).

After further consultation on the scheme, the relevant government ministry, the Department for Environment, Food and Rural Affairs (DEFRA), announced the details of how the landfill allowance trading scheme (LATS) will function in England⁽²³⁾. This started functioning from April 2005. To summarise⁽²⁴⁾:

- each WDA will be allocated allowances based initially on the amount of BMW it was landfilling in 2001/02;
- by the first target date (2009/10), the total of all WDA allowances will have fallen to the amount which England as a whole is allowed to landfill in 2010. From the initial allowance, convergence to the 2009/10 figure will be achieved in steps equivalent to 10, 15, 20, 25 and 30 % of the difference between the initial allowance and the 2009/10 figure. The allowances for individual WDAs in 2009/10 will be based on the proportion of England's municipal waste they were responsible for in 2001/02;
- borrowing a maximum of 5 % of the following year's allowance will be allowed;
- the system will allow for banking;
- reconciliations will be carried out through a mass balance process based on data submitted to the Environment Agency;
- fines will be set at GBP 200 for every tonne of waste disposed of without a corresponding permit;

- the government reserves the right to pass on fines to WDAs which result from England failing to comply with its obligations under EU legislation.

There have been some critical comments about the nature of the system. In particular, the Local Government Association is concerned about the scheme's early introduction, notwithstanding the fact that the allocation proceeds towards target levels relatively slowly in the earlier years, with progressively larger steps to target levels in later years, and that banking and borrowing can buy time for local authorities which seek to avoid engaging in trading⁽²⁵⁾. The lead time for the planning, procurement and development of new waste management facilities in the UK is often many years (depending partly on the treatment chosen) so that the speed at which local authorities can respond is somewhat constrained. However, local authorities have known for some time that such a scheme would almost certainly enter into force before 2010 (the first consultation document on the scheme was issued in 1999). As such, the current complaints appear to suggest some lack of planning on their own part, and a general concern about the level of fines to be applied in the event of non-compliance.

Other areas of application

The trading idea has also been used to create markets for water and for marine fisheries, both resources being highly vulnerable to destructive overuse in the absence of appropriate market signals.

Individual transferable quotas in fisheries

Individual transferable quotas were first used in the 1980s in New Zealand (1982), Canada (1983), Iceland (see Box 2.3) and Australia (1984) (Davidse *et al.*, 1997). The Netherlands was the first EU Member State to use an ITQ system (1985, for five species). It has since been introduced for very specific fisheries in the UK, Denmark (on a trial basis in the pelagic fishery), Portugal and Italy. One major difference from other ET schemes is that the trading does not cover a waste product, but the actual final product to be marketed. There are strong economic arguments for the introduction of ITQs. They are expected to allow the achievement of a total allowable catch (TAC) target, and to do so with reduced fishing

⁽²³⁾ Because of the process of devolution, different countries of the UK have the right to decide on how they will ensure that they comply with the requirements of the landfill directive. Northern Ireland has recently completed a consultation exercise. The Welsh Assembly has decided not to introduce trading.

⁽²⁴⁾ For details, see DEFRA (2004), Landfill allowance trading scheme: Consultation outcome, April 2004 (www.defra.gov.uk).

⁽²⁵⁾ The Local Government Association, which represents local authorities in the UK, has been quite critical of the scheme's potential consequences. See Local Government Association (2004), 'Position statement: Landfill trading', April 2004, and Local Government Association (2004), 'Position statement: Biowaste and risk', July 2004 (both documents are available at <http://www.lga.gov.uk/OurWork.asp?lsection=59&ccat=210>).

Box 2.3 Individual transferable quotas in Iceland

Iceland is a prominent fishing nation and one of the earliest to introduce an ITQ system. It was formally introduced in 1984 with the support of the industry at a time when it was confronting a deep crisis. The fishery was clearly overcapitalised and the stocks were overfished. Between 1945 and 1983, the value of fishing capital increased by 1 200 % while the value of the landings increased by only 300 %. Fishers and boat owners saw the introduction of ITQs as a necessary but temporary remedy.

On the whole, the economic impact has been positive. Productivity has increased, though this is more marked for some species than others. The distributional impact has been profound, in that the number of ITQ quota holders fell from 1 100 in 1991 to 700 in 1997, of whom 22 held over half the total quota.

Sources: Mongruel and Pálsson (2004); Sterner (2003).

effort — those who cannot afford to buy ITQs, or who find it more profitable to reduce effort and sell, exit or reduce their fishing effort — thereby contributing to economic efficiency. A positive impact on the environment is achieved indirectly as a result of reduced fishing, but this is not the primary aim of an ITQ system.

The major issues that need to be addressed when introducing an ITQ system are similar to those which arise with pollution-based emissions trading schemes, namely:

- units traded — typically a share of the total allowable catch;
- scale and scope — fish stocks and geographical space included;
- allocation — who is eligible to hold quotas, and how are they allocated (auction or free);
- market management and structure — how transferability is facilitated;
- enforcement — how non-compliance is identified and penalised.

2.3.2 Emissions trading and climate change

Emissions trading is a particularly appropriate instrument where the emissions have the same effect regardless of their source or location; greenhouse gases have this quality. Because enforcement is important, national boundaries provide a natural limitation on widening scope, unless transfrontier enforceable provisions are in place — as in the EU — or can be agreed.

Before addressing the EU scheme, the UK experience, which preceded it, is summarised.

UK greenhouse gas emissions trading scheme

The UK greenhouse gas emissions trading scheme forms part of the UK climate change programme. The scheme was launched in April 2002 and is the product of more than two years' close collaboration

between the UK government and business. It was the world's first economy-wide greenhouse gas emissions trading scheme and is designed to give both the government and business early experience of emissions trading.

The goal of the domestic UK trading scheme is to contribute towards reducing greenhouse gas emissions by 12.5 % below 1990 levels by 2008 and carbon dioxide emissions by 20 % below 1990 levels by 2010. This will underpin further reductions over longer time frames, particularly through to 2020. The UK's domestic emissions trading scheme has two types of participants — direct participants who accept an absolute cap, and 'climate change agreement' participants.

Direct participants

Direct participants are required to make absolute reductions against their emission levels in 1998–2000 (their baselines) in exchange for an incentive payment. As the UK emissions trading scheme is a voluntary scheme and its participants would also have to pay a climate change levy (CCL) on their energy consumption, it was anticipated that not many organisations would actually volunteer to participate in the scheme. The government has therefore provided a financial incentive for organisations that have taken on annual voluntary targets for a five-year period, 2002–2006. Up to GBP 215 million was made available which is equivalent to GBP 30 million per year after tax. The incentive was made available to most of the organisations responsible for greenhouse gas emissions within the UK, with the exception of emissions already covered by a climate change agreement (CCA), emissions from electricity generation (except where the energy generated is used onsite) and emissions from most modes of transport. The targets and level of incentive payment were set through a competitive auction held in March 2002, whereby organisations sold their reductions against their baselines to the

government for the entire period 2002–2006, divided into five equal annual targets.

The competitive auction ended after nine rounds, clearing at a price of GBP 53.37 (about EUR 80), which is the price the government will pay per tonne of emission reduction delivered by the organisations directly involved in the scheme. There are 34 direct participants currently in the scheme covering a range of sizes and sectors. The organisations that won the auction at this price are committed to legally binding targets amounting to a reduction in annual emissions of approximately 4 million tonnes of CO₂ equivalent by the end of the five years of the scheme. This was about an average 11 % reduction from the organisations' baselines. The committed reductions account for more than 5 % of the planned reductions in the UK's annual emissions by 2010.

Climate change agreement participants

The UK also has climate change levy and climate change agreements that interact with the emissions trading scheme. The CCA companies will be able to use trading either to help meet their target or to sell any overachievement if they exceed their target. Climate change agreements are voluntary agreements for industrial sectors to commit to certain emission reduction targets. Under the CCAs, firms can choose either absolute or relative targets: an absolute target in terms of energy or CO₂ emissions, or a unit or relative target, again either in terms of energy or CO₂ emission per unit of output. However, because many of the targets set through the agreements are defined relative to levels of output, i.e. they are efficiency targets rather than absolute emission caps, trading by these companies will be subject to certain restrictions. In practice, most firms have chosen the relative targets. Those that opt for absolute targets under CCAs are also eligible to participate in the emissions trading scheme.

The link between the emissions trading scheme and CCAs is known as a gateway. The gateway links the market for the 'unit or relative sector' for those with a unit target under the CCAs to the 'absolute sector' under the ETS. There is no limit to the sale of absolute sector permits into the unit/relative sector, as these permits are based on absolute emission reductions. However, the sale of compliance credits under CCAs (relative sector) into the ETS (absolute sector) is restricted, and allowed only as long as the total historical sale in this direction does not exceed the quantity of absolute sector permits previously sold into the relative sector. This is aimed at ensuring that there will be no net transfer of allowances from the relative to the absolute sector,

as otherwise this could undermine the total emission reduction achieved in absolute terms.

Link with project-based reductions

Companies will be able, in time and subject to prior approval by the government, to undertake specific emission reduction projects and sell the resulting credits into the scheme. These credits can be bought by companies with caps to meet their targets. A project cannot cover emissions that are already covered by other targets. In addition, any individual or organisation that does not want to enter the scheme on the basis of an emission reduction target or project can simply open a trading account on the UK emissions trading registry and buy and sell allowances.

Features of the scheme

All holdings of emission allowances are recorded on a computerised registry that is accessible by participants through a dedicated website. Each direct participant has an account on the registry into which their allowances are issued. These allowances may then be traded. This is no different from trading any other commodity.

The scheme is equipped with penalties that are sufficiently strong to ensure its effective operation but not disproportionate in the context of a voluntary scheme. Initially, the main penalties for not meeting targets are the withholding and clawback with interest of the incentive payments coupled with a reduced allocation of allowances the following year. Direct participants have their compliance assessed at the end of each year, and they will have a three-month reconciliation period in which to ensure that their allowance holdings cover their annual emissions. The compliance of the CCA participants is assessed at the end of a 12-month 'target period', which occurs one year in every two.

There is no restriction on the banking of allowances up to the end of 2007, and some banking is also allowed in the first commitment period (2008–2012) when proposed international emissions trading will begin.

Performance

De Muizon and Glachant (2003) have made a preliminary *ex ante* assessment of the cost-efficiency and environmental effectiveness of the agreements/energy tax/emissions trading mix in the UK and concluded that the performances of the policy mix would not be affected by the absence of CCAs. They point out that the CCAs are basically the initial allocation mechanism of the baseline and credit trading market. They were a crucial part of

the policy mix in terms of political acceptability, and thus may increase the environmental effectiveness. However, emissions trading based on grandfathering may have reduced the political objections, and thus they conclude that the use of agreements complicated the scheme while adding no obvious efficiency advantages.

The total number of 2002 vintage allowances allocated to both direct participants and those with CCAs was 31 577 869. Of these allowances, 7 216 105 were transferred up to 31 March 2003. A steady increase in the number of transfers was witnessed over the first year: 364 transfers took place between April 2002 and December 2002 with a further 1 637 occurring during the reconciliation period up to March 2003. One transfer usually covers more than one allowance.

In addition to the direct participants, CCA participants have also used the trading scheme. CCA participants delivered a total reduction in CO₂ emissions of 13.5 million tonnes against an estimated 2000 baseline (or 15.8 million tonnes against pre-2000 baselines). A total of 866 CCA participants used the trading scheme, trading almost 600 000 emission allowances. In all, 743 participants from 27 sectors (44 sectors have CCAs) bought 565 918 allowances and retired them against their targets; 123 participants from 17 sectors were allocated 1 346 454 allowances.

Thirty-five non-target holders such as brokers and others have bought or sold on the market.

Of 32 direct participants (two of the original 34 auction winners withdrew from the scheme in 2002), 31 are in compliance and have met their emission reduction target (DEFRA, 2003).

The latest price information from the UK scheme is that allowances are trading at a price of GBP 2 per tonne (4 August 2005) ⁽²⁶⁾.

The scheme is regarded as having been a very useful learning tool to understand how trading works and what issues need to be addressed to ensure appropriately set-up and functioning schemes. It has also resulted in some environmental improvement in terms of reducing some emissions that would otherwise have occurred, but some participants may have been paid for reductions that they would have made anyway. One criticism that people observing

the system have had that needs to be taken on board for the future is the overallocation to certain companies, which received subsidies to reduce emissions in the 1990s, then had a baseline set under ET that allowed them to claim credit for the same reductions.

A further lesson is that the scheme could not be linked to the Danish system which has been in existence since 2001 and hence obtain additional cost savings. This has raised useful arguments that future national trading schemes, when being set up, should consider the benefits of trading across borders and hence the idea of compatible systems across Europe.

The EU emissions trading scheme (EUETS)

Emissions trading was included as a 'flexible mechanism' – together with the clean development mechanism (CDM) and joint implementation (JI) – in the Kyoto Protocol to the United Nations Framework Convention on Climate Change. The EU has approved an emissions trading scheme for greenhouse gases, which came into operation on a pilot basis in January 2005 ⁽²⁷⁾. It is one of the instruments for achieving the EU target of reducing greenhouse gas emissions by 2008–2012 by 8 % compared with emissions in 1990.

The EU's emissions trading scheme, formally approved by the European Parliament in July 2003, will be the first transnational greenhouse gas emissions trading scheme in the world. With the participation of the European Economic Area countries and the accession of 10 new countries to the EU in 2004, 30 countries could potentially be involved in this scheme from 2012, with the possibility of Norway entering at an earlier stage.

Considering that it was only in 1997 that trading moved from being mainly of academic interest to taking centre stage in Europe, progress with adopting the instrument has been remarkable.

What has happened to move emissions trading towards the top of the policy agenda in Europe? There are three main explanations. The first is the conviction of the Commission that it provides a potentially powerful mechanism for helping to achieve agreed EU and global targets. Second, some parts of business in some Member States and non-governmental organisations are cautiously supportive. Third, the fact that it is included overtly

⁽²⁶⁾ www.natsource.com.

⁽²⁷⁾ Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. This text incorporates the amendments adopted by the European Parliament at its second reading on 2 July 2003 and accepted by the Council at its meeting of 22 July 2003. See Boemare and Quirion (2001) for an analysis of this directive.

in the Kyoto Protocol as a flexible mechanism has forced all parties to give the instrument consideration.

The EUETS is based on six principles ⁽²⁸⁾:

- it is a cap and trade system;
- its initial focus is on CO₂ from big industrial emitters;
- implementation will take place in phases, with periodic reviews and opportunities for expansion to other gases and sectors;
- allocation plans for emission allowances will be decided periodically;
- it includes a strong compliance framework;
- the market is EU-wide but taps emission reduction opportunities in the rest of the world through the use of the clean development mechanism and joint implementation mechanism under the Kyoto Protocol, and so provides for links with compatible schemes in third countries.

Coverage and duration

The scheme runs in two phases – a first 'pilot' phase, from 2005 to 2007 inclusive, and from 2008 to 2012 (the 'first commitment period' in Kyoto Protocol parlance).

As proposed initially by the Commission, the trading scheme was obligatory for the entities to which it applies, but an 'opt-out' of the pilot phase was added. The UK has decided to maintain its own trading system in the pilot phase and some of its participants have opted out. In the first phase, the following sectors are in the trading scheme:

- power and heat generation (for installations with a rated thermal input alone or in aggregate exceeding 20 MW (except incinerators);
- mineral oil refineries and coke ovens;
- production and processing of ferrous metals including metal ore, pig iron and steel;
- production of cement clinker, glass, tiles, bricks and porcelain smelters;
- production of pulp, paper and board (with production capacity exceeding 20 tonnes per day).

Even with this limited scope, more than 12 000 installations in the 25 Member States will be covered, accounting for around 45 % of the EU's

total CO₂ emissions or about 30 % of its overall greenhouse gas emissions ⁽²⁹⁾.

The chemical sector is excluded because its emissions of 26 million tonnes of CO₂ equivalent in 1990 (less than 1 % of carbon emissions in that year) are relatively modest, and the number of installations (34 000) is relatively high. Waste incinerators are excluded because of the complexities of measuring the carbon content of the waste material being burnt, though discussions have continued concerning ways in which waste facilities could be included within the scheme.

Form

The EU scheme is cap and trade, in that absolute quotas are issued, allowances can be bought and sold, and the emitter must hold sufficient allowances to cover emissions. The operator must surrender allowances equal to the total emissions of the installation in each calendar year, within four months following the end of that year. This is an important gain over the alternative of baseline and credit (whereby entities earn credits when they reduce their emissions below a defined baseline, and emissions can increase with economic growth); the latter would have posed very substantial and potentially contentious administrative burdens, and, depending on how it was designed, might also have proved environmentally ineffective.

Unit and allocation

The unit of the EU emissions trading scheme is the 'EU allowance' (EUA). An EUA permits its holder to emit 1 tonne of CO₂ within a given year.

In the emissions trading directive, the European Commission determined that, for the three-year period beginning on 1 January 2005, Member States shall allocate at least 95 % of allowances free of charge. For the five-year period beginning on 1 January 2008, Member States are to allocate at least 90 % of allowances free of charge. Member States have been required to develop a national allocation plan (NAP) for the first period of emissions trading. The NAP details the total quantity of allowances that Member States intend to allocate to the trading sector and how they propose to allocate them. For an installation in the trading sector to receive an allowance allocation it must hold an emissions trading permit ⁽³⁰⁾. Allowance allocation is governed by Articles 9 to 11 of and Annex III to the emissions

⁽²⁸⁾ EU emissions trading: An open scheme promoting global innovation to combat climate change, European Commission, November 2004, ISBN 92-894-8326-1.

⁽²⁹⁾ European Commission, November 2004.

⁽³⁰⁾ Each Member State had the choice of setting its own deadline by which installations covered had to apply for their emissions trading permit. Installations that failed to secure a permit by the chosen deadline are subsequently treated as new entrants and it is at the Member States' discretion how they choose to deal with new entrants.

trading directive. To assist with NAP development, the Commission has provided Member States with guidance on the necessary criteria that should be adhered to when developing their plans. For example, no allowances are to be allocated to cover emissions that would otherwise be reduced or eliminated as a consequence of Community legislation on renewable energy for electricity production. The EU-15 Member States were due to submit their NAPs by 31 March 2004; Austria, Denmark, Finland, Germany and Ireland succeeded in meeting this deadline. The accession countries had until 1 May 2004 (the date of accession to the European Union) to submit their NAPs⁽³¹⁾. From the date of submission, a cross-DG working group within the Commission had a three-month period for reviewing all NAPs to see whether or not they are in conformity with the allocation guidelines. The European Commission's Competition DG scrutinises each Member State's NAP to review the impacts on competitiveness. The Commission has the power to reject a Member State's NAP in whole or in part.

For the five-year period beginning 1 January 2008, each Member State must again decide, by mid-2006, on the total quantity of allowances it will allocate for that period. This allows Member States to adjust the allowances after the first three years, based on actual and projected progress towards the Kyoto Protocol targets, to comply with the national assigned amount in the burden sharing agreement.

Banking and borrowing

Banking is permitted over the three-year pilot phase (2005–2007) and it is up to Member States to decide whether to allow banking from this period to carry over into the first commitment period (2008–2012).

Participating installations will receive their allowance allocation for the coming year by 28 February. At the same time, installations will have until 30 April to surrender unneeded allowances from the previous calendar year. The overlapping time period between allocation and surrender (28 February to 30 April) will be when borrowing can take place.

Monitoring and enforcement

Emissions trading in each Member State is to be overseen by a government-approved 'competent authority'. One of the primary functions of the selected authority is to establish and manage an allowance registry. While companies are allocated allowances through the NAP process, and since

allowances only exist in electronic form, companies will not be able to receive any of their allowances until their national registry is in place. These registries will ensure the accurate accounting of the issue, holding, transfer and cancellation of allowances. Member States are to ensure that allowances can be transferred within and between Member States⁽³²⁾. All transactions within the EUETS will be monitored by a transaction log run by the central administrator. Allowances issued by the competent authority of another country will be recognised in all Member States for the purpose of meeting an operator's obligations. By 30 April at the latest each year, the operator of each installation must surrender a number of allowances equal to the total emissions from that installation during the previous calendar year.

Member States must ensure that each operator of an installation reports the emissions from that installation during each calendar year to their competent authority after the end of that year. Verification must be based on strategic analysis of all activities, with spot checks (process analysis) onsite to determine the reliability of reported data and information, identification of sources with risk of error, and risk-control measures (risk analysis). For any trading scheme to work effectively, it is necessary to have built-in penalties that will discourage non-compliance. Where an operator does not surrender sufficient allowances to 'cover' its emissions by 30 April of each year, it will be liable for the payment of an excess emissions penalty of EUR 100 for each tonne of CO₂ equivalent emitted by that installation for which the operator has not surrendered allowances. However, for the first three years of the scheme, beginning 1 January 2005, the penalty will be lower. The penalty incurred during this period will be EUR 40 for each tonne of excess CO₂ equivalent emitted. Payment of the excess emissions penalty will not release the operator from the obligation to surrender an amount of allowances equal to those excess emissions when surrendering allowances in the following calendar year.

Other issues

A number of provisions have been added to the emissions trading directive in order for it to be adopted by Member States.

- **The 'opt-out' provision** — Individual installations or economic activities can be exempted from emissions trading during the first period of the scheme, to 2007.

⁽³¹⁾ Slovenia was the only accession country to submit a NAP to the Commission by the 1 May deadline.

⁽³²⁾ The first provision — transfer within Member States — is essential to maintain the integrity of the system. The second is essential to ensure that the market is as wide as possible, so that maximum benefit can be derived from differences in abatement costs.

Table 2.1 Status of national allocations plans as of 13 June 2005

	Allowances ⁽¹⁾ (million t CO ₂ /year)	Installations ⁽²⁾ (number)	Status
Austria	33.0	209	Conditionally
Belgium	62.9	360	Approved
Cyprus	5.7	13	Approved
Czech Republic	97.6	477	Notified
Denmark	33.5	357	Approved
Estonia	18.9	43	Approved
Finland	45.5	326	Conditionally
France	156.5	1 172	Conditionally
Germany	499.0	1 849	Conditionally
Greece	74.4	139	Notified
Hungary	31.3	261	Approved
Ireland	22.3	110	Approved
Italy	232.5	1 240	Conditionally
Latvia	4.6	72	Approved
Lithuania	12.3	107	Approved
Luxembourg	3.4	19	Approved
Malta	2.9	2	Approved
Netherlands	95.3	333	Approved
Poland	239.1	1 166	Notified
Portugal	38.2	239	Approved
Slovakia	30.5	236	Approved
Slovenia	8.8	80	Approved
Spain	22.9	927	Approved
Sweden	174.6	499	Approved
United Kingdom	245.3	1 078	Conditionally
Total	2 158	11 105	

(¹) Including new entrant reserves.

(²) Without opt-in or opt-out.

- **The 'pooling' provision** — Member States may allow operators of installations carrying out one of the activities listed in Annex I to form a pool of installations from the same activity for the 2005–2007 period of the trading scheme and/or the first five-year period. There is a potential for national groups to act in an anti-competitive fashion. Such potential is likely to be highest where a pre-existing voluntary agreement covering a sector and managed by an industry association already exists, and it accounts for a relatively high proportion of total allowances. However, individual companies can 'opt out' which means that it would be very difficult in practice to maintain a cartel where the price obtainable within the pool was lower than in the wider EU market.
- **Force majeure** — This arises where very dramatic circumstances occur in a Member State that require action; it will be up to the Commission to determine whether *force majeure* is demonstrated, in which case it will authorise the issuance of additional and non-transferable

allowances by that Member State to the operators of those installations.

Linkage to the clean development mechanism and joint implementation

In April 2004, the Council of Ministers and European Parliament agreed on a text for the 'linking directive' ⁽³³⁾. Its core element is to provide for the recognition of clean development mechanism (CDM) and joint implementation (JI) credits ⁽³⁴⁾ for compliance use within the EUETS. From 2005, operators of installations participating in the EUETS will be able to buy CDM credits to help them fulfil their emission reduction obligations. Installations may only purchase JI credits from 2008 onwards. While linking will increase liquidity and the diversity of compliance options within the EU scheme, leading to a probable reduction in the price of carbon in the EU (i.e. EU allowances will become cheaper), the extra demand for CDM credits will raise their price, which will result in some convergence between the CDM credit and the EU allowance markets. However, installation

⁽³³⁾ The linking directive is a directive of the European Parliament and the Council of Ministers amending the directive establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms (COM(2003) 403 final).

⁽³⁴⁾ A CDM credit is known as a CER (certified emission reduction) and a JI credit is known as an ERU (emission reduction unit).

operators in the EU scheme will be competing with governments from around the world for CDM credits and, from 2008 onwards, for JI credits — ironically, including their own governments which will be using them for compliance with their own Kyoto targets⁽³⁵⁾. In addition, they will also be competing with private companies in Annex I countries such as Canada and Japan. The linking directive sets out the ground rules for the purchase of CDM and JI credits by firms in the EUETS. Member States remain free to decide whether and how to limit the number of CDM and JI credits firms can buy. The use of CDM and JI credits must respect the principle of supplementarity — achieving more than half of all emission reductions domestically. According to the directive, firms will not be allowed to use credits generated from land-use projects such as reforestation. However, if scientific uncertainties surrounding carbon sinks can be cleared up, there is the possibility that these credits could be recognised for use from 2008 onwards. Credits from investment in large hydropower projects (over 20 MW) can be used or purchased for use in the EUETS, provided that the projects are in line with criteria

drawn up by the World Commission on Dams. Some Member States had wanted to allow firms covered by the EUETS to gain credits by investing in emission reduction projects at home, in areas such as transport. The European Parliament was against this. This issue will be re-examined when the Commission undertakes a review of the EUETS in 2006.

Performance

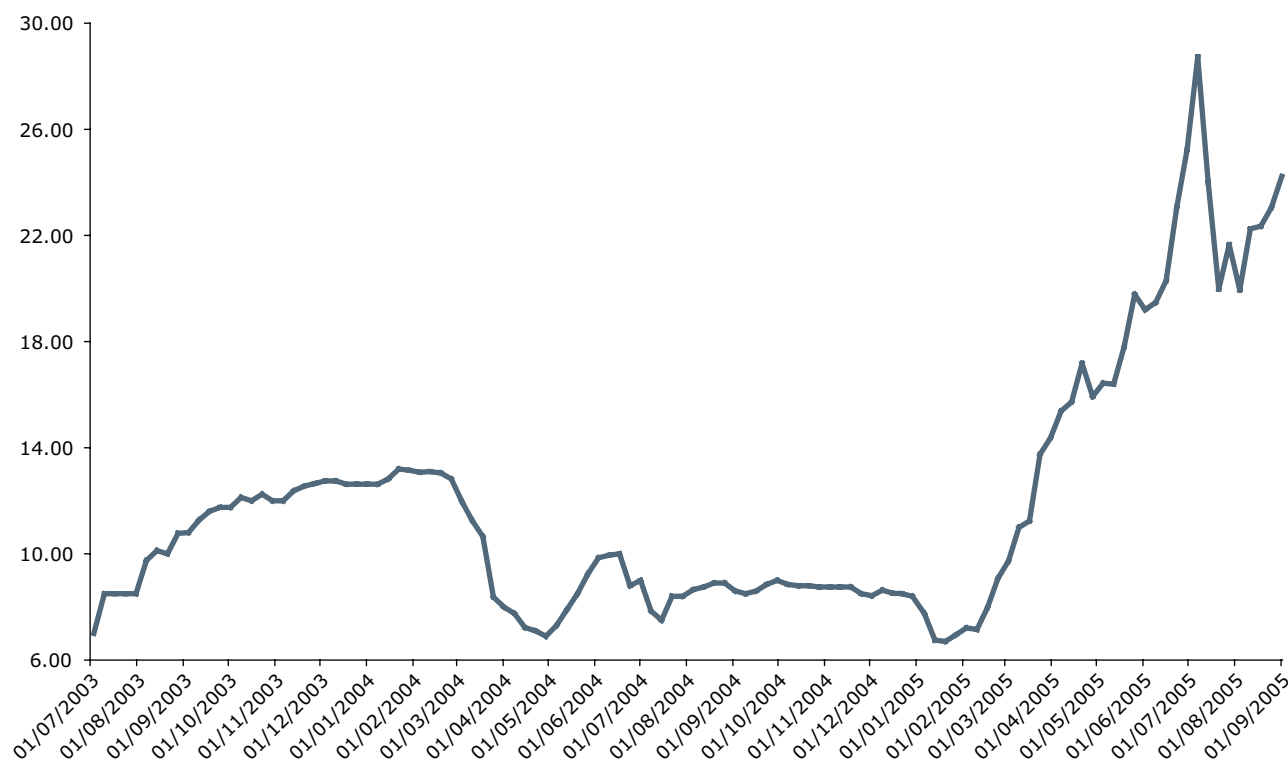
Allocation: The state of affairs regarding the national allocation plans is given in Table 2.1.

Prices: The trend in prices per tonne of CO₂ can be seen in Figure 2.1. It shows considerable volatility over the November 2003 to August 2004 period. The price started to climb immediately after the introduction of the EUETS in January 2005, to a level of about EUR 20 per tonne in June 2005.

Implications for international competitiveness and firm migration

Klepper and Peterson (2003) survey issues in this domain. It is sometimes argued that, if large

Figure 2.1 Price of EUETS allowances in the period July 2003 to June 2005 (EUR per tonne)



Source: Point Carbon, 2005.

⁽³⁵⁾ A number of European governments (including Austria, Denmark, Ireland, Italy and the Netherlands) have already made it clear that they intend to purchase significant quantities of CERs and ERUs during the 2008–2012 period.

countries (in the context of an international agreement to introduce emissions quotas as in the Kyoto Protocol) use free allocation of allowances, competing countries cannot use auctioning without overly hurting their economies. In this regard, there is often confusion about overall national well-being and the fate of individual firms. Our focus is on the former. Allowance prices make it equally costly to increase emissions, or equally profitable to reduce them. Allowance prices are what determine the output prices and technology choice of emitting industries in each case. The difference between the options is in the distribution of wealth and, indirectly, on efficiency as shown above, and possibly also on competitiveness (see below).

The choice of allowance allocation method may affect the international migration of firms as well as the location of new firms. This is relevant in the case where some countries have decided not to comply with a quantitative cap on greenhouse gas emissions, or the cap is so large that it is not a binding constraint. Firms in those Annex 1 countries that have a cap such that they have to buy allowances in order to expand will be competing with firms in countries where there is no need to buy allowances. This then becomes a competitive wedge that could influence the location of new investment, or even trigger a move by existing capacity from 'Kyoto capped' jurisdictions to those that are not so constrained. This could even become an issue within the EU. If the relatively well-allowance-endowed accession countries, for example Poland, were to provide free allowances to new foreign direct investment, this would provide some competitive edge over countries such as Ireland, Portugal and Spain that have limited surplus allowances to provide free of charge. Fitz Gerald (2004) focuses particular attention on the situation that might arise in adjacent jurisdictions, for example Ireland and Northern Ireland, for new investment in electricity generation or cement production if one provides more indulgent support to new entrants than the other. It is unlikely that allowance prices will be so high, and therefore so burdensome on firms, that they will prove pivotal in making decisions about where to locate, and there is the fact that jurisdictions not now in 'Kyoto cap country' may join so that these liabilities will be incurred anyway in the new location. Nevertheless, at the margin, as long as some comply and others do not, there could be 'carbon leakage'.

Energy-intensive firms that are very dependent on electrical energy perceive themselves as being especially vulnerable as the cost of allowances gets 'built-in' to the prices they will have to pay for

electricity. Estimates vary dramatically as to how high such price increases are likely to be.

Carbon Trust (2004) examined in depth five sectors that differ widely in their energy intensity and trade characteristics — electricity, cement, paper, steel and aluminium. Quantitative results were generated for three scenarios at various prices and allocations, reflecting plausible stages in the development of the EUETS. While there will be winners and losers at the firm level, at the sectoral level only aluminium loses from the EUETS. This is because it is not within the EU trading scheme and will suffer the effects of rising electricity prices without the compensation of receiving valuable allowances free of charge, and because much of its trade is outside the EU. If allowance prices rise over time, then the steel sector may also be adversely affected. These sectors have expressed concern about the possible inter-EU competitive effects of inconsistent allocations of allowances by Member States.

Expanding scope, and linking with other schemes

According to Article 24 of the directive, 'the (European) Community should conclude agreements with third countries listed in Annex B to the Kyoto Protocol that have ratified the Protocol for the mutual recognition of allowances between the Community greenhouse gas emissions trading scheme and other greenhouse gas emissions trading schemes'. The wider the scope of the scheme, the more diverse the range of opportunities for reducing emissions. This is therefore a very important provision, as it will allow the widening of the scheme to include others that have developed in parallel and are compatible. A domestic emissions trading scheme is expected to be operational in Canada by 2005. Another scheme is projected in Switzerland in accordance with the national CO₂ law. Japan's climate policy is under review, and emissions trading may be part of its strategy from 2008 onwards. While emissions trading has been dismissed at the federal level in Australia, the state of New South Wales has established its own greenhouse gas trading scheme. The government of New South Wales is seeking the cooperation of other states to extend this scheme to a multi-state scheme with broader coverage of sectors. However, as long as the Australian government continues to refuse to ratify the Kyoto Protocol, it is hard to envisage the EU linking up with an Australian-wide scheme, were it to develop.

From the second period, Member States will have the option of including other greenhouse gases and additional industrial sectors in the trading scheme. This ability to expand the scope of the

EUETS will strengthen the scheme over time. The European Commission ⁽³⁶⁾ indicated that it will look at the possibility of including the transport sector and aviation in its review of the emissions trading scheme in 2006. The review of the directive specifically obliges the Commission to look at how transport could be included in emissions trading, since emissions from the sector are rising. Including aviation would create a different set of challenges for the European Commission, as monitoring CO₂ emissions is only part of the picture — total radiative forcing from aircraft depends on a number of factors. Aviation is also not covered by the Kyoto Protocol, so including it in the EUETS is not an easy task (Cames and Duber, 2004). Interest in including aviation in the EUETS is growing, with indications that it will be a priority issue; the UK has indicated that it will encourage the inclusion of aviation during its EU Presidency next year (ENDS, 2004).

2.4 Lessons from the past and insights for the future

We now have about three decades of experience with emissions trading applied to the challenge of meeting environmental objectives. It is clear from this experience that it can be a powerful and effective tool, but the design and implementation protocols applied are crucial to its success. This section contains some lessons that apply generically to any trading scheme that is proposed, and some insights with reference to the follow-up of the EUETS. In outlining these lessons, we are conscious of the mathematical truism that it is impossible to maximise for more than one variable at a time. Those in the policy process are faced with difficult trade-offs, where more of one good (e.g. political viability) can be had only by sacrificing others (e.g. equity, environmental effectiveness or economic efficiency). The lessons below are designed to provide insights into the losses and gains involved as these trade-offs are made in the design of any trading scheme.

2.4.1 Generic lessons

These include the following:

- Various interests have different objectives, and, as schemes are adapted to meet these, they become more complex. Complexity typically adds costs in terms of time and money. Keep it simple — avoid constant pressure to complicate things. As a scheme is negotiated, show the losses in market effectiveness if complexity is to be indulged; this can improve the quality of the debate.
- Specifically, keep transaction costs — the costs of price discovery, finding buyers and sellers, making the trade, administering the system, including allocation of allowances and enforcement — as low as is consistent with having an effective market. For example, experience shows that a requirement to get permission to make a transaction is fatal to the prospects of an effective market. Likewise, where allowances are allocated free of charge, a simple standard (e.g. an emissions quantum per unit of heat input as applied in the acid rain programme) can reduce the negotiation costs. A target maximum of 5 % of trade value incurred as transaction costs seems reasonable ⁽³⁷⁾.
- If auctioning of all allowances is precluded by political considerations, a hybrid scheme of allocating allowances, where some are allocated free of charge and others auctioned, has many benefits including improved price discovery, lowered transaction costs, potential to reduce other taxes, generation of funds to compensate losers, and compensation to participants in the form of free allowances.
- Have a mechanism in place to compensate losers at the micro level, especially if these are vulnerable individuals and families — as price rises that affect lower-income households are expected. This argues the case for auctioning some allowances so that there are funds available for this purpose.
- Limit total allocations to the point where demand initially exceeds supply, so that a positive price emerges quickly. If there is a surplus supply, with no trades and prices, the viability of the scheme and its rationale can be undermined, even where demand over time does exceed supply and prices do emerge.
- Make the market as wide and deep as possible. Where there are relatively few players, the opportunity for diversity in abatement is diminished, and the prospects of collusive behaviour are increased. Where trading is confined within national boundaries, smaller economies are at a disadvantage. 'Bubbles' that embrace more than one country can overcome some of these limitations, but harmonising enforcement and other aspects can become more expensive.

⁽³⁶⁾ Peter Vis speaking at the Carbon Market Insight Conference organised by PointCarbon in Amsterdam on 20 April 2004. Information on his speech is taken from an article entitled EC targets fuel retailers, mineral oil refiners for emissions trading, which appeared on the PointCarbon website on 20 April (www.pointcarbon.com).

⁽³⁷⁾ But do not underinvest such that enforcement is so weak that it lacks credibility.

- Ready availability of price information is especially important in this context; if price discovery is difficult, decisions on whether to abate or to buy allowances are hindered. Thus, auctioning off some portion of the allowance pool — even where such revenues must be returned to the emitters — plays a valuable role.
- Liquidity is also important — the ability to buy or sell whatever volume of allowances is at issue without delay lubricates the market and keeps it efficient.
- History is always a surprise. Have a long-term strategy, but be able and willing to adapt as new knowledge emerges. Review and learning by doing should be built into the scheme.
- Avoid combination with technologically based standards that are applied at the individual installation level (e.g. best available technology). These undermine the logic and benefits of trading, where the objective is to shift the burden of abatement to those who can do so at least cost.
- Where there is less likelihood of major shifts in the volume of emissions from year to year, it makes sense to specify the units of emission or resource as tonnes per year. Where there is significant seasonal variation, then the units should be specified as shares of the total for the year in question.
- Invest in information that addresses competitiveness concerns, so that the focus can be narrowed to those sectors that are likely to have a genuine concern. This will allow any remedial action to concentrate on where the real problems arise.
- Announce new schemes early and in concrete terms. Long-term stability is a key condition for companies when 'internalising' the changes in their investment plans.
- Where the environmental impact varies from location to location, hot-spot concerns may arise. However, experience from the United States with the acid rain programme has been that most of the clean-up took place in the worst areas; the fears were not realised, and substantial benefits of having a market that is not spatially differentiated were derived. Those designing ET markets should consider having no spatial segmentation, and if hot-spot problems do turn out to be a problem, address them *ex post*.
- **Keeping it simple.** There has been considerable achievement in this regard, and it is important not to lose this as we move forward.
- **Maximising the scope.** The EUETS already covers a large geographical area and includes a large number of sources. Further widening by including other sectors (transport, aviation, chemicals) would further increase its environmental and cost-effectiveness potential.
- **Maximising the auctioning provision** (10 % of allowances) for 2008–2012. The virtual absence of this in the first period — only Denmark, Ireland and Lithuania have plans — is an important weakness. An amendment to the directive mandating this rather than leaving it as a voluntary provision would be desirable.
- **Tighten up on allocations in the second period** (2008–2012) so as to reduce the (almost certainly) higher costs of compliance in the non-trading sectors.
- **Impose carbon taxes on the non-trading sectors**, with an amount approximately equal to the allowance price. This will maintain symmetry in the incentives, and encourage further widening of the scheme as those who 'opt in' should forgo paying the tax. It is also in line with the provisions of the energy products directive. However, taxing non-trading sectors, compared with free allocation of permits to other sectors, does not contribute to equity unless appropriate recycling is undertaken.
- If price discovery proves difficult, encourage and facilitate those already providing price information, for example Carbon Market Europe, to intensify their efforts, and **Member States should conduct periodic auctions of 'unused' allowances.**
- **Avoid perverse incentives.** These include: providing free allowances to new fossil fuel-powered entrants to the electricity generation market, thereby discriminating against renewable suppliers; using emissions in the 2005–2007 period as the basis for allocation in the 2008–2012 period, thereby incentivising continued emissions in the pilot phase. The 'use it or lose it' provision in some national allocation plans, whereby installation closure results in the firm losing the allowances, is perverse as it encourages greenhouse-gas-inefficient plants to stay running.
- **Take the equity dimension seriously.** This means quickly identifying vulnerable households, individuals and firms that are likely to be adversely affected and helping them adjust. The absence of auction income makes this more difficult, but the regulation of the electricity market to capture some of the rent

Insights for the future development of the EUETS

It is clear that all parties to the EUETS face considerable opportunities and challenges in moving forward. These include the following:

and transfer it to households in the form of support for energy conservation will help. This will involve engaging with electricity regulators in the Member States.

- **Monitor competitive effects** — especially within the EU — during the pilot phase and ensure that the new entrant provisions do not result in movement of new capacity across frontiers, notably where cement and electricity markets can readily be served from adjacent national jurisdictions.
- **Monitor the extent to which cost-effectiveness and dynamic efficiency are achieved**, develop adaptations to enhance performance regarding these if such are needed and publish the cost savings achieved.

With the range of lessons being learnt and still to be learnt, emissions trading in Europe is sure to move swiftly from a new instrument with inevitable teething problems to a mature instrument that allows targets to be met at lower costs than would otherwise be incurred. This, in turn, could facilitate agreement on new targets.

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3 Environmental taxes and charges, deposit-refund schemes

3.1 Introduction

Environmental taxes and charges are the most widely used market-based instrument for environmental policy in Europe, despite current interest in trading schemes (see Chapter 2). They were introduced for different reasons and purposes: some to raise revenue, others to provide incentives to reduce pollution levels or the use of polluting products or natural resources. They are particularly useful for addressing the environmental challenges of diffuse sources of pollution such as cars and the use of pesticides. They are also of value to regulators since they can provide new information about polluting activities and those responsible for them.

Instruments such as environmental taxes are generally seen as the most cost-effective instruments for achieving environmental objectives (provided the transaction costs are not higher than those of alternative instruments), since the price signals and the room for manoeuvre that result encourage actors to allocate their resources more efficiently than would be the case with a command and control approach. Whether the required outcome necessarily results is, however, less certain. Environmental taxes and charges cannot guarantee a defined quantifiable outcome; regulatory measures and emissions trading schemes are established in terms of quantifiable outcomes and should therefore be able to achieve clearly defined policy objectives.

This chapter ⁽³⁸⁾ provides an overview of the application of environmental taxes, charges and deposit-refund schemes in environmental policy, highlights some recent developments and experience, and identifies lessons for their future use.

Environmental taxes and charges are a form of market-based or economic instruments that have matured considerably: they were increasingly

implemented during the 1980s and 1990s and continue to be used in many European countries.

Their use has been closely associated with increasing support for the 'polluter pays' principle (PPP), which requires that environmental costs are 'internalised' and reflected in the prices of the goods and services that cause pollution as a result of their production or consumption. The extent to which the principle is actually supported depends on the design of the instrument, for example the extent of exemptions from the tax or charge and whether the revenues are refunded, but also on whether the 'true' environmental costs associated with emissions or natural resource use can be identified.

Definitions

The terms used in this report are defined in Box 3.1. There is no generally accepted definition of the term 'environmental taxes' in the current literature, though progress has been made over the years. In 1997, the European Commission summarised the issue as follows: 'In the area of environmental taxation, different meanings are often given to similar terms in different Member States, and no precise definitions are offered by EU legislation' (European Commission, 1997, p. 3). The difficulty in establishing a formal definition agreed by everybody has led to a focus 'on the tax bases that have a particular environmental relevance, and to consider all taxes levied on these tax bases as environmental' (Eurostat, 2001, p. 9). The definition currently generally accepted by the European Commission and the OECD is based on the rationale that an environmental tax is defined through the **tax base**.

This definition, however, takes no account of the **intent** of the tax — why the policy-makers launched it. As long as 'the thing that is taxed' is related to the environment, the intention is regarded as unimportant. Hence, taxes which some commentators refer to as being principally for

⁽³⁸⁾ This chapter has been drafted for the EEA (contract reference 3223/B2003.EEA.51620) by Stefan Speck, Ian Skinner (IEEP), Dominic Hogg (Eunomia) and Patrick ten Brink (IEEP), with valuable inputs from Frank Convery and Louise Dunne (UCD), Dirk Reyntjens (IEEP), Jason Anderson (IEEP) and Hans Vos (EEA), as well as from Marloes van der Winkel and Svetlana Tashchilova. It has benefited from the comments of the expert group (see 'Foreword and acknowledgements').

Box 3.1 Definition of environmental taxes and charges

The widely used definition of **environmental taxes**, based on the statistical framework and jointly developed by international organisations such as the European Commission and the OECD, is:

'A tax whose tax base is a physical unit (or a proxy of it) of something that has a proven, specific negative impact on the environment' (Eurostat, 2001, p. 9).

This definition is significant because the tax base is considered as 'the only objective basis for identifying environmental taxes for the purpose of international comparisons' (ibid., p. 9). The name and purpose of the tax and the motivation for implementing it are not considered in this definition.

A further distinction in the overall context of economic instruments for environmental policy can be found in the literature by considering the terms 'taxes', 'charges', 'fees' and 'levies'.

A **tax** is defined as 'any compulsory, unrequited payment to general government levied on tax bases deemed to be of particular relevance. Taxes are unrequited in the sense that benefits provided by government to taxpayers are not normally in proportion to their payments' (OECD, 2001, p. 15).

The terms '**charges**' and '**fees**' are commonly used and are defined as compulsory and requited payments to general government or to bodies outside general government, such as environmental funds or water management boards. Examples include wastewater, abstraction, and waste charges.

'**Levy**' is a more general term covering taxes as well as charges and fees, and is commonly used, for example, in the UK (climate change levy, aggregates levy). This is partly to avoid the bad publicity and hence resistance associated with the word 'tax'.

The terms '**fin**s', '**penalties**', and '**penalty charges**' and '**non-compliance fees**' are also used. These are economic instruments closely related to direct regulation, and are widely used in the former centrally planned economies, where fines are often set up to 100 times higher than the fees charged when emissions are within certain limits.

'revenue raising' are considered as 'environmental' under this definition, for example those levied on transport fuels. However, the way the tax is perceived may be important from the political point of view and also, given the potential benefits of signalling that the pollutant, resource or product taxed should be emitted or used less, from an environmental perspective ⁽³⁹⁾.

3.2 Overview of the use of environmental taxes in Europe

Reports on the development of environmental taxes and charges have been published regularly by different international organisations. They focus mainly on OECD countries (OECD, 1989, 1995a, 2001), and on European countries with

particular focus on EU Member States (EEA, 1996, 2000; European Commission, 1999; Ecotec *et al.*, 2001; Eurostat, 2004). The situation in central and eastern Europe has also been repeatedly studied by organisations such as the OECD (OECD, 1994, 2003a), the Regional Environmental Center for Central and Eastern Europe (REC) (Klarer *et al.*, 1999; Speck *et al.*, 2001a), and the Baltic Environmental Forum (BEF, 2003). Complementing these multi-country studies are a wide number of country-specific and tax/charge-specific analyses (see references throughout the text). Many of these studies are also good sources for the rationale and benefits of taxes and charges.

Box 3.2 and Tables 3.1 and 3.2 provide an overview of the use of environmental taxes and charges in Europe.

⁽³⁹⁾ Value added tax (VAT) is not usually considered to be an environmental tax since it is related not to environmentally damaging goods per se, but to price (i.e. not something which itself has a negative environmental impact). However, this does not mean that taxes such as VAT cannot have environmental consequences. Differentiating VAT rates, such as a lower rate for repair services, is a means sometimes used with an explicitly environmental rationale.

Box 3.2 Environmental taxes and charges in Europe

- **CO₂ taxes:** While attempts to introduce a CO₂/energy tax at the EU level have failed, CO₂ taxes have been widely adopted in the Member States. The first CO₂ tax was levied in Finland in 1990, and there are now CO₂ taxes in Denmark, Finland, Germany, the Netherlands, Norway, Poland, Slovenia, Sweden and the UK. Estonia introduced a charge on CO₂ emissions in 2000. These taxes are often an additional tax levied on some energy carriers, not always differentiated according to their carbon content, and with many exemptions.
- **Air pollution:** A levy on NO_x is in place in France, Italy and Sweden, and SO₂ levies are in place in Denmark, France, Norway, Sweden and Switzerland. More comprehensive, multi-pollutant systems of air pollution charging are in place in some of the new EU Member States (such as the Czech Republic, Estonia, Latvia, Lithuania and Poland) and candidate countries (Bulgaria and Romania) as well as in the eastern European countries (such as Russia where more than 200 different air pollutants and around 200 water pollutants are subject to a pollution charge). Switzerland has introduced a tax on volatile organic compounds (VOCs).
- **Agricultural inputs:** There are taxes or charges on pesticides in Denmark, Norway and Sweden, and in Belgium, although not on products used in agriculture; and on fertilisers in Denmark (tax on phosphorus in animal food), the Netherlands (to be abandoned) and Sweden, and earlier (now abolished) in Austria, Norway and Finland.
- **Products:** There are taxes or charges on a wide range of polluting products, including: batteries in Belgium, Bulgaria, Denmark, Italy, Latvia, Lithuania and Sweden, with a takeback scheme in place in Austria, Germany and Switzerland; plastic carrier bags in Denmark, Italy and Ireland; disposable beverage containers in Belgium, Denmark, Estonia, Finland, Latvia, Lithuania, Poland and Sweden and deposit-refund schemes in Austria, Germany and the Netherlands; tyres in Bulgaria, Denmark, Finland, Latvia and Sweden; chlorofluorocarbons (CFCs) and/or halons in Latvia and Denmark; disposable cameras in Belgium; lubricant oil in Denmark (now abolished), Finland, Italy, Latvia, Norway, Slovenia, Spain and Sweden; and oil products (to combat and compensate oil pollution damage) in Finland and France.
- **Waste:** User charges are in place in most EU Member States and Balkan as well as eastern European countries and in the EFTA countries (Norway and Switzerland). There are waste taxes (landfill tax) in many EU Member States; hazardous waste taxes or charges in a number of countries, notably Belgium, Denmark, Finland, France, Germany and Poland; and differentiated user charges in many municipalities in a wide range of Member States, with the aim of making this compulsory across all municipalities in Ireland and Italy.
- **Water:** User charges for water are in place for all EU Member States and Balkan and eastern European countries, though with different levels of cost recovery implicit in the price. There are water abstraction tax/charges in Denmark, the Netherlands and the majority of the new EU Member States and applicant countries; wastewater tax/charge — effluent charges in several EU-15 Member States including Denmark, France, Germany and the Netherlands, and in several new EU Member States and Balkan as well as eastern European countries.
- **Fisheries:** While not strictly speaking an environmental charge, there are economic instruments that apply to fisheries. The EU pays access charges on behalf of its long-distance fleet for access to the fisheries resources of some third countries. In some cases, these countries also levy additional charges directly on the boat owners. These may be flat rates or linked to catch levels. The levying of charges on recreational fishing is common throughout the EU.
- **Others:** Aggregates taxes, covering sand, gravel and/or crushed rock, are in place in Belgium (Flanders), Bulgaria, Denmark, Russia, Sweden, Ukraine and the UK.
- In addition, there already are, or are seriously proposed, taxes/charges on: air transport (noise charge), chlorinated solvents, disposable tableware, light bulbs, PVC, phthalates, junk mail; vehicle scrapping charges (already in place in Norway, Slovenia and Sweden), electronic and electric waste (already in place in several EU countries), nuclear waste management, and air polluting emissions from incinerators.

For further information regarding taxes and charges listed above or in the tables, see the OECD/EEA database on environment-related taxes at <http://www.oecd.org/env/tax-database>; BEF (2003); OECD (2003a); Speck *et al.* (2001a); and the websites of Ministries of Finance and Environment of the European countries.

Table 3.1 Overview of environmental taxes and charges in the EU-15 plus EFTA countries (Iceland, Liechtenstein, Norway and Switzerland)

	AT	BE	DK	FI	FR	DE	EL	IS	IE	IT	LU	NL	NO	PT	ES	SE	UK	LI	CH
Air/energy																			
Energy/carbon dioxide			■	■	■	■			■	■		■	■				■		
Sulphur dioxide			■		■					■			■						■
Nitrogen dioxide					■					■							■		
Other air pollutants			■																■
Fuels	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Sulphur in fuels		■	■	■	■	■						■	■				■		■
Other GHGs			■										■						
Transport																			
Car registration	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Annual circulation tax	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Water																			
Water effluent	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Water abstraction			■	■	■	■				■		■			■	■	■	■	■
Waste																			
Landfill and/or incineration tax		Flanders			■					■					Catalonia				
Products																			
Tyres			■	■	■							■							
Beverage/disposable containers		■	■	■	■			■			■		■				■		
Packaging	■	■	■	■	■					■			■						
Bags			■					■	■	■									
Pesticides		■	■	■	■								■				■		
Products with CFCs	■	■	■																
Batteries	■	■	■	■	■			■		■							■		■
Light bulbs			■																
PVC/phthalates			■																
Lubrication oil				■						■			■		■				
Fertilisers (N, P) – minerals			■		■							■					■		
Paper, board		■	■	■	■			■											
Resources																			
Raw materials		Flanders								■								■	■

Note: Grey cells indicate occurrence of tax base

Table 3.2 Overview of environmental taxes and charges in new EU Member States, EU candidate countries, Balkan and other European countries

	CY	CZ	EE	HU	LV	LT	MT	PL	SI	SK	BG	RO	TR	HR	MK	CS	BA	AL	RU	UA	BY	MD	
Air/energy																							
Energy/CO ₂			■					■	■														
Sulphur dioxide		■	■	■	■	■	■	■	■	■	■	■	■	■	■					■	■	■	■
Nitrogen dioxide		■	■	■	■	■	■	■	■	■	■	■	■	■	■					■	■	■	■
Other air pollutants		■	■	■	■	■	■	■	■	■	■	■	■	■	■					■	■	■	■
Fuels		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Sulphur in fuels											■	■											
Other GHGs																							
Transport																							
Car sales/imports				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Circulation tax		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Water																							
Water effluent		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Water abstraction		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Waste																							
Waste taxes		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Products																							
Tyres				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Beverage containers		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Packaging		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Bags																							
Pesticides																							
CFCs		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Batteries				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Light bulbs				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PVC/phthalates																							
Lubrication oil		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Fertilisers (N, P) – minerals																							
Paper, board					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Resources																							
Raw materials			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Note: Grey cells indicate occurrence of tax base

3.3 Rationale for the use of environmental taxes

Environmental pollution can lead to damage to human health, ecosystems and the built environment. This can be of considerable economic significance, but is typically not reflected in market prices, and the consequences are usually borne by society as a whole rather than by the polluter.

The 'polluter pays' principle (PPP) was confirmed as a foundation of European environmental policies, along with the precautionary principle, in the EC Treaty (Article 174). The PPP was adopted by the OECD Council in 1972 as the primary economic principle for allocating the costs of pollution prevention and control. Economic instruments such as taxes are seen as appropriate tools for implementing this principle, which has become the widely accepted framework for internalising environmental externalities.

The main advantage of taxes is that the price signals should encourage producers and consumers to change their behaviour. These price signals are the rationale for the taxes; they can result in static and dynamic efficiency gains. These two concepts are widely discussed in the literature: 'static efficiency gains can be realised at the level of abatement measures undertaken by industry, the impact on consumer decisions, and industry structure' (OECD, 2001, p. 22), and dynamic efficiency gains can be

achieved because taxes 'create a continual incentive for firms to further reduce polluting emissions, through cost-effective abatement, innovation of cleaner production techniques and better abatement technologies, and through industrial restructuring' (OECD, 2001, p. 23).

There are two recognised approaches to internalising environmental costs through the application of a tax.

- The tax is set at the level that internalises all the environmental costs, i.e. the costs of environmental damage (also called externalities or external costs), into the price. To guarantee this, the tax rate must be equal to the marginal social costs and the marginal social benefit that result from the activity that emits an additional unit of pollution (see OECD, 2001). This approach is referred to in the literature as a Pigouvian tax after Pigou who developed the rationale for environmental taxation (Pigou, 1932).
- The tax is set at a level which is estimated to be sufficient to achieve a given environmental objective⁽⁴⁰⁾. This approach can be traced back to Baumol (1972) and Baumol and Oates (1971).

The preferred approach — based on theoretical economic considerations — is the first (the Pigouvian) approach: this way of taxing (in a perfect market) results in the most efficient use of resources.

Box 3.3 The ExterneE project — An example of the assessment of external costs

The aim of the EU-funded ExterneE project and its successors (NewExt and ExternePol) has been to value the external environmental costs of energy-related production and consumption activities. A power station that generates emissions of SO₂, causing damage to building materials and human health, imposes external costs if these costs are not included in the costs of power generation, and hence in the price of electricity.

There are several ways of internalising these external costs. One is via eco-taxes, i.e. by taxing the use of fuels and technologies according to the external costs they cause. For example, if the external cost of producing electricity from coal were factored into electricity bills, a tax of EUR 0.02 to EUR 0.07 per kilowatt-hour would have to be added to the current price of electricity in the majority of EU Member States, doubling the bill for some.

The ExterneE project highlighted the large uncertainties that remain in determining and monetising the external costs associated with environmental pollution. These uncertainties go beyond differences due to location and exposure, and include methodological uncertainties, valuation ranges, etc. Estimates of external costs should be seen as indicative, illustrating the importance of the problem by the range of cost estimates. Current estimates confirm that these costs are not negligible, with the external social (including environmental) costs of electricity generation amounting to around 1–2 % of GDP, and the external costs of transport even to around 8 % of GDP in the EU-15 (plus Norway and Switzerland).

Source: European Commission (2003a). For further information, see www.externe.info and European Commission (2001a, 2002).

⁽⁴⁰⁾ Given objectives are not necessarily optimal in the Pigouvian sense.

However, full internalisation of external costs is difficult to achieve in practice because the value of environmental damage is generally not known. EU-funded projects attempt to assess these external costs (see, for example, Box 3.3). The more pragmatic Baumol–Oates approach is therefore generally used, meaning that, if the environmental target is given, environmental taxes can be used to achieve this target effectively, again resulting in the most efficient use of resources. They also provide incentives for technological improvements and increased efficiency in the long run (dynamic efficiency).

Current practice shows that it is difficult to design environmental taxes based on the theoretical rationale and objective of internalising environmental damages. However, some progress is being made towards full internalisation of external costs. The UK landfill tax (see Box 3.4), the UK aggregates tax, and the landfill tax in Norway

are all based on assessments of the external costs associated with landfill and the use of aggregates (and gravel and crushed rocks). Also, road charging can be based on the calculated external costs of the use of infrastructure, which is actually being done in Switzerland.

3.4 Main developments

The spread of environmental taxes

The use of environment-related taxes and charges has increased throughout Europe during the past two decades, and existing tax schemes have been revised and refined. In the second half of the 1990s, new taxes were introduced in the following areas:

- waste generation and disposal, with landfill taxes introduced in Austria, Finland, France, Greece, Italy, Norway, Sweden and Catalonia

Box 3.4 The UK landfill tax

Some 434 million tonnes of waste are generated each year in the UK and landfill is the most common form of waste disposal. Of the total, 28.8 million tonnes are described as municipal solid waste (MSW). In 2001/2002, about 77 % of this was landfilled.

The UK landfill tax was introduced in 1996 with the intention of internalising externalities associated with landfill such as those from methane emissions and groundwater pollution. The implementation of the tax was preceded by a wide-ranging consultation that included industry, local authorities and environmental groups, and an assessment of the external costs associated with landfill, incineration and other waste management options. However, a number of potentially important effects were not quantified in the assessment.

The tax is applied to all waste disposed of at licensed landfill sites, although there are some exemptions. There are two rates of tax, a lower rate of GBP 2 per tonne that applies to inert/inactive waste ⁽⁴¹⁾ and a standard rate applicable to all other types of waste, originally GBP 7 and currently GBP 15 per tonne. On the basis of parliamentary approval, the standard tax rate has increased by GBP 1 per tonne each year, and, from 2005/06, the standard rate will rise by at least GBP 3 per tonne per year until it reaches GBP 35 per tonne.

To make the introduction of the landfill tax revenue neutral, its implementation was accompanied by reductions in employers' national insurance contributions. Furthermore, some revenue was hypothecated for waste management research purposes and investment projects in landfill areas via an organisation entitled Entrust with which those seeking funding were registered. Funds were generated through a tax credit scheme under which landfill operators were able to devote 20 % of their total tax liability to fund projects that met a set of specified criteria. The tax credit received was equivalent to 90 % of the funds, meaning that either the landfill operator or a third party had to contribute the 10 % balance of funding for any project.

The UK Treasury is currently working on mechanisms to earmark revenues from the increasing tax to help businesses address issues of waste management, in particular approaches to encourage resource efficiency through waste minimisation.

Sources: www.defra.gov.uk; www.hm-treasury.gov.uk; Davies and Doble (2004).

⁽⁴¹⁾ The classification of inert waste typically includes construction and building material waste. Subject to certain qualifications, tax exemptions exist for waste material from dredging, mining and quarrying, contaminated land, pet cemeteries (see HM Customs and Excise website: www.hmce.gov.uk).

(Spain), and taxes on batteries implemented in Austria, Belgium and Italy;

- climate change, with several countries (Germany, Italy and Slovenia) introducing new energy/CO₂ taxes;
- transport and air quality, where Denmark, Germany and Norway differentiated their annual vehicle taxes to include environmental characteristics;
- transport and waste, with Denmark, Finland and the Netherlands introducing taxes on car tyres.

Since 2000, the use of environmental taxes has spread further:

- new energy/climate-change-related taxes were introduced in Estonia, Ireland, Poland and the UK, increasing the number of countries that use such taxes to eight in the EU-15, three in the new EU-10, plus Norway;
- taxes on greenhouse gases other than CO₂ were introduced in Denmark and Norway;
- taxes on the sulphur content of motor fuels were introduced in Belgium, Finland, Germany, the Netherlands and the UK, so that half of the EU-15 plus Norway now promote the use of low-sulphur or 'sulphur-free' fuels through economic incentives.

Mixes of instruments

Increasingly, instruments of various categories are combined in order to build an effective policy mix. In the early 1990s, Denmark combined its CO₂ tax with voluntarily agreed energy conservation programmes. The climate change levy introduced in the UK in 2001 provides the same mix of an economic instrument and an instrument from the 'moral suasion' category. A new development is to combine taxes with other economic instruments, which received a new impulse with the introduction of emissions trading programmes in the EU and individual countries.

Building on existing taxes and charges

In the 1990s, the UK operated the fuel duty escalator as its principal measure to reduce the growth of CO₂ emissions from transport, which has resulted in the UK's motor fuel taxes being the highest in Europe. Germany introduced a similar system between 1999 and 2003, as a result of its ecological tax reform. Annual circulation tax (also often called annual road tax) has recently been reformed in the United Kingdom and Denmark to reflect either CO₂ emissions or fuel consumption, while company car taxation in the United Kingdom has recently been reformed to reflect CO₂ emissions.

Some of the forerunners with regard to the introduction of environmental taxes — Denmark, the Netherlands and Norway — are in the process of refining existing tax schemes. The Netherlands has revised the energy tax scheme originally implemented in 1996 in recent years, and Norway refined its air pollution and waste taxes, and differentiated its pesticide tax according to the environmental and health risks of groups of pesticides. Denmark introduced a tax on PVC and certain plasticisers in 2000 and subsequently refined the tax scheme.

Regional perspective: non-EU-15 countries

Many countries are applying a whole range of environmental taxes and charges and the number has increased recently, partly as a consequence of the process of EU accession. The Balkan countries and the other eastern European countries (Belarus, Moldova, Russia and Ukraine) have implemented a variety of environmental taxes and charges. Most of these countries have a comprehensive system of pollution charges levied on air and water pollutants. These schemes differ from the air and water pollution taxes implemented in some of the older EU Member States. Sometimes more than 100 different pollutants are subject to an emission charge (OECD, 2003a) and the revenues are often earmarked for environmental funds (OECD, 1999a; Speck *et al.*, 2001b). Despite the existence of complex charging systems, the Balkan and eastern European countries, in particular, still need to overcome many obstacles in order to improve the effectiveness of particular instruments.

Some of the new EU Member States will face major challenges with regard to energy taxes in the coming years, since their current tax rates on energy products are far below the minimum tax rates laid down in the 2003 taxation of energy products directive (see Section 3.5.1). The new and some of the old EU Member States have transitional periods to reach the new minimum tax rates. Some of the new EU Member States have significantly increased tax rates, particularly on transport fuels, during recent years.

Importance of taxes in achieving environmental effectiveness

A key issue in demonstrating the significance of environmental taxes is their environmental effectiveness, especially where they are intended — and designed — to offer environmental incentives, rather than being primarily revenue-raising instruments.

Studies that assess the performance of economic instruments are increasingly becoming available. The overall evaluation is that they have, in general,

been offering positive incentives to reduce pollution and natural resource use. Particularly effective examples include:

- motor fuel taxes in Europe;
- tax differentiation for low-sulphur motor fuels (12 countries);
- the NO_x charge in Sweden;
- the nutrient surplus tax in agriculture in the Netherlands;
- the Danish waste-disposal tax;
- the Danish batteries tax;
- the Norwegian pesticide tax;
- the London congestion charge;
- the plastic bag tax in Ireland.

In many cases, effectiveness is more marginal, usually reflecting one or more of:

- a levy rate too low to bring about significant behavioural change ⁽⁴²⁾;
- poor instrument design;

- poor enforcement capacity of relevant institutions ⁽⁴³⁾;
- exemptions from the levies for significant polluters, this argument usually being based on a perceived need to maintain competitiveness.

The use of the revenue has often led to environmental improvements, for example with wastewater collection and effluent charges in many European countries. The unique Swedish charge and refund scheme for NO_x emissions derives its effectiveness from the very high charge rate, made possible by refunding the revenues of the charge on an NO_x-neutral basis (Sterner, 2003).

Although environment-related taxes and charges are defined on the basis of their particular environmental relevance, some have been implemented as tools of environmental policy, whereas others have been used for fiscal purposes, i.e. to raise revenues for the general budget. A major example of the latter is motor fuel taxes, found in all countries. Despite their fiscal background, the

Box 3.5 Examples of how revenues from taxes and charges are used

- CO₂/energy tax revenues go to the national exchequer and are sometimes linked to reductions in labour-related costs, as in Germany, the Netherlands and the United Kingdom. Since 2004, part of the CO₂ tax revenue in Slovenia has been used to support energy-efficiency projects and promote the use of renewable energy.
- NO_x charge in Sweden: revenue is recycled to liable payers (larger energy producers).
- Aggregates tax: The revenue of this UK tax will be recycled in part to businesses via the reduction of national insurance contributions and via a new sustainability fund delivering environmental benefits to local communities affected by quarrying.
- Landfill tax revenues in France are recycled mainly to municipalities via funds/investments and some private sector and research activities. In Austria, they fund the clean-up of contaminated sites and are used for investments at landfill sites. In the United Kingdom, the revenues are used to offset reductions in national insurance contributions, and also to support environmental projects. In Norway, the revenues go to the general budget.
- Batteries tax: In Belgium, the revenues fund the Belgian batteries collection and recycling scheme (BEBAT).
- Charges levied on cars, car tyres, batteries, organic solvents and refrigerators in Iceland go to a recycling fund and are used for covering the costs of environmentally sound disposal and recycling.
- Revenues from environmental levies, such as waste-disposal charges, wastewater charges and charges for groundwater extraction, are allocated to the MINA fund in Flanders, Belgium, and used for financing a range of environmental projects in different sectors.
- Revenues from a wide range of environmental charges, including pollution charges levied on air and water pollutants, charges on fossil fuels and resource extraction charges, have often been earmarked for environmental investment via environmental funds in some of the new EU Member States, as well as in some Balkan and eastern European countries.

Source: Building on Egenhofer and ten Brink (2001).

⁽⁴²⁾ It is often the case that taxes and charges are implemented at a low rate, with the intention of increasing the rate over time. In some cases, the levels do not rise significantly after imposition.

⁽⁴³⁾ Particularly relevant for some of the Balkan/eastern European countries.

environmental consequences of these taxes are substantial. Petrol taxes in Europe are roughly twice as high as in the United States, and average new car fuel efficiency is about 25–50 % better ⁽⁴⁴⁾.

Use of revenues

As defined in the introduction, revenues from environmental taxes normally go to the general budget, while revenues from environmental charges are generally used for financing services to the charge payers. However, even though environmental tax payments are 'unrequited', many policy-makers would argue that it is often necessary to earmark or 'hypothecate' revenues for the tax to be publicly acceptable, and arrange for reductions in the tax burden elsewhere ⁽⁴⁵⁾. Whether or not in the framework of a formal environmental tax reform programme, such tax reductions sometimes appear in the area of labour taxes and social contributions, with the aim of reducing their distorting impact on the economy (see also Chapter 4). Revenues can also be allocated in advance to finance specific environmental programmes (e.g. environmental funds, environmental projects, training or outreach activities, or research and development activities) (see Box 3.5).

3.5 Main areas of application of environmental taxes

The following sections describe developments in the main areas where environmental taxes have been or are being introduced.

3.5.1. Energy and climate change; transport fuels

The development of a general political framework for energy taxes

In many respects, energy taxes are the most significant environment-related taxes. They are levied on a range of energy products, and, in particular, motor fuel taxes generate large revenues (see Chapter 4). The main motive for taxes on energy products has traditionally been as a source of government income. Their relatively high level and potential for differentiating tax rates according to environmental characteristics make them significant market-based instruments for tackling climate change, air pollution and other environmental problems.

At the EU level, the potential for using taxes to reduce greenhouse gas emissions first came to

prominence in 1992 with the publication of the proposed EU carbon/energy tax (COM(92) 226; see Tables 3.A.1 and 3.A.3 in the appendix to this chapter). The proposal was one of the EU's policy responses to its signature of the United Nations Framework Convention on Climate Change and its aim was to contribute to stabilising the EU's greenhouse gas emissions. However, the proposal proved contentious, was amended in 1995, and was eventually withdrawn by the Commission in 2001 (for a more detailed discussion, see EEA, 2000, and Boeshertz and Rosenstock, 2003).

The Commission's response to the lack of progress on the carbon/energy tax proposal was the publication in 1997 of the proposal (COM(97) 30) that led to the adoption of the taxation of energy products directive (Directive 2003/96/EC) in 2003. This came into force in January 2004 and repealed the 1992 mineral oils directives (Directives 92/81/EEC and 92/82/EEC). The new directive is likely to be less effective than a fully functioning carbon/energy tax would have been, not least because its final form is significantly weaker than originally proposed back in 1997. Directive 2003/96/EC widens the scope of the pre-existing EU energy taxation framework from transport fuels, which had previously been addressed by the 1992 mineral oils directive, to a broader range of energy products, including electricity. The framework includes the setting of minimum tax rates for these products, as well as increasing the minimum rates for transport fuels that had been set by Directive 92/82/EEC. Directive 2003/96/EC is far from being a purely environmental measure. For example, it refers to its contribution to reducing current distortions of competition between Member States because of differing taxes levied on energy products, and to the creation of a more balanced playing field between mineral oils and other energy products that were previously not subject to any EU tax harmonisation rules.

Reaching agreement on Directive 2003/96/EC was far from easy. Six years of negotiation had seen various initiatives from the country holding the rotating EU Presidency end in failure, and the negotiations only gained enough momentum to reach an agreement once enlargement of the EU was imminent. The main obstacles to an agreement had been the belief among some Member States, such as the United Kingdom, that taxation issues should be decided at the national and not the EU level, and the need for unanimity among Member States, as required for changes in tax legislation.

⁽⁴⁴⁾ ADEME/WEC (2004); it is difficult to give the exact figure because of differences in car fleet composition.

⁽⁴⁵⁾ Many economists would argue against earmarking or hypothecation on the ground that this can lead to economically suboptimal allocations of the revenues.

Table 3.3 An overview of the chronological development of proposals, communications and directives relevant to the taxation of energy products at the EU level

Directive 92/81/EEC	Harmonisation of the structures of excise duties on mineral oils
Directive 92/82/EEC	Approximation of the rates of excise duties on mineral oils, i.e. establishing minimum levels of tax rates for mineral oils, which were in force until 2004
Proposal: COM(92) 226	Proposal for a Council directive introducing a tax on carbon dioxide emissions and energy (withdrawn by the Commission in 2001)
Proposal: COM(95) 172	Amended proposal for a Council directive introducing a tax on carbon dioxide emissions and energy (withdrawn by the Commission in 2001); a modification of the 1992 proposal
Communication: COM(97) 9 final	'Environmental taxes and charges in the single market' setting out guidelines for Member States on the use of economic instruments at the national level
Proposal: COM(97) 30 final	Proposal for a Council directive restructuring the Community framework for the taxation of energy products
Communication: COM(2000) 110 final	'Taxation of aircraft fuels'
Communication: COM(2001) 260 final	'Tax policy in the European Union — Priorities for the years ahead'
Proposal: COM(2001) 547	Proposal for a Council directive amending Directive 92/81/EEC with regard to the possibility of applying a reduced rate of excise duty on certain mineral oils containing biofuels and on biofuels
Proposal: COM(2002) 410 final	Proposal for a Council directive on the taxation of commercial diesel fuel
Directive 2003/96/EC	Restructuring the Community framework for the taxation of energy products and electricity

As a result of Directive 2003/96/EC, several EU Member States are required to introduce new taxes on coal, natural gas and electricity, where such taxes have not previously been levied (see OECD/EEA database and EEA, 2000) and some have to increase existing taxes on mineral oil products (see, as an example, Figures 3.A.1 and 3.A.2 in the appendix presenting the current situation with regard to tax rates levied on unleaded petrol and diesel in EU Member States). The consequences for individual Member States differ considerably, with some Member States not being obliged to introduce or increase any energy taxes and others being required to do so. Generally, the impact on the new EU Member States is significant. The directive represents an achievement in harmonising environmental and fiscal policies. However, tax rates in some Member States, for example on mineral oils, are significantly above the minimum, while those in others are around the minimum. Hence, large differences in tax rates still exist, so the practical impact of the directive on harmonising rates has been to ensure that countries cannot reduce taxes below a minimum level.

Special tax provisions are applicable if companies are taking part either in a voluntary agreement or in a tradable permit scheme (see Chapter 2). In addition, the commercial use of energy products is subject to lower tax rates. Non-energy-intensive businesses may be subject to a tax rate which must be at least 50 % of the minimum tax rate; a zero tax rate may apply to energy-intensive businesses. The directive defines energy intensity on the basis of one of two possible criteria: the purchases of energy products and electricity amounting to at least 3 % of the production

value, or the national energy tax payable amounting to at least 0.5 % of the added value. However, Member States can also apply more restrictive conditions for defining energy-intensive businesses.

Transitional periods for reaching the new minimum excise tax rates (some have to introduce new taxes, others to raise the rates) on different energy products apply to some of the old EU Member States. More extended transitional agreements with respect to temporary tax exemptions or tax reductions have been granted to the new EU Member States.

Finally, energy use by private households can be made tax exempt.

The development of energy and CO₂ taxes in Europe

Taxes on transport fuels

Transport fuels are taxed to some degree in all European countries, mainly for fiscal reasons, although some taxes have specific environmental components. The generally high level has provided incentives for more efficient vehicles and less travel.

On the whole, taxes on unleaded petrol and diesel in Europe increased between 2000 and 2004 (see Figures 3.A.1 and 3.A.2 in the appendix). They increased only slightly in several EU-15 countries but rose dramatically in others, such as Ireland, Germany and Portugal. Sharp increases in fuel taxes also occurred in most of the new EU Member States. Between 1999 and 2003, Germany's taxes on petrol and diesel rose by 30.6 and 48.4 % respectively, which was the largest increase in this period in any Member

State. Other notable increases between 1997 and 2003 occurred in Denmark and Sweden (around 20 % in both) and the Netherlands (where petrol taxes rose by 20 % and diesel taxes by 10 %). These changes coincided with a tripling of the world oil price between 1999 and 2000 followed by a drop in 2001 and a steady increase between 2002 and 2004.

The lowest tax rates for unleaded petrol and diesel in 2004 were in the new Member States and the highest in Germany and the United Kingdom. The high taxes in the United Kingdom were the result of the fuel duty escalator measure that was put forward to reduce CO₂ emissions from transport (see Box 3.6). The increase in transport fuel taxes in Germany since 1999 has also been the result of environmental considerations, as the environmental tax reforms included the raising of fuel taxes (see Chapter 4 for further discussion). In both countries, the increases were met with opposition from motorist and road haulier groups.

Excise duties on transport fuels are also in place in eastern European countries. In Russia, up to 1998, the excise duty on petrol was in the form of an *ad valorem* tax. In 2001, Russia increased tax rates on petrol and other oil products by almost 300 % and introduced a tax on diesel fuel, as part of a new tax package. The increase in transport fuel taxes was a countermeasure to the reduction of other federal taxes, a policy approach normally referred to as environmental tax reform (see Chapter 4) ⁽⁴⁶⁾.

Current Russian tax rates on petrol and diesel are much lower than those in EU Member States, for example EUR 69 per 1 000 litres for high-octane petrol compared with the lowest rate in the EU-25,

around EUR 290 per 1 000 litres in some of the Baltic countries for unleaded petrol, and the EU minimum excise tax rate of EUR 359 per 1 000 litres. Ukraine imposes even lower taxes on transport fuels than Russia: the tax on petrol in 2003 was around EUR 44 per 1 000 litres and on diesel around EUR 25 per 1 000 litres. Russia, as one of the resource-rich countries, also levies taxes on the extraction and export of oil and natural gas.

Levies on transport fuels are commonly found in the Balkan and applicant countries. In Bulgaria and Serbia and Montenegro, charges also apply to some non-transport fuels such as coal and gas oil used for industrial purposes ⁽⁴⁷⁾. In Albania, the tax was recently introduced (in 2002), with the rate for diesel being twice that for petrol. The intent of these taxes is explicitly environmental in some countries; in others, they are used to raise revenues for road construction/maintenance.

Tax level differentiation

It is not just the level of taxes on transport fuel that can be used for environmental purposes. Taxes on fuels used for similar purposes can be differentiated to encourage the use of cleaner fuel or cleaner technology, for example, as is increasingly the case with biofuels.

The differential that favours diesel over petrol in most EU countries is not environmental in origin and purpose, as it generally dates back to times when diesel was used mainly for commercial transport. The United Kingdom is the only State in the EU-25 that differentiates between the two fuels for environmental reasons and has set the diesel tax rate higher than the tax on unleaded petrol. The UK

Box 3.6 The UK's fuel duty escalator

The high tax rates for petrol and diesel in the United Kingdom compared with other EU-15 countries were accentuated as a result of the so-called 'fuel duty escalator' under which the price of fuel rose by a fixed percentage above the rate of inflation for seven years in the 1990s. When it was introduced by the then centre-right government in 1993, the fuel duty escalator was presented as a measure to reduce greenhouse gas emissions from transport. Initially, it increased fuel duty by 3 % per year above the rate of inflation, but when the current centre-left government came to power in 1997, it increased the escalator to 5 and then to 6 % above the rate of inflation. Interestingly, the impact of the escalator was not to increase prices significantly, but to prevent them from decreasing, since its initial period of operation coincided with a declining price of crude oil. However, the escalator was abandoned in the March 2000 budget, in anticipation of potential high prices caused by the strong increases in the price of crude oil. Subsequent fuel tax rises in the United Kingdom have been no higher than inflation.

Sources: www.hm-treasury.gov.uk; www.hmce.gov.uk.

⁽⁴⁶⁾ The increase in the tax rates for transport fuels came with a change in the system of personal income taxes. For example, the tax rate of high-octane gasoline was RUB 585 per tonne in 2000 and it was increased to RUB 1 850 per tonne in 2001. The personal income taxes were established as a progressive scaling scheme with rates between 12 and 35 %. This scheme was in place until 2000 and was replaced by a single rate of 13 % in 2001.

⁽⁴⁷⁾ In Bulgaria, a charge is levied on fuel oil if its sulphur content exceeds 1 %.

policy is based on the health concerns associated with the large emissions of particulates from diesel engines.

Following the success of tax differentiation in Sweden and Finland (Stockholm Environment Institute, 1999), other European countries⁽⁴⁸⁾ have differentiated their taxes on petrol (and some on diesel) in order to encourage the early introduction of lower-sulphur fuel. This has been driven by EU fuel quality legislation, which in the past decade has been consistently lowering the sulphur levels allowed in transport fuels in order to encourage the development of cleaner-vehicle technology (Directive 2003/17/EC, relating to the quality of diesel and petrol, requires that 'sulphur-free'⁽⁴⁹⁾ petrol and diesel be widely available from 2005 and made mandatory from 2009). Such tax differentiation was allowed as long as there was no mandatory requirement to sell low-sulphur fuels. Tax differentiation is also used to encourage the use of alternative fuels, and tax breaks are available for biofuels (beyond the level of pilot projects), for example in Austria, France, Germany, Hungary, Spain, Sweden and the United Kingdom⁽⁵⁰⁾.

This policy approach follows the successful tax differentiation between leaded and unleaded petrol in the 1990s, which contributed to the phasing-out of leaded petrol, as required under EU legislation. This was achieved with only small differences in the tax rates.

Within the EU, the differentiation of tax rates on similar fuels with different quality, for example to promote ultra-low-sulphur petrol or diesel, is allowed by Directive 2003/96/EC. The directive also allows for lower tax rates to be charged on fuel used in public transport, both on buses and on railways. Many Member States have lower rates, or some system of rebates; for example, the United Kingdom applies a significantly reduced rate of duty on diesel used on the railways, and operates a fuel duty rebate for buses.

The first report reviewing the process of implementation of the sulphur directive published by the European Commission (European Commission, 2003b) reveals that between 2001 and 2002 the market share of low-sulphur petrol in the EU-15 grew threefold and that of low-sulphur diesel more than doubled, amounting to 47 % for

petrol and 43 % for diesel in 2002. Fuels classified as sulphur-free accounted for only 2 % of the market in 2002.

Fuel used in non-road modes of transport is generally exempt from EU legislation; for example, Directive 2003/96/EC exempts fuel used in commercial air or sea transport, although Member States can decide to tax such energy products at the national level or through bilateral agreements. For example, kerosene used as a fuel in aviation is rarely taxed in the EU although international agreements do not prohibit this. Taxes can be levied on fuel used on domestic flights, as is the case in the United States and Norway, and on fuel stored at the airport before it is loaded onto an aircraft. Hence, there is a lost opportunity to help reduce the environmental impacts of aviation through taxation⁽⁵¹⁾. However, aircraft fuel is taxed when used in private pleasure flying.

Taxes on other energy products

In spite of the failure to agree a carbon/energy tax at the EU level, a range of countries have acted unilaterally by introducing supplementary energy or CO₂ taxes in addition to the existing mineral oil taxes which the EU-15 were obliged to implement under the earlier directive. These include a number of EU Member States, such as Austria, Denmark, Finland, Germany, the Netherlands Sweden and the United Kingdom, as well as Norway and new EU Member States, such as Estonia and Slovenia. However, the 2003 energy products directive partly corrects this imbalance by introducing minimum excise taxes on energy carriers (electricity, natural gas and coal) that were until then tax-free.

Some countries, such as Norway, either abolished energy/CO₂ taxes or reduced the number of energy products which were liable to such a tax. Germany introduced a broad environmental tax reform in 1999, increasing tax rates for energy products in stages between 1999 and 2003 and introducing an electricity tax. A levy on the non-domestic use of energy, the so-called 'climate change levy', was introduced in the United Kingdom in 2001.

The Dutch regulatory energy tax which entered into force in 1996 has been revised several times during recent years. Initially, the tax was levied on the small-scale use of energy, introducing a tax-free allowance for the consumption of natural

⁽⁴⁸⁾ In 2004, seven EU countries, two applicant countries, and three EFTA countries (see Tables 3.1 and 3.2) had some form of tax differentiation to support reduced sulphur levels in motor fuels.

⁽⁴⁹⁾ The term 'zero sulphur' generally means a sulphur concentration of 10 ppm or less.

⁽⁵⁰⁾ Member States' reports under Directive 2003/30/EC.

⁽⁵¹⁾ Skinner and Fergusson (2003).

gas and electricity, and a tax ceiling, i.e. energy consumption above the ceiling was tax exempt. Tax rates have been increased several times and the tax base broadened by lifting the exemptions for large-scale users and by withdrawing the tax-free allowance, although the tax rates are still significantly lower than for other target groups. Some of these revisions are consequences of the assessments carried out by the European Commission to evaluate whether the tax was in

accordance with EU regulation, in particular with regard to State aid regulations (Heineken, 2003).

The introduction of new energy taxes is not limited to the old EU Member States, as recent developments demonstrate. An increased use of energy and CO₂ taxes can also be seen in other European countries. The first CO₂ tax in central and eastern Europe was introduced in Slovenia in 1996. The tax has been revised in recent years — an

Box 3.7 The UK climate change levy

The climate change levy came into effect in April 2001. Sales of electricity, coal, natural gas, and liquefied petroleum gas (LPG) to the business and public sectors are subject to the levy. The levy is an integral part of the UK climate change programme for meeting its Kyoto target and helping to achieve the government's domestic goal of a 20 % reduction in CO₂ emissions by 2010. Special provisions are provided for the business sector, including a transitional 50 % reduction of the rates for horticulture firms. However, the climate change levy cannot be classified as a CO₂ tax in a strict sense because the actual rates do not reflect the carbon content of the different energy products; for example, the energy products are not taxed on a carbon-equivalent basis (Sorell, 2003).

The amount of levy is based on the quantity of fuel supplied. There are separate rates for each fuel type:

- electricity — 0.43 pence per kilowatt hour;
- natural gas — 0.15 pence per kilowatt hour;
- solid fuel, for example coal and coke — 1.17 pence per kilogram;
- liquid petroleum gas for heating — 0.96 pence per kilogram.

The revenue raised is being recycled to business through a 0.3 % reduction in employers' national insurance contributions, and additional government support for energy-efficiency measures. There is no net gain to public finances, i.e. it is revenue neutral.

Businesses agreeing to energy-efficiency targets with the government through climate change agreements qualify for an 80 % discount on the levy as long as their targets are met. All the major energy-intensive trade associations have signed such negotiated/voluntary agreements with the government. Electricity generated from renewable sources (excluding large-scale hydro > 10 MW) and in combined heat and power plants (CHPs) is exempt from the levy. Similarly, those with the lower rate of 5 % VAT, for example domestic users and some businesses, are also exempt and a half-rate applies to eligible horticultural producers.

The scheme is interesting because of its design, which combines a tax with a negotiated agreement, linked to exemptions, and with links to the domestic emissions trading scheme, albeit with some 'gateway' restrictions (see Chapter 2).

The effectiveness of this type of combined approach relies very heavily on the quality of information available to the regulator. Some have argued that, given the widespread overachievement of the 2002 targets, the climate change agreements are insufficiently challenging, and that incremental changes in performance will be required to justify significant reductions in the levy rate. This suggests that the potential for effectiveness is limited because of the asymmetric nature of the quality of information available to industry and the regulator.

One overall conclusion on the instrument package is:

'If we started with a blank piece of paper, we probably wouldn't end up with the mixture that we have ... But in terms of the way it has built up, it does work as a package...'
(UK government representative).

Sources: www.hm-treasury.gov.uk; www.hmce.gov.uk; Bowyer *et al.* (2004).

exemption applied to coal was phased out in 2004. Estonia has recently introduced a CO₂ levy which is imposed only on large combustion plants (thermal input exceeding 50 MW) and is based on measured emissions. Other countries, such as Albania, Latvia and Serbia and Montenegro, are considering the implementation of a CO₂ levy, while some of the Balkan countries have already made some attempts to impose additional levies on fossil fuels.

Obstacles to the extensive use of energy taxes

Competitiveness: The main obstacle to the widespread use of energy taxes is the potential or perceived risk of loss of international competitiveness due to the tax and the resulting price increases (OECD, 2003b; Ekins and Speck, 1999; Eurostat, 2003). Special tax provisions for energy-intensive industries are normally incorporated into the tax laws in many European countries, in particular in those which have introduced special energy and CO₂ taxes. Tax exemptions and reductions can constitute State aid and must therefore be examined by the European Commission as established in Article 87(1) of the EU Treaty. The assessment is based on the guidelines on State aid for environmental protection, which came into force on 1 January 2001, laying down the conditions under which such provisions may be authorised (for more detailed discussion, see Chapter 5). The main requirement for authorising such provisions is to assess whether the distortions of competition due to tax reductions are offset by real environmental benefits (Boeshertz and Rosenstock, 2003). The new energy tax directive takes due account of the State aid rules, for example when dealing with industries which have dual-use energy products.

As can be seen from recent Commission rulings, such special national tax provisions can be in accordance with these conditions, meaning, for example, that special provisions adopted under the tax schemes in Germany, the Netherlands and the United Kingdom are approved. EU Member States can exempt, or partially exempt, economic sectors such as energy-intensive industries from energy taxes for a given period (up to 10 years) under specific conditions, such as voluntary agreements concluded between the relevant sector and the authorities.

Equity: The second major obstacle to the extensive use of energy taxes is associated with the distributional implications of environmental taxes, i.e. the notion that energy taxes, in particular

in residential heating, can be regressive, imposing a greater percentage burden on lower-income groups. This is of particular importance in the Balkan countries and eastern European countries.

In the central and eastern European countries (and indeed many EU-15 countries), there has been a history of prices for energy and other resources and services (water supply, wastewater and waste collection and treatment) not covering the costs of provision of the good or service. During recent years, particularly during the transition period, there has been a move towards full cost recovery, though this has been limited by the affordability to consumers – there has been uneven 'progress' among the central and eastern European countries. Prices in eastern European and the Balkan countries are still often significantly lower than the cost of supply, and hence do not offer the right incentives for efficient use.

Equity issues do not only play a role in central and eastern Europe. In the United Kingdom, for example, major resistance to levying VAT on domestic fuels led the government to levy only a reduced rate of VAT. There are differences in the level of VAT on domestic heating fuels across Europe, and also on the provision of water supply, wastewater treatment and waste services.

3.5.2 Transport

A wide range of fiscal instruments is applied to road transport in the EU, whereas taxes and charges on other modes are relatively small. The instruments can broadly be categorised (Fergusson and Skinner, 2000) ⁽⁵²⁾ as:

- taxes on transport fuels (with variations in levels and patterns of differentiation between fuels, as discussed above);
- taxes on vehicles, including purchase or registration taxes, annual circulation tax and scrappage incentives (the last of these is noted under subsidies and support in Chapter 5);
- charges for the use of infrastructure (e.g. road-use charges).

Taxes on vehicles

As with taxes on transport fuel, taxes on passenger cars have not generally been levied for environmental purposes in the past, although this has started to change. In 2002, a review of car registration taxes undertaken for the European Commission ⁽⁵³⁾ found that 10 of the EU-15 countries

⁽⁵²⁾ This classification is different from the categories developed by Eurostat and discussed above.

levied some form of registration tax, mostly based on price although some on engine capacity; none was based on specifically environmental criteria. In Denmark and Finland, the purchase tax at least doubles the price of passenger cars, while in other countries the tax is much lower. High purchase taxes are also applied in Norway.

Annual circulation taxes are levied by all EU-15 countries except France. Again, the basis for the taxes and the rates vary — they include engine capacity, power and weight. Only one country, the United Kingdom, bases its circulation tax on CO₂ emissions (since 2001). In addition, a new company car taxation scheme was introduced in the United Kingdom in 2002, which reflects the car's CO₂ emissions⁽⁵⁴⁾. In Denmark, the circulation tax was reformed in 1997 to reflect fuel consumption. The German annual circulation tax is diversified according to exhaust gas characteristics and weight.

Many of the new EU Member States as well as the Balkan and candidate countries have implemented a whole range of different taxes on vehicles, including annual circulation taxes, sales taxes and import taxes. In some countries, sales and import taxes are linked to some environmental criteria, for example a reduced tax rate for vehicles with a catalytic converter; the most frequent criterion for rate differentiation for recurrent, annual taxes is engine capacity. A proposal by the European Commission on the 'greening' of registration and circulation tax schemes is expected. In the Netherlands, an additional levy is payable when a car is first registered in the country in order to cover its disposal at the end of its useful life (see Box 3.15 in Section 3.5.9).

The level and basis of annual vehicle taxes for commercial vehicles also vary between Member States, and some countries also levy a registration or sales tax (Kågeson and Dings, 1999). A review in the late 1990s revealed that these are also generally not based on environmental criteria, although Germany bases its taxation system on the Euro emissions standard of the vehicle (Kågeson, 1999). Unlike taxes on cars, taxes on commercial vehicles over 12 tonnes are regulated at the European level, under the Eurovignette directive (Directive 1999/62/EC), which sets minimum tax rates for such vehicles.

In Cyprus, a tax has been levied since November 2003 on each passenger and commercial vehicle before being cleared by Customs. The tax is set at

EUR 0.01 per cubic centimetre (cc) of engine size; for example, for a car with an engine of 1 600 cc, a tax of CYP 16 (around EUR 27) has to be paid. The revenues from this tax are earmarked for the development and enhancement of the public transport sector. However small the revenue, the provision constitutes an innovative measure in Cyprus' budgetary practice with respect to environmental issues.

Charges for the use of infrastructure

The Eurovignette directive governs the application of tolls and charges on commercial vehicles using EU roads. It is considered necessary to have such a framework at the EU level in order to ensure that Member States do not introduce tolls or charges that discriminate against foreign hauliers or adversely affect the functioning of the internal market. Directive 1999/62/EC sets the conditions for the maintenance and introduction of tolls or charges and the maximum levels allowed. The Eurovignette directive allows for variable infrastructure cost-based charges to be differentiated on the basis of emissions standards, but does not allow for environmental costs to be included in the charge, except for infrastructure costs incurred for investments in noise protection.

In 2004, Austria introduced a charging scheme for all vehicles above 3.5 tonnes. The charge rate for Euro-3 class lorries of 40 tonnes is EUR 0.22 per kilometre. The system Germany introduced in January 2005 applies to commercial vehicles over 12 tonnes; the charge rate is EUR 0.12 per kilometre (Euro-3, 40-tonne lorries). Both countries apply charge rates that are meant to internalise road infrastructure costs only.

The scheme in operation in Switzerland (see Box 3.8) has a charge rate of EUR 0.55 per kilometre (Euro-3 class, 40-tonne lorries) and internalises social and environmental as well as infrastructure costs. This would not be possible in the EU, where other countries such as the United Kingdom are studying this policy instrument, unless the Eurovignette directive is modified in that direction.

Toll rings were introduced in three Norwegian cities — Trondheim, Oslo and Bergen — in the late 1980s/early 1990s, but these were aimed mainly at raising revenue to fund new road building, rather than having any environmental objective. Due to the widespread use of various subscription

⁽⁵³⁾ COWI (2002).

⁽⁵⁴⁾ DLR (2004); European Commission communication to the Council and the European Parliament 'Taxation of passenger cars in the European Union — Options for action at national and Community levels' (COM(2002) 431), Brussels. See also the annex to the communication (SEC(2002) 858).

Box 3.8 Road-user charging for heavy goods vehicles in Switzerland

In 2001, Switzerland introduced a distance- and weight-related system of road-user charging for commercial vehicles. Charges vary according to the emissions standards of the vehicles; hence, cleaner vehicles are charged less than older, dirtier vehicles for similar journeys. The system applies to all commercial vehicles over 3.5 tonnes using any part of the national road network. The system has been successful in making road transport more efficient and cleaner, but has not yet resulted in the intended increase in rail use for freight transport. The following results have been noted:

Changes in fleet composition: In the year prior to the introduction of the charge, sales of new commercial vehicles increased significantly, as cleaner vehicles benefit from reduced charges.

Traffic levels: Levels of commercial traffic on the whole network declined by 5 % in the first year of the charge's operation, compared with a rise of 7 % in the previous year. This change was not due to broader economic conditions, but was a result of the introduction of the charge, which is performance related, replacing the previous flat-rate fee.

Transit traffic: This stabilised in the first year of the scheme's operation (2001), which was a change from the previous increasing trend. In 2002, the amount of transit traffic declined, but this was probably mainly a result of the St Gotthardt accident.

Impact on rail: No significant increase in rail use for commercial goods has been noted, although some companies have made decisions to make more use of the rail network for the transport of goods; the reductions on the roads have been achieved by efficiency gains rather than modal shift. However, the charge has raised money to develop the rail network, which should encourage modal shift in the future.

Source: Skinner (2003) ⁽⁵⁵⁾.

schemes, for most users, the marginal costs of passing a checkpoint is zero. An ambitious road-pricing scheme to cover the Randstad area in the Netherlands (covering Amsterdam, Rotterdam, The Hague and Utrecht), originally intended to come into operation in 2001 (Fergusson and Skinner, 2000), never reached fruition. However, discussions on the introduction of a road-pricing scheme in the Netherlands are now back on the political agenda. Since February 2003, a congestion charge has been in operation in the UK capital, London, which has proved to be a success (see Box 3.9). As a result of the success of the London scheme, other UK cities (e.g. Edinburgh) are considering their own schemes, as are other European capitals (e.g. Stockholm and Lisbon).

In the aviation sector, airlines have to pay airports for using their infrastructure, and there are some examples of these charges being adapted for environmental purposes. Zurich airport in Switzerland has a system whereby an emissions surcharge, based on the relevant International Civil Aviation Organisation (ICAO) certification, is added to the landing fee of an aircraft. The charge was introduced to encourage airlines to use their cleanest aircraft when using the airport and accelerate the use of the best available technology,

and its revenues are used to fund emission reduction measures at the airport. At the same time, the weight-based landing fee was reduced to ensure that the charge remained revenue neutral for the airport.

In 1998, Sweden introduced a similar tax at a number of its airports — again to ensure that the tax remained revenue neutral, landing fees were reduced appropriately.

A comparable scheme has been introduced in the Czech Republic whereby since 1996 each aeroplane landing at Prague airport has been subject to a landing charge based on its noise level.

Norway introduced a 'green tax' on domestic tickets in 1995 for the routes where rail offered a suitable alternative, as well as for all international flights. The revenues are not earmarked. In 1999, Norway also introduced a CO₂ tax on kerosene for all domestic and international flights, although it later withdrew the tax relating to international flights under pressure from the aviation industry and neighbouring countries (Skinner and Fergusson, 2003).

⁽⁵⁵⁾ The scheme is monitored and regularly evaluated and new information should be available on the Internet.

Box 3.9 London's congestion charge

A congestion charge was introduced in central London on 17 February 2003. The main aim of the scheme was not environmental, but to reduce traffic congestion in and around the charging zone. It was noted that, on average, vehicles spent half their time in queues, and that the average speed was only 15 km/hour. It was also expected to raise revenues to improve transport in London more generally. Vehicles entering, or parked on the streets, in central London on weekdays during the day (7.00 to 18.30) are subject to a GBP 5 daily charge, which can be paid electronically. The charging zone covers 22 km² in the heart of the capital within the inner ring road. Certain vehicles, for example taxis, motorcycles, buses and alternatively fuelled vehicles, are exempt from the charge, while some users, for example residents and the disabled, benefit from discounts.

A recent review of the charging system undertaken by Transport for London found that congestion within the charging zone has reduced by 30 % and the volume of traffic by 15 %, and that there was no sign of significant adverse traffic effects outside the zone. Bus services in the zone have improved and public transport, more generally, has coped with the displaced car users, although some users dispute this. The evidence suggests that the charge has had little direct negative impact on business, but has had benefits in terms of environmental amenity and reduced traffic emissions.

The London Mayor and champion of the congestion charge, Ken Livingston, was committed to scrapping the scheme if it were clear that it was not working after six months. It is still operational and there is currently consultation on whether the scheme should be extended to cover about twice the current area of the charging zone.

Source: Transport for London (2004). See also www.tfl.gov.uk/tfl/cclondon/cc_monitoring.shtml for the first and second annual reports on the congestion charge.

3.5.3 Agriculture

There are few taxes and charges in the agricultural sector in Europe. Taxes or charges on pesticides are currently in place in five European countries (Belgium, Denmark, Finland, Norway and Sweden) and on fertilisers or nutrients in three (Denmark, the Netherlands and Sweden). The design of these taxes, and consequently their effectiveness, differs from country to country (Ecotec *et al.*, 2001; GLU *et al.*, 2004).

The Norwegian tax on pesticides changed in 1999 to a system of diversified tax rates for eight different groups of plant-protection products, based on their risks for the environment and health. This followed the development of indicators to assess health and environmental risks under an action plan (1998–2002) for reducing the risks associated with the use of pesticides. The sales of these products and the health and environmental risks have been assessed to be lower since the change.

Austria and Finland repealed their fertiliser taxes when they joined the EU in 1994. Consumption of fertilisers dropped in both countries while the fertiliser taxes were in use. Austria abolished the tax because it seemed that the costs for the agricultural sector would be too high in view of greater competition following EU accession (GLU

et al., 2004). Norway abolished the fertiliser tax in 2000, aiming to reduce the cost of farming, and other political measures were implemented to control nutrient emissions. Tax exemptions are part of the different schemes. For example, Danish farmers are exempt from the fertiliser tax when using more than 2 000 kg of nitrogen (per year, per farm, basically to exclude commercial use), and all agricultural uses in Belgium are exempt from the pesticide tax.

Although the Dutch levy system (the so-called MINAS – mineral accounting system) showed some positive results in terms of a reduction in the surplus of nitrogen and phosphorus since its introduction in 1998, it will be repealed before 2006, because it was ruled that the system was not in accordance with the EU nitrates directive. The MINAS system obliged Dutch farmers to keep records of nitrogen (N) and phosphorus (P₂O₅) inputs and outputs. This allows the determination of a balance at the farm level and a calculation of N surplus and P₂O₅ surplus per hectare as the input minus the output per hectare. When the calculated surplus exceeds some predefined level of nitrogen and phosphate surplus, the farmer has to pay a levy. No user standards for input of nutrients have been established, and the levy is not prohibitive, allowing farmers to pay off higher input. These characteristics are not in accordance with the nitrates directive.

A tax on growth promoters entered into force in Denmark in 1998. The aim is to reduce the consumption of growth promoters which are additives to animal feed that aim to increase the growth of animals and which can enter water supplies through groundwater and surface waters. The application of growth promoters in animal feed is not in accordance with sound agricultural production practices so that the call for a reduction in the consumption of these products can be understood even if environmental and health impacts remain unknown (DEPA, 1999). In addition, Denmark plans to introduce a tax on mineral phosphorus in animal feeds aiming to limit the overenrichment of freshwaters. The proposed tax on phosphorus was passed by Parliament in June 2004, and is expected to come into force in 2005.

The new pesticide tax system introduced in Norway is an example of tax design becoming more sophisticated over time. In the past, policy-makers felt that more complex tax design would result in unbearable administrative burdens, and this limited the degree to which a tax could be designed to be closely related to environmental and health outcomes. This now appears to be changing, with policy-makers becoming more confident

in differentiating taxes in line with potential environmental impacts.

3.5.4 Mining taxes

Taxes on mining of natural resources are normally implemented with the aim of capturing the resource rent (see Box 3.10)⁽⁵⁶⁾. Mining taxes lead to restricting the exploitation of certain natural resources by reducing the demand for these resources and improving the competitiveness of alternative, secondary materials. Mining taxes may also internalise the external costs of loss of amenity associated with quarrying activities. This is the case in the United Kingdom, where the rate of the aggregates tax (tax on sand, gravel and crushed rock) has been based on an estimate of the external costs⁽⁵⁷⁾. This was also the rationale for introducing the natural gravel tax in Sweden in 1996. A tax on raw materials has been in place in Denmark since 1990.

Mining taxes are implemented in different forms with regard to the tax base: for example, in Denmark and Sweden, the tax base is the physical amount of the resource extracted (*ad quantum* tax). Some countries in central and eastern Europe, for example the Czech Republic, Moldova, Poland and Russia,

Box 3.10 Fiscal regime for capturing economic rent from natural resource extraction

Taxes on the extraction of minerals and petroleum products, including oil and natural gas, do not belong to the categories of the statistical framework for environmental taxes established by Eurostat (see Eurostat, 2001, p. 12). However, such taxes are implemented in many resource-rich countries, such as Norway and Russia, and are a major source of government revenues.

The challenges that governments face when establishing an economically efficient fiscal regime for taxing natural resource extraction activities have been summarised as follows: 'The traditional objectives of the government are to establish a fiscal system, or contract, which (i) captures excess rent, (ii) is neutral, (iii) reduces variability of government income, and (iv) realises some revenue early, thus avoiding undue postponement of receipts, with taxes that are feasible to administer' (Gray, 1998).

A fiscal regime which should achieve these objectives therefore requires a range of different fiscal instruments consisting of royalty fees to offset the depletion of the nation's wealth, corporate profit taxes, and taxes to capture resource rent (Baunsgaard, 2001; EBRD, 2001). Examples of packages containing a range of such instruments can be found in the Russian system of natural resource taxation, but are more pronounced in the systems implemented in OECD countries such as Denmark, Norway and the United Kingdom. Bosquet (2002), analysing the Russian system of natural resource taxation, concludes that 'despite their importance in the Russian economy, natural resources do not contribute as much as they could to public revenues'. The result of this policy is that large resource rents are dissipated and wasted or appropriated by private interests. Natural resource taxes amount to around 18 % of the combined tax revenues in Russia but could be twice as high under a different fiscal regime of natural resource taxation (OECD, 2003c).

Sources: Gray (1998); Baunsgaard (2001); EBRD (2001); Bosquet (2002); OECD (2003c).

⁽⁵⁶⁾ The resource rent is defined by Eurostat as 'the value of output less all extraction costs, including a normal return on fixed capital, and represents a kind of "pure profit" from extraction' (Eurostat, 2001, p. 12).

⁽⁵⁷⁾ Laslett and Yaron (1998).

have implemented *ad valorem* taxes and charges. The rates are normally established as a percentage of the cost of extracted mineral raw materials. Materials liable to such mining taxes include soil, sandy and clay loam, clay, sand, gravel, dolomite and gypsum (BEF, 2003).

The tax rates are relatively low. In the Baltic States, they account for 1–4 % of the total price of the resource (BEF, 2003). Therefore, a real incentive effect is probably not being achieved, given the small effect on the overall price.

3.5.5 Other emissions to air

Air pollution levies, such as SO₂ or NO_x taxes, are still not in widespread use in the old EU Member States. This is in sharp contrast to the situation in the new Member States and other eastern European countries, where legislation has been adopted, including a complex system of pollution charges with a large number of taxable air pollutants. Basic rates usually apply to emissions within permitted levels, with higher rates in the case of non-compliance with standards. In some of the other central and eastern European countries, air pollution taxes are only applicable in cases of excess pollution. The Balkan countries have recently started to introduce pollutant-based charges, the most recent example being Croatia.

Denmark and Norway have recently introduced taxes on a range of non-energy-related greenhouse gases. In addition to the CFC tax, which has been in force since 1989, Denmark introduced a tax on the Kyoto protocol gases perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and hydrofluorocarbons (HFCs) in March 2001. The Norwegian greenhouse gas tax came into force on 1 January 2003 and is levied on perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs). The Danish and Norwegian greenhouse gas taxes supplement the CO₂ tax on fossil fuels. The tax rates are based on the greenhouse effects of the taxed substances in both countries.

Norway revised the SO₂ tax scheme by removing the SO₂ tax on coal, coke and refineries in 2002. The Norwegian institutions found in a survey that the SO₂ tax at NOK 3/kg SO₂ would not lead to any significant investments in measures to reduce SO₂ because the marginal cost of reducing Norwegian SO₂ emissions from process industries in order to comply with the Gothenburg Protocol amounted to more than NOK 14/kg SO₂ (Norwegian government, 2003). Sulphur-related taxes still exist on waste incineration plant emissions (NOK 20/kg) and on sulphur in fuels (NOK 29/kg or NOK 70/kg, depending on the content).

Russia and other transition economies

The current system of market-based instruments in air pollution policy originated in the former Soviet Union and can be found in the majority of central and eastern European countries, including many of the new EU Member States. A similar system applies to water pollution (see Box 3.11 and Section 3.5.6). Charges on pollution emissions are commonly the most widely applied tool in environmental policy in these economies (World Bank, 1998). This type of economic instrument is more difficult to administer and monitor than taxes or charges on the use of products such as energy. Although the theoretical advantage of pollution charges is associated with their incentive function, the actual reason for their implementation in eastern European countries, such as Russia, is closely connected to their revenue-generating potential. However, revenues are rather low given that the amount of revenues from these charges relative to GDP is less than 0.1 % in Russia and Ukraine (OECD, 2003a), compared with 2.7 % (environmental taxes only) in the EU-15 in 2001.

The system of pollution charges was designed so that it can deal with all major air and water pollutants. For example, the Russian scheme covers 214 air pollutants and 197 water pollutants. In addition, the air pollution charges in countries such as Lithuania and Russia are levied not only on emissions from stationary sources but also on those from mobile sources. The Lithuanian air pollution charge scheme for mobile sources is levied only on motor vehicles and the charge base is the amount of fuel consumed, for example per tonne of fuel consumed (BEF, 2003). However, only vehicles used for commercial activities are liable to the charge, and the private use of vehicles is exempt.

In Moldova, where a wide range of air and water pollutants are covered by the scheme, the charge rates are set depending on location and thereby differing within the country.

A common feature of these schemes is that polluters can be exempt from paying the charge when they invest in environmental technologies that aim to reduce pollution and improve environmental performance. The effectiveness of these schemes must be assessed as rather low because of several shortcomings, including the very high number of chargeable pollutants and the rather low rate of pollution charge rates, which were further eroded by high inflation in many eastern European countries in the 1990s (see Table 3.A.3 in the appendix for an overview of selected charge rates). The real value of these rates diminished over time because the rates had not been completely indexed to inflation. For

Box 3.11 The system of air and water pollution charges implemented in selected central and eastern European countries

The system of pollution charges is based on very strict ambient environmental quality standards — maximum allowable concentrations (MACs — established for hundreds of the most harmful air and water pollutants by governmental institutions.

The MAC of a specific pollutant in water or air is defined as the maximum concentration of the pollutant resulting in 'no adverse effect' (or 'zero risk') to humans drinking that water or breathing that air throughout their entire life. The chosen approach includes acute consequences and also chronic health impacts that may affect current and future generations. The strictness of these standards can easily be seen when compared with the standards established by the World Health Organisation (WHO), or those established by the European Union ⁽⁵⁸⁾.

Emission limit values (ELVs, sometimes also called maximum permissible levels (MPLs) of pollution) are calculated for air and water pollution using a special methodology on the basis of the MACs. The rationale for determining ELVs is to derive the maximum levels of pollution so that the concentration of emitted pollutants at a checkpoint located — for example, in the case of water — at a specific distance downstream or from an outlet do not exceed the given MACs. The procedure for determining these values is based on computerised dispersion models. The complexity of this approach can be seen from the fact that calculation of the ELVs has to be carried out for the individual sources of pollutants, taking into account the specific features of the outlets and the recipient water bodies.

The setting of these, rather stringent, ambient environmental quality standards requires that the ELVs are equally stringent, meaning that the latter are often unrealistic, since compliance is technologically and/or economically not feasible. In these cases, the dischargers and the authorities can agree on permissible levels of discharges into air and water in the form of temporary emission limit values (TELVs, sometimes called temporary compliance levels — TCLs). These are set above the ELVs and often at a level of emissions corresponding to the applied process technology of production with feasible end-of-pipe treatment.

The actual charges paid by emitters depend on whether the discharges are within the ELVs or exceed them. Where the discharge is above the allowable limit (either ELVs or TELVs), a non-compliance fee is due which is calculated by multiplying the base rate (i.e. the pollution charge) by a specific factor of between 1.5 and 200. The revenues generated by pollution charges are normally earmarked for environmental funds.

The effectiveness of this complex scheme of pollution charges is limited because of some underlying features inherent to the system. The charge rates are generally too low and have been eroded even further because of high inflation, which has not been offset through increases in the rates. Shortcomings with regard to the institutional and regulatory framework, such as weak enforcement of charges and non-compliance fees and limited monitoring capacity, have further constrained effectiveness.

Source: OECD (2003a).

example, in 1999, the real value of pollution charges in Russia amounted to less than 2 % of the real value of the charge when introduced in the early 1990s (OECD, 2003a).

Weak enforcement impairs the effectiveness of the pollution charge schemes in eastern European countries. However, as the Ukrainian example shows, enforcement can be improved. In Ukraine, 95 air pollutants and 27 water pollutants were subject to charges; these have been reduced to 25 air pollutants and 10 water pollutants. Until 1999, environmental

agencies were in charge of monitoring environmental violations and enforcing the system of pollution charges. The cost of enforcing these regulatory measures was too high for the environmental authorities, and they were thus ineffective. In 1999, responsibility for enforcement of charge collection fell to the State tax administration with the result that enforcement has improved — the tax administration has much better resources (and experience) in enforcing payments. Environmental authorities are now only in charge of reporting and approving environmental charge payments. The change in

⁽⁵⁸⁾ For example, the Moldovan standard for SO₂ is 0.05 mg/m³ (24 hours) compared with the WHO guideline value of 0.125 mg/m³ (24 hours); a similar result can be found when the Moldovan CO standard of 5 mg/m³ (20 minutes) is compared with the WHO guideline of 100 mg/m³ (15 minutes) (OECD, 1999b, p. 104).

responsibility led to an improved collection efficiency; for example, total revenues from charges and fines doubled within a year and quadrupled in two years — from about USD 6 million in 1999 to USD 13.6 million in 2000 and USD 25 million in 2001.

The pollution charge system is intended to provide an incentive for polluters to invest in reducing emissions and thus avoid payment of pollution charges. However, this has not been the case in Ukraine. This is because charge rates should be high enough to make investment in pollution abatement economical, but many firms are currently unable to afford either the current charge rates or new investments, making compliance with the whole system unrealistic. Moreover, whereas private firms consider environmental charges when planning their future operating expenses, government-owned enterprises are often subject to soft budget constraints or may simply negotiate exemptions from payments.

In addition, the actual charge liability was commonly based on estimates and not on actual measurements, which further affected the incentive function of such levies. This rather complex system of pollution charges requires a properly functioning institutional and regulatory framework if it is to be effective. However, the current lack of proper monitoring and enforcement of this system has impaired the effectiveness of the pollution charge system in many eastern European countries (see, for a more detailed discussion, OECD, 2003a), and the same is true for some countries in the Balkan region.

3.5.6 Water

Environmental policies in the European Community are generally encouraging the more widespread use of economic instruments. A main example is the EU water framework directive (WFD — Directive 2000/60/EC). One of the key policies of the WFD is to establish an adequate water-pricing policy including the application of economic instruments. These should provide an incentive for the sustainable use of water resources, thus supporting the achievement of the environmental objectives established under the WFD. Water prices should aim to better allocate the costs to (at least) the three main water users (households, industry and agriculture). The directive obliges EU Member States to ensure that the water prices charged to consumers reflect the full costs, financial as well as environmental and resource, so that water pricing is an effective instrument for the promotion of water conservation. This policy approach is in accordance with the overall principle of EU environmental policy of 'getting the prices right', i.e. internalising the external effects. The transposition of this principle

is still a major challenge because of the problems of determining the monetary values of environmental damages and resource scarcities.

Water abstraction

Water-pricing policies differ between EU Member States, within Member States and between economic sectors. Economic instruments with regard to water supply are not in widespread use in the EU-15. Water abstraction levies — a natural resource tax rather than a charge to recoup infrastructure costs — on tap water are implemented in Denmark, France, Germany, the Netherlands and the United Kingdom. These taxes and charges are generally used in combination with licensing and permit systems. Their design differs considerably in terms of tax rates and coverage, for example which economic sectors are liable. In general, water abstraction taxes are normally designed either as taxes on the amount of water abstracted or on the quantity for which an abstraction permit has been given.

The Danish tax on tap water was part of the major tax reform in 1994, and, although the tax is not a genuine water abstraction tax, the results are encouraging in that a distinct reduction in water demand and leakage rate has been reported. However, industry and agriculture are not liable to this tax. The exemptions were granted to avoid any potential negative impact on competitiveness (Ecotec *et al.*, 2001; DEPA, 1999). The provision of exempting economic sectors is not part of the Dutch groundwater tax which was introduced as part of a tax reform in 1995. The groundwater tax covers public water supply as well as self-abstraction. A tax on tap water has also been introduced recently, to be paid by all entities connected to the public water supply system and levied on a maximum of up to 300 m³ per connection per year.

The system implemented in England and Wales is different from the Danish and Dutch systems since abstraction charges are connected to licences so that the charge is based on the maximum quantity of water to be abstracted by users. A further unique feature of the scheme is that the abstraction charge rates are determined by the costs of the Environment Agency and its regional branches for monitoring and administering the abstraction licence scheme. This system results in regional variations in the charge rates. The scheme is currently under review and is likely to move from regionally determined abstraction charges to one national charge, to ensure fairer competition between businesses. The existing UK scheme is, however, essentially a levy to recover the costs of administration and regulation and has not been designed to influence water consumption

behaviour. This would require an additional charge on top of the cost recovery items. Since, in many regions, water companies are the dominant abstractors (providing water to domestic consumers and some industries), some argue that there is no financial benefit for them to promote demand reduction on the part of their customers. The logic of cost recovery would simply lead to an increase in the unit charge (Ecotec *et al.*, 2001).

The situation regarding the use of economic instruments for water supply is different in the new EU Member States and other European countries (see Table 3.2). Water abstraction levies are implemented in most of these countries and the rates are set in accordance with water quantity and quality, as well as distinguished between surface water and groundwater. Further factors which are usually considered in setting the rates are the water users and the purposes for which the water will be used. All these economic instruments have been introduced because of their revenue-generating potential. Environmental and resource considerations have not been the driving forces.

3.5.7 Water effluent charges

Water effluent charges are a common instrument used in European countries for regulating discharges of effluents into natural waters. In 2000, seven of the EU-15 Member States were using this type of economic instrument and a further five were looking into the possibility of introducing water effluent charges, underlining the importance of this instrument (European Parliament, 2001) ⁽⁵⁹⁾.

Major differences exist in the actual designs and rates, making a consistent comparison between the systems almost impossible. Differences concern the charging schemes, including the approach to calculating the liability and basis for the levy. The actual liability is usually calculated in relation to the quantity of different characteristics of the discharge, usually including chemical and biological oxygen demand (BOD), heavy metals, suspended solids, nutrients (nitrogen and phosphorus) and the total volume. In general, only a small number of pollutants are liable to a water effluent charge. For example, the Danish wastewater charge is applied in respect of three characteristics: biological oxygen demand, nitrogen and phosphorus. Some water effluent charge schemes cover only direct discharges to surface water (Denmark, Germany, Spain and the United Kingdom), while others include indirect

discharges (Belgium, France and the Netherlands). Some water effluent charges have been designed to provide an incentive to reduce water pollution, for example in Germany. The levies implemented in countries such as Belgium, France and the Netherlands have a dual function: to cover the general costs of wastewater collection and treatment services, and to fund water-related investments. Despite its primary financing function, the Dutch water pollution charge appears to be sufficiently high as to have a significant incentive effect on industrial water polluters.

The earmarking of air and water pollution charges for environmental investments is common in central and eastern European countries and has a long history. 'Extra-budgetary' units, whose main focus was to earmark revenues for special projects, were already in place in the 1980s in these countries and the former Soviet Union. After the breakdown of the centrally planned economies in the early 1990s, the transition process created significant challenges for national economies and gave rise to competition between sectors for scarce and declining State resources. In one format or another, these countries and Russia took advantage of the opportunity offered by this transition process to introduce legislation transforming the old extra-budgetary units into environmental funds which ensured that scarce financial resources were directly available for environmental measures. During recent years, environmental funds have either been dissolved (e.g. in Russia) or have been transformed into a foundation (e.g. the Environmental Investment Centre Foundation in Estonia) or into a special line in the annual budget of the Ministry of the Environment (e.g. in Hungary) (OECD, 1999a; Speck *et al.*, 2001b; BEF, 2003). The extra-budgetary units, including environmental funds, have undergone quite rapid changes during recent years and these changes are continuing. Discussions on the political agenda have been on whether the funds will function as an implementing agency for EU financial assistance after the countries join the EU, for example by being transformed into a unit administering Structural Funds (see Chapter 5).

Some of the environmental funds in central and eastern European countries have maintained their comprehensive nature by providing financial means for a broad range of environmental needs, unlike similar institutions in countries such as Belgium, France and Germany, where these institutions have clearly defined objectives and are sector-specific. The

⁽⁵⁹⁾ The seven Member States already implementing water effluent taxes in 2000 were Belgium (in all three regions: Walloon Region, Brussels Capital Region and Flemish Region), Denmark, France, Germany, the Netherlands, Spain and the United Kingdom.

fundamental task of these institutions in improving the environmental situation in these regions is to play a leveraging role in mobilising financial resources from other sources.

The water pollution charge schemes implemented in these countries differ from those in western European countries in that they are part of the complex system of pollution charges levied on a large number of pollutants. For example, in Romania, the number of chargeable pollutants increased from two to more than 30 different pollutants between 1991 and 2002. In addition, non-compliance fees have to be paid for discharges in several countries, for example Bulgaria, Estonia, Poland and Slovakia, when the pollution concentration exceeds permitted levels. These non-compliance fees can amount to up to 25 times the base rate in Russia and in specific cases to up to 300 times depending on the hazardousness of the pollutant, for example in Lithuania.

Economic instruments for water protection are in place in most of the Balkan countries, but their designs differ from the prevailing systems in central and eastern European countries and from those in western Europe. The instruments, usually called water protection charges, are normally levied on the volume of wastewater discharged (with differentiation of rates depending on the type of polluter). In Bosnia-Herzegovina, the basis for the water protection charge is population equivalent (the amount of water pollution one person is assumed to produce per day). These instruments do not play an important role in managing water pollution; the reasons include design weaknesses, poor enforcement and the low level of the rates. Administration of the schemes in the remaining European applicant countries (including Croatia) is more advanced, and the instruments have better potential to contribute to environmental improvements. The Romanian levy is based on pollutant concentrations in the effluent, and the Croatian water protection charge is calculated on the basis of a formula that takes into account the quantity and quality of the discharged water. The Bulgarian discharge levies are calculated on the basis of charges on each pollutant and the volume of wastewater. Revenues are earmarked for water management agencies in Croatia and Romania, and partly for the environmental fund in Bulgaria.

As with energy taxes, special provisions are granted to economic sectors in European countries. The motives for these are to mitigate the risk of loss of competitiveness of water-intensive industries because of higher water tariffs compared with competitors in foreign countries.

3.5.8 Waste

Disposal taxes

A number of European States use landfill taxes. These vary in level and ambition, and in the way the funds are used. Most are applied only to landfill, though in Denmark, the Netherlands, Norway and Flanders, they are also applied to incineration. Norway has recently revised the incineration tax, part of which related to the energy generated by the plant, to one based on emissions from the plants in order to better internalise external costs. The tax is combined with a subsidy scheme for energy produced from waste (Martinsen and Vassnes, 2003).

The vast majority of waste tax revenue is directed straight into the general budget (see Table 3.4). Revenue usage is more closely tied to the source of revenue in Austria and Switzerland, where funds are used to remediate contaminated land. Although the tax revenue becomes part of the general budget in Finland, the Ministry of Finance is understood to have had a 'gentleman's agreement' with the Ministry of the Environment when the tax was introduced, so that more money would be made available to fund contaminated land remediation.

In the United Kingdom, the introduction of a landfill tax was timed to coincide with an offsetting reduction in employers' national insurance contributions. Another scheme, the landfill tax credit scheme, was also set up to encourage those liable to the tax (landfill operators) to support projects with environmental purposes by enabling them to claim tax credits in respect of the funds so used (up to a maximum of 20 % of their tax liability). This mechanism was later halted and the United Kingdom Treasury is currently considering alternative ways of using the revenue, which is increasing as a result of annual increases in the tax rate.

The other key area in which landfill taxes vary (apart from their level) is the 'structure' of taxation. In Austria, the tax is differentiated by waste and type of landfill; in the United Kingdom, by type of waste only. In Italy, the tax varies across regions. Different countries exempt different activities from the tax.

Most countries have gradually increased waste tax rates over time. The exception is Finland, which kept the same rate of FIM 90 (EUR 15) per tonne from when it introduced the tax in 1996 until 2003, when it was raised to EUR 23, and then to EUR 30 in January 2005. Denmark has increasingly differentiated its tax according to the disposal route, so that there is now a clear economic incentive to maximise recycling and then use incineration with energy recovery.

This type of instrument is also used in some of the new EU Member States. Estonia has introduced a fairly comprehensive system of waste-disposal charges. The charge rates are differentiated between different types of wastes and also vary depending on the location of the landfill site and whether the site meets predefined environmental standards.

Slovakia has recently introduced a scheme in which municipalities will pay a levy on landfill to the local authority in whose borders the landfill is located. The level of payment is related to the number of fractions being separately collected by the municipality sending the waste for disposal. A similar waste charge is also in place in the Czech Republic.

A limited variety of mechanisms are used to **collect** and **administer** the disposal tax. In the United Kingdom and Finland, the customs and excise authorities run the tax. In France, the tax was originally collected by ADEME (French Agency for Environment and Energy Management), although changes to the tax regime have now moved the responsibility to the Excise and Duty Directorate-General, within the Ministry of Finance. In Denmark, Norway and Sweden, waste taxes are paid to the national tax authorities.

Landfill taxes have different effects on different actors. The effect on households is conditioned by the way in which the (municipal) collection

scheme responds to the tax in passing it on, and differentiates the charges for households according to the amount of waste offered. Commerce and industry usually pay per tonne of waste collected and the tax is included in their bills.

As the range of treatments for residual waste becomes broader, the nature of taxes is likely to change to the extent that they aim to reduce the amount of residual waste. An interesting example is the Austrian tax, which includes a lower rate for treated landfilled residues from mechanical biological treatment plants (Eunomia and TBU, 2003). The 2003 tax rate for untreated waste was EUR 87 per tonne. Where waste is pretreated so as to meet stability criteria, the rate applied is EUR 21 per tonne. This difference of EUR 66 per tonne is likely to be sufficient to make pretreatment an attractive alternative to direct landfilling.

Another recent instrument of interest is the new landfill tax applied in Catalonia. Recognising that the landfill directive requires the diversion of municipal waste from landfill, the revenue of this tax is used to support the development of schemes for separation of biowastes at source, to be implemented by municipalities. Municipalities will receive support based on a per tonne basis, which varies with the level of contamination of the collected material. Door-to-door schemes are likely to receive greater support than schemes based on road containers.

Table 3.4 Use of waste tax revenues in selected EU Member States

Use of revenue	Country application
General budget	<ul style="list-style-type: none"> • Belgium (Flanders) (currently) • Denmark • Estonia (*) • Finland • Netherlands • Norway • Sweden
Fund waste management schemes etc.	<ul style="list-style-type: none"> • Flanders (at the start, environment and nature fund) • France (at the start, modernisation fund for waste management) • Latvia (distributed between national and municipal environmental funds) • Poland (distributed between environmental funds) • United Kingdom (partly to Entrust fund)
Clean up contaminated sites	<ul style="list-style-type: none"> • Austria, Finland (**) • Switzerland
Other	<ul style="list-style-type: none"> • Czech Republic (municipal budget where landfill is located) • France (currently revenue neutral with reduced VAT on collection) • United Kingdom (partly to reduce national insurance contributions)

(*) Revenue becomes part of the central budget but it is earmarked for environmental protection.

(**) Although the revenue becomes part of the general budget, the Ministry of Finance had a 'gentleman's agreement' with the Ministry of the Environment when the tax was introduced, so that more money would be made available to fund contaminated land remediation.

3.5.9 Product taxes/charges and deposit-refund schemes

Product taxes/charges

Ideally, taxes and charges should internalise external effects where they occur. This works for the larger point sources, but when the number of potential sources becomes too big — and pollution becomes diffuse — administering such taxes or charges quickly becomes unmanageable. As an alternative, taxes or charges can be imposed at the point of sale of the potentially polluting products. Such taxes increase the price of the product, providing incentives for consumers to buy substitutes that are friendlier towards the environment. The incentive function is not always the primary one, however. In quite a number of cases, the revenues from product charges are used for financing (collective) schemes to reduce the environmental impact of the taxed products. Examples include the various collection systems for bottles, batteries and waste paper.

Packaging waste is a main area where product taxes are applied. Recent data show an increase in the total volume of packaging waste generated in most EU-15 Member States as well as the EU as a whole (EEA, 2004). Some countries have implemented broader packaging taxes for dealing with this type of waste, and some operate taxes or charges on specific categories such as disposable beverage containers or plastic bags. These product charges are also widely used throughout Europe (see Tables 3.1 and 3.2)

including the Balkans (Albania) and eastern Europe (Belarus).

One of the most notable success stories is the plastic bag levy introduced in Ireland in 2002 (see Box 3.12).

Product taxes and charges are levied in Europe on many different products. Apart from waste-related applications (different types of packaging, tyres, batteries, containers, etc.), product taxes are aimed at reducing pollution from the use of pesticides, fertilisers and CFCs, and health risks from chemicals such as PVC and phthalates. These environmental levies are normally part of a range of different instruments, for example in the case of packaging waste (EEA, 2004). Several EU Member States have introduced levies on packaging to complement deposit-refund schemes as a means of reaching the targets of the EU packaging directive (Directive 94/62/EC) and its 2004 amendment.

The revised Danish packaging tax (see Box 3.13) is an interesting example of an environmental tax because its design and rates are directly related to the estimated environmental impacts of the different packaging materials under the tax scheme.

The Norwegian levy system on beverage containers (see Box 3.14) has recently been revised and is now an example of combining different instruments with the intention of achieving better results.

Box 3.12 The Irish plastic bag levy

Prior to the introduction of this levy, some 1.2 billion plastic shopping bags were provided annually free of charge to Irish consumers (about 325 bags per person per year). They were a highly visible component of litter and had negative impacts on habitats and wildlife. The possibility of an Irish plastic bag levy had been on the political agenda since 1994 and the levy was finally introduced in March 2002 as a point-of-sale charge. The levy was fixed at EUR 0.15 per bag, which was thought to be sufficiently high to give most consumers pause for thought, and to stimulate them to avoid paying by bringing their own 'permanent' reusable shopping bags with them. There was no attempt to identify the marginal external costs and determine the optimum level of tax. Retailers have reported a reduction of over 90 % in the provision of disposable plastic bags since the levy's introduction, amounting to around 1 billion plastic bags.

The revenues from the levy have been assigned to a new environmental fund and are used for a variety of purposes such as to defray the costs of administration, support and promote any programmes established for the prevention or reduction of waste, and research and development in the waste area. The costs to the government are modest. Furthermore, retailers are facing lower costs because they do not have to purchase the plastic bags which were provided free of charge.

This is a good example of an effective environmental levy. Its design is simple and transparent, and immediate environmental benefits are discernible because there is less litter on the streets. Own bags can easily be used as substitutes for plastic bags and this is also responsible for the success. The experience gained in Ireland has led several other countries and regions, such as Australia, the United Kingdom and New York City, to discuss the introduction of such a levy.

Source: http://www.oasis.gov.ie/public_utilities/waste_management/plastic_bag_environmental_levy.html.

Box 3.13 The Danish packaging tax

The tax on packaging introduced in 1999 replaced another, more narrowly defined tax, which only applied to bottles and jars. The old tax was volume based and applied only to liquids such as drinks, vinegar, edible oil and methylated spirits.

From 1999, the packaging tax was broadened so as to include sales packaging and multi-packs with volumes of less than 20 litres for the packaging of specific articles. Initially, the tax remained based on weight, irrespective of the character of the packaging material.

The aim of 'fiscal equality' of materials was changed in the revision of the tax in 2001, when the government decided that the environmental impact of different packaging materials should be reflected in the tax rate. Originally the same for all materials, tax rates were then differentiated on the basis of an index of environmental impact, CO₂ emissions, primary energy use, fossil resource use and waste, with glass as the benchmark. Different rates were applied to one-trip and multi-trip packaging, with the tax base being the weight for the former and the volume for the latter. This reflects the fact that multi-trip packaging generally needs to be heavier to withstand the handling associated with such packaging.

Source: Nordic Council of Ministers (2002).

Box 3.14 The Norwegian charge on beverage containers – A combination of different instruments: packaging tax and recycling scheme

The system of environmental taxation of beverage containers was changed on 1 January 2000. The new system distinguishes between different container materials. Containers used for beverages most likely to be used at home, such as milk and milk products, beverages made of cocoa and chocolate and concentrates of these, and juice, are exempt from the environmental tax. Containers used for other beverages are taxed according to the material they are made of, such as glass, aluminium and cardboard. The tax is reduced if the container is refillable and included in a recycling system. The reduction is proportional to the recycled proportion of the containers sold. If the recycled share of a specific container exceeds 95 %, this container type is fully exempt. Each year, the expected recycling rates for the following year are decided for every container type and this determines the tax rate payable for the containers for that year.

In addition to this environmental tax, a tax of NOK 0.85 (2002) is levied on all non-refillable beverage containers. This is a flat-rate tax, independent of recycling rates. Containers for milk are exempt.

Source: Nordic Council of Ministers (2002).

The vehicle disposal levy operated in the Netherlands (see Box 3.15) is an example of a market-based instrument supporting the implementation of the EU directive on end-of-life vehicles (Directive 2000/53/EC).

In many European countries, some form of mandatory national consortium (such as the green dot scheme for packaging in Germany) and other private recycling organisations were established as part of national waste reduction policies to support the creation of collection and recycling activities, mainly for packaging wastes but also for oils, leaded batteries and aluminium (Eurostat, 1999). The consortia are partly financed by some mandatory contributions paid by their members, which are normally passed on to the final consumer. For example, Switzerland has applied a prepaid disposal fee since 2001, which is included

in the retail price of products such as batteries and refrigerators. The revenues from these charges are used to cover the collection, transport and recycling costs of the products.

Deposit-refund schemes

Deposit-refund schemes require paying a deposit on the purchase of potentially polluting products, which is refunded when the products or their residues are returned for recycling or disposal. The refund is not necessarily equal to the deposit. It may be lower, including a handling fee for the recycler (as in the Swedish return system for aluminium cans and PET bottles), or higher if there is a long period between paying the deposit and receiving the refund (as in the earlier deposit-refund scheme for car hulks in Sweden).

Box 3.15 Dutch vehicle disposal levy

In the Netherlands, Auto Recycling Nederland (ARN) BV operates a scheme whereby the disposal of vehicles (cars and small vans) is funded from a levy payable when cars are first registered in the country. ARN is a private, non-profit company set up by four Dutch motoring organisations in 1993 to operate the national end-of-life vehicle (ELV) collection and recycling system.

The fee was originally EUR 115 per vehicle, but it has since been reduced to EUR 45 per vehicle and is paid directly to ARN. ARN then works with certified dismantling, recovery and recycling companies to ensure that ELVs in the Netherlands are collected and safely scrapped and recycled. The responsibility for disposing of an ELV properly is placed on the final owner as without a certificate of disposal he/she has to carry on paying the annual circulation tax for the car. The owner does not, however, have to pay anything for the vehicle to be scrapped.

In 2003, 89 % of all ELVs were scrapped and recycled by ARN-certified scrapyards. The target is to reach 95 % by 2007.

Source: Skinner (2001).

This type of environmental instrument is designed to encourage recycling and prevent waste, and reward good behaviour. Many of the schemes, in particular the traditional, voluntary schemes for refillable bottles, have proved very effective, with return rates of 95 % or more. In addition to these voluntary deposit-refund schemes, many European countries have introduced mandatory deposit-refund schemes, levying deposits, in particular, on products such as plastic bottles and batteries.

Like environmental taxes and charges, deposit-refund systems are of a voluntary character, in so far as the intended action can be ignored. They are therefore not powerful enough to address major environmental concerns that do not allow for unintended behaviour and require, stronger, direct regulation, for example for chemical waste and toxic substances. However, the diffuse problem of waste from chemical products used in households is difficult to regulate. Compliance with an obligation for separate collection depends largely on moral suasion. Deposit-refund systems are seldom applied (batteries is a main exception) and could be considered to support existing measures.

Deposit-refund schemes are sometimes combined with product taxes, as in some Nordic and Baltic countries, for example for refillable beverage containers.

Mandatory deposit-refund schemes have sometimes been used as a 'hidden incentive' in pushing for certain targets. For example, the German mandatory deposit-refund scheme on most one-way drink containers for all beer, fizzy soft drinks and mineral waters packaged in disposable cans or bottles, implemented in 2003, was stimulated when the

market share of refillable drink containers fell below the 72 % level mandated in the 1991 packaging law. The rates depend on the size of the packages and vary between EUR 0.25 and EUR 0.5. At the start of the system, some German retailers took one-way drink containers off their shelves.

The system has faced opposition since its launch, both from within and outside the country. It was examined because it lacked a properly functioning nationwide return system and hindered imports of one-way drinking packages for beer, mineral water and soft drinks from other Member States. The Commission further claimed that it breached EC Treaty rules on the free movement of goods and the packaging directive. In addition, the Court of Justice of the European Communities argued that German rules requiring at least 72 % of drinks to be packaged in refillable containers discriminated against foreign mineral water producers, considering that under EU regulations mineral water must be bottled at source. Proposals for amending the national packaging ordinance were put forward in 2004; these revise the controversial system of mandatory deposits by delinking the deposits on one-way drinking packages from the market share of refillables. Parallel to the voluntary deposits on refillable bottles, a deposit on one-way beverage containers for beer, fizzy soft drinks and mineral waters is planned and a nationwide return system will be mandatory. At the end of 2004, the German Parliament revised the legislation by removing the link between the market share of refillable containers and the deposit-refund scheme. Under the new law, to be implemented in 2005, 'ecologically unfavourable' drink containers will only be subject to a deposit of EUR 0.25, while all other drink containers remain deposit-free. Revisions aimed at establishing a nationwide return system

have also been approved, but these changes will only come into effect in 2006.

In 2002, Denmark revoked the ban on disposable drink packaging and replaced it by a mandatory deposit-refund scheme. The implementation of this scheme ended a long-lasting conflict between the European Commission and the Danish government which reached its peak when the Court of Justice supported Denmark's right to require all beer and soft drinks to be sold in returnable bottles, also arguing against the Commission's position that the ban constituted a barrier to trade. The deposit price was originally set at DKK 1.5 for containers below 1 litre and DKK 4.25 for those of 1 litre or above and was reduced by around one third in early 2004. Cans that could not be found on the shelves of the Danish stores before 2002 are common today, with a deposit levied at the sales point, and a refund on return.

3.6 Where are we going?

Overview

Looking to the future, some key issues regarding the application of taxes and charges are as follows:

- Successful experience with environmental taxes and charges may lead to other countries applying similar schemes, adapted to national circumstances. For example, several EU countries with similar problems have been looking into congestion charging and plastic bag taxes following the successes of the UK and Irish schemes.
- There is clear potential in some sectors for the application of taxes where this has been rather limited in the past, for example aviation, maritime transport, and agrochemicals. The potential increases as the technology required to implement taxes that more accurately target the externalities concerned evolves and improves. For example, distance-based road charging required extensive administrative effort, but has been simplified dramatically with the current common and therefore cheap availability of GPS technology.
- There is potential and legislative pressure for a continuing move towards full internalisation of the costs of providing environmental goods and services — water supply, wastewater treatment, waste services. One example is the water framework directive that states "The use of economic instruments by Member States may be appropriate as part of a programme of measures. The principle of recovery of the costs of water services, including environmental and resource

costs associated with damage or negative impact on the aquatic environment should be taken into account in accordance with, in particular, the 'polluter pays principle' (Article 38). The greater use of internalisation instruments, such as with the use of road infrastructure and water abstraction, can also be expected as countries move towards greater fiscal prudence within the boundaries of affordability.

Discussion

Regulatory measures (command and control policies) are still the most widely used method for environmental policy: national emissions ceilings or air quality standards, specific emission limits for large power plants, vehicle emissions standards, fuel quality standards, standards laid down in the integrated pollution prevention and control (IPPC) directive for individual factories and, for example, in the waste electronic and electrical equipment (WEEE) directive. However, market-based instruments, and in particular taxes, have been playing a larger role in addressing environmental pollution during the past decade.

Environmental taxes were often seen as potential substitutes for regulatory measures, although their non-compulsory character often made them inferior in the eyes of the usually non-economist regulators. This view changed slowly as the implementation deficit of traditional regulation appeared difficult to close and also because of the growing need for cost-effective measures that were easy to apply. Taxes are now perceived as tools complementary to command and control policies, and it is widely accepted that a policy package of regulation and market-based instruments may be required to achieve environmental objectives. Examples of combining these different tools are becoming more widespread and can be found in the waste policy area, for example for achieving the objectives of the WEEE directive and end-of-life vehicles directive.

The adoption of the EU directive on restructuring the Community framework on taxation of energy products in 2003 may trigger developments in energy taxation at the EU Member State level. It took six years of negotiation and amendment to adopt this directive, and it can be seen as a reflection and confirmation of unilateral processes leading towards a better (though far from full) internalisation of the external costs of the use of fossil fuels. For example, the introduction of the energy and electricity tax in Germany and the climate change levy in the United Kingdom illustrate the relevance and need for environmental taxes in environmental policy.

The call for the extensive application of market-based instruments is on the political agenda of the EU (European Commission, 2004a) and supported by many stakeholders, such as international (EEA, 2004) and non-governmental organisations. However, recent developments, in particular with regard to the adoption of the new EU directive on energy products taxation demonstrates the difficulties of introducing any new taxes or charges at the EU level under the current institutional conditions. The current concern over European economic growth and job creation is attracting considerable attention from political decision-makers. This is leading to a refocus from strengthening the integration of environmental considerations into sectoral policies to stressing the importance of competitiveness considerations as a major assessment criterion for EU environmental policies.

Another reason for the slow progress with introducing new EU-wide environmental taxes is the fact that a single Member State can block progress because all decisions on taxation issues require unanimity at the European Council level. To amend this, the Commission

proposed to the Intergovernmental Conference that environmental taxation should in future be decided under qualified majority voting rules in the Council. This proposal was rejected by the Heads of State or Government at the 2000 Nice European Council and not included in the EU Constitution.

Unanimity voting with regard to taxation, including environmental taxes, will not easily be changed in the near future. This implies that the likelihood of a proposal to introduce new environmental taxes at the EU level is small. However, ongoing progress can be expected in national approaches, leading to a more widespread use of environmental levies, partly based on experience gained in other European countries. This process of shared policy learning may increasingly include new Member States and candidate countries, and spread further to other countries in the European area, including the Balkan and eastern European countries.

New opportunities for environmental taxes

The introduction of new environmental taxes, or the revision of existing ones, is under continuous

Box 3.16 The EU and enhanced cooperation

In 2001, the Commission reiterated its opinion that qualified majority voting was indispensable for certain tax issues and expressed its opinion that the overall shift towards more environmental taxes is slow (European Commission, 2001b). An option for overcoming the standstill in questions relating to taxation is the so-called 'enhanced cooperation mechanism' (for more detailed discussion, see Boeshertz and Rosenstock, 2003, and Jørgensen, 2003). The Treaty of Amsterdam established the legal framework for this mechanism and Article 43 allows it to be applied in the context of energy taxes. The Treaty of Nice supported this strategy and developed it even further.

The enhanced cooperation mechanism enables closer cooperation between subgroups of EU Member States in some limited areas: for example, a number of Member States can agree to new measures, for example in the area of energy taxation, and these new measures can be adopted and implemented by these Member States. However, the application of this mechanism is, in reality, closely regulated and it can only be introduced when the proposed measure is in strict accordance with other EU regulations and directives, in particular regarding the rules establishing a single European market. Special attention is given to the guiding principles of the EU, namely that measures to be adopted under enhanced cooperation do not contradict internal market rules (Article 43e) and do not establish new trade barriers between Member States and therefore distort competition between them (Article 43f). This means, for example, that the special tax provisions, such as tax exemption for specific economic sectors, laid down in the EU directive on energy products taxation (Directive 2003/96/EC), could not be altered under enhanced cooperation.

Because enhanced cooperation is part of the overall Community framework, it provides a more efficient approach for integration between Member States than individual and informal cooperation. However, it can only be applied as a last resort, meaning that an agreement for implementing the proposed measures will not be achieved within the European Council in the near future (Article 43a). The concept of enhanced cooperation has been motivated by a desire to deepen integration across like-minded Member States, but it can also have the effect of accelerating the integration process more broadly across Member States, because those Member States which are initially not part of the enhanced cooperation can join at a later stage (Article 43b). Enhanced cooperation — at least momentarily in the field of environmental taxation — lost its momentum following the adoption of the energy products taxation directive, although the possibility for use of this mechanism clearly exists.

discussion in European countries. Initial approaches for using economic instruments, in particular environmental taxes, are under way in the aviation and shipping sectors. Discussions on taxing aviation fuel for commercial air transport are ongoing and the EU directive on energy products taxation maintains the principle of exemption (due to the Chicago Convention of 1944), but provides Member States with the possibility of introducing such a tax for national flights⁽⁶⁰⁾ and intra-EU flights on the basis of bilateral agreements. Steps for the introduction of a levy on road transport fuels as well as for aviation fuels are suggested by the Commission as one of three options for establishing a new resource to replace the current financing mechanism of the Commission budget as discussed in the financing proposal for the Commission budget period 2007–2013. Measures to curb shipping emissions are also being assessed, partly in the context that 'by 2020, shipping emissions of air pollutants are projected to equal all land-based emissions in the EU' (NERA, 2004).

Apart from these new areas for the application of environmental taxes, new environmental levies can be expected to further gain attention in the fields of waste management, water quantity and quality management, and transport in EU Member States in the coming years, based partly on the implementation of EU directives.

Taxes levied on waste in landfills and incineration plants have increased in number recently in EU Member States. Countries wish to divert waste streams from landfills, in particular, to accommodate the obligations of the landfill directive, and increase prevention and recycling of waste, which would make it easier to achieve the objectives of the directive on incineration of waste. Further expansion of the use of such taxes can be expected, based on positive experience in other countries, as regards landfill taxes and incineration taxes in countries with significant incineration capacity. The water framework directive may provoke similar developments in the near future where full cost internalisation of water services is demanded.

As regards transport, an expansion of the implementation of road-charging schemes and congestion charges is on the political agenda in several European countries. After the success of the London congestion charges, European cities are investigating similar measures (e.g. Edinburgh) or running experiments (e.g. Copenhagen). The

European Commission proposed — in the form of a revision of the 1999 Eurovignette directive — a common road-charging structure for freight hauliers in 2003 for internalisation of external costs. Environmental and social costs may, however, not be included in the charge, but only used to differentiate the charge according to the relevant characteristics of the types of lorries charged. Consequently, the charge rates for lorries under the Austrian and German road-charging systems are lower than the charge rate for similar lorries under the Swiss system which is not bound by EU regulation.

The decision of the Irish government to drop the plan to introduce a carbon dioxide tax in September 2004 may indicate a wider reservation towards new energy/carbon taxes. The EU emissions trading scheme, starting in January 2005, is widely seen as the major market-based instrument in this policy area. Although not all economic sectors are captured by the scheme, plans exist to widen the scope (e.g. by including the chemicals sector and aviation), and policy-makers may prefer to await such developments before taking initiatives for new energy/carbon taxes, which will not be popular in a period of high oil prices and reduced economic growth.

3.7 Lessons from the past and insights for the future

Design of environmental taxes and charges

At the European level, there have been few examples of attempts to guide the application of environmental taxes through comprehensive measurements of externalities (although attempts to set targets have, in some cases, been informed by cost-benefit analysis). This remains the case despite increased familiarity with the term among policy-makers. Nevertheless sound policy design calls for a greater use of assessment of externalities in policy development. This does not necessarily mean that policy-makers should feel bound by some form of externality 'straitjacket'. It would seem, however, that such analysis can at least inform the design of taxes where the intention is to internalise environmental costs. There may be good reasons why taxes should stray from the assessment of externalities, for example:

- where it seems unlikely that other externalities will be accounted for in the short to medium term (so the UK landfill tax's departure from

⁽⁶⁰⁾ The Netherlands government proposed in the 2005 budget law the abolition of the tax exemptions for aviation fuel on domestic flights. A tax on aviation fuel should therefore be introduced as of January 2005.

its initial level may be justified by the lack of internalisation of impacts which would incentivise recycling);

- where there are reasons to believe that stronger incentives may be required to change behaviour, for example to overcome 'lock-in' (e.g. to stimulate the use of alternative transport modes);
- where there is reason to believe that, given the prevailing regulatory infrastructure, an externality tax might encourage illicit behaviour which could outweigh any benefits from the tax;
- where the science underpinning such valuations is too uncertain (not least, for example, in respect of climate change).

Continued research is needed to increase the knowledge of externalities and facilitate its use in designing environmental tax schemes.

Over time, States have become more confident in designing taxes which reflect more closely the environmental issue being addressed. Examples include taxation of vehicles (the United Kingdom), pesticides (Norway), road charging (Austria, Germany), the nutrients surplus tax in the Netherlands (to be abandoned), and charging for waste at the household level (where schemes including charges based on combinations of bin size, frequency and weight are now used). This evolution may reflect, in some cases, changes in technology, which allow such taxes or charges to be levied. This suggests that tax design may achieve more accurate targeting as technology develops.

Environmental effectiveness

Environmental taxes and charges are introduced to provide incentives for behavioural change leading to a reduction in environmental pollution, or to generate revenues to be earmarked for environmental investment programmes. These objectives are not mutually exclusive. However, an attempt to reach both objectives simultaneously may blur the environmental effectiveness of environmental taxes because of the conflicting targets.

Empirical studies analysing the environmental effectiveness of environmental taxes are still very rare. There are many reasons for this, mainly the lack of a tradition of policy evaluation in general and the methodological difficulties and complexities associated with performing such assessments (OECD, 1997, 2001; European Commission, 1999). They also include lack of

data availability to conduct evaluation studies and developing the counterfactual as the basis for the evaluation assessment ('What would have happened otherwise?'). Furthermore, environmental taxes are normally introduced in combination with command and control regulations, which make the disentangling of the impacts of individual instruments a difficult task. During recent years, more work has been carried out on assessment studies analysing the effectiveness of environmental taxes in the EU-15 (see, for an overview of such studies, *Ecotec et al.*, 2001). *Ex ante* assessments analysing the possible effects of the use of environmental taxes by using experimental simulation models are more common than *ex post* evaluation studies. The latter seek to trace back whether the introduction of economic instruments led to the changes in variables that were aimed for. Studies assessing the environmental effectiveness of environmental taxes in the new Member States and other eastern European countries are insignificant because of the abovementioned methodological problems and the lack of data.

In 1997, the OECD created a framework for conducting evaluation exercises (OECD, 1997). This 'in-built' framework has not lost any of its significance and it can be concluded that recourse to this framework should be sought in the political decision-making process of designing environmental taxes.

Empirical evidence can shed some light on the question of how environmental taxes should be designed to be environmentally effective as illustrated by the following examples ⁽⁶¹⁾.

Energy and CO₂ taxes

- Norway — CO₂ tax: The carbon taxes contributed to only a 2 % reduction in CO₂ emissions because of the generous tax treatment of energy/carbon-intensive economic sectors. This relatively small effect relates to extensive tax exemptions and relatively inelastic demand in the sectors in which the tax is implemented (Bruvoll and Lasen, 2004).
- Germany — energy tax: Increased petrol and diesel prices resulting from the introduction of energy taxes led to a decrease in the sale of petrol and diesel between 1999 and 2003; consumption of petrol fell by around 15 % between 1998 and 2003 and diesel consumption increased between 1998 and 2001 but has fallen slightly since then. During this period, the energy tax levied increased by around 31 % for petrol and 48 % for

⁽⁶¹⁾ Some of these are newer studies, but the majority are rather older; there is a general lack of *ex post* studies analysing the environmental effectiveness of taxes and charges.

diesel. Other reasons for this development are efficient, more careful driving habits and overall mileage reductions as well as lower specific fuel consumption of new vehicles (Ministry of Finance, 2004; Statistisches Bundesamt, 2004). It is notable that the introduction of the energy tax coincided with an increase in the world market price of oil, resulting in a further increase in the pump price of petrol and diesel.

Air pollution charges

- Sweden — NO_x charge: The Swedish environmental authorities imposed high charge burdens on the larger electricity generators with the main purpose of creating strong incentives to abate NO_x emissions. In order to protect the firms under the scheme, the revenues were refunded, creating an incentive charge system that is unique in Europe (SEPA, 1997).

Waste taxes

- Denmark — landfill taxes: The introduction of the landfill tax led to a reduction in the total amount of taxed waste and an increase in the reuse of building and construction materials.
- UK landfill tax: The introduction of the tax improved overall data availability. Design changes and a simultaneous increase in tax rates were made because the landfill tax when introduced did not affect household waste arisings, since it provided no incentives for change of behaviour (Ecotec *et al.*, 2001).

Water (effluent) taxes

- The Netherlands — wastewater effluent charges: Water pollution by the 14 industries responsible for 90 % of water pollution decreased by 90 % between 1969 and 1975 and by a further 20 % by 1980. Half of this reduction was attributable to the effluent charge and accompanying measures (OECD, 1995b).
- Denmark — tax on tap water: A 26 % reduction in total water consumption by households took place between 1989 and 1998; half of the reduction only occurred after the inception of the tax, illustrating the fact that just announcing the introduction of an economic instrument can affect behaviour (Ecotec *et al.*, 2001; DEPA, 1999).

Product taxes

- Ireland — plastic bag levy: There was a reduction of around 90 % in the consumption of carrier bags after the levy was introduced.

Agricultural taxes

- Norway: Differentiation of the tax on pesticides according to environmental characteristics has

reduced the perceived risks to health and the environment of the use of pesticides.

Transport charge

- Congestion charge in London: Congestion in the charging zone has been reduced and there is increased interest in the experience gained from other countries which may have the intention of introducing such a scheme.

There is no single recipe for a successful and effective tax scheme. Different factors determine the functioning of the specific schemes, each in their own context. Examples include the Danish waste-disposal tax (high tax rates), the Norwegian pesticide tax (tax rates differentiated according to toxicity), the London congestion charge (strong champion; rather high charge), the Dutch nutrient surplus tax in agriculture (flexibility), and the Irish plastic bag tax (awareness of the advantages and simplicity of alternative behaviour).

Environmental taxes are not always the preferred option for achieving effective solutions. The Dutch tax on the disposal of harbour sludge can serve as an illustration of the difficulties of designing a tax that addresses and solves environmental problems.

Economic efficiency

Evidence on the efficiency of environmental taxes (their main textbook advantage) has proved difficult to obtain. However, it is clear that full pricing is the main determinant of efficient schemes. An often overlooked phenomenon is the relative high taxes on motor fuels in Europe. They have led to fuel prices which are roughly twice those in the United States, and the European passenger car fleet is about 25–50 % more fuel efficient than that in the United States.

Full pricing is far from being achieved in practice. A study (Eurostat, 2003) analysing tax provisions applied in the Nordic countries found 'that the burden of the energy tax is not distributed equally to the consumers of the energy and hence does not follow the polluter pays principle. 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).

Such tax provisions can impair the achievement of efficiency gains that are one of the motives for introducing environmental taxes instead of command and control regulations. As a result of tax provisions granted to industries, the potential

Box 3.17 The Dutch tax on landfilling of sludge

A huge amount of sludge — 25–30 million m³ — is dredged for nautical and water management reasons from the Dutch harbours and waterways every year. In all, 3 to 5 million m³ are too polluted to spread on the land or return elsewhere to watercourses or the North Sea. Of this amount, 90 % is stored in specific landfills for sludge.

In the legal framework of the law on environmental taxes, waste to landfills is subject to an environmental tax. Landfilled harbour sludge was exempt before 2002, when a tax of EUR 13 per tonne was introduced. The objective of the tax was to prevent sludge being brought to landfills and encourage the reuse of sludge and other ways of processing. Sludge with less than 60 % sand fraction (almost 90 % of the 3–5 million m³) is exempt from the tax, because of the lack of realistic alternatives to dumping. Sludge providers applying for exemption need to acquire a certificate.

The government withdrew the tax because it was deemed ineffective. Support for the tax system was minimal and the measure was difficult to enforce. For example, only 5 % of the lots for which an exemption was not granted were offered to depots under payment of the tax. Apart from non-compliance, explanations of this large gap could be postponing the dumping, reapplying for a certificate, and postponing or stopping the planned dredging project.

Arguments for reconsidering the tax include the vulnerability and costs of the certificate system and the insufficiency of (government) budgets for the dredging needed for nautical and water management reasons. Another drawback of the current system is the lack of environmental target setting, since whether or not to reduce the dumping of sludge is left to the market. Moreover, the tax is not nearly high enough to close the financial gap between landfilling and processing. Thus, the tax may have the opposite effect of what it intends and may result in reduced efforts to improve the quality of the sludge before dumping.

The Netherlands government has replaced the tax by setting targets via a regulatory rule of minimum processing standards.

for exploiting cheap emission abatement in industry is not being utilised, and, instead, more costly options for emission abatement have to be used in the household sector, resulting in 'substantial excess costs' (Böhringer, 2002). Regulatory measures also have implications with regard to the competitiveness of European industries, as highlighted in a recently published report (European Commission, 2004b). This report, analysing air pollution policies in Europe and other regions of the world, concluded that the European approach 'has largely been based around EU- and national-level legislation (command and control) setting national emission ceilings or air quality standards, as well as specific emission limits for large power plants, vehicle emission standards (for road transport vehicles), fuel quality standards, and integrated pollution prevention and control measures for individual factories' (European Commission, 2004b, p. 9) and in addition national environmental taxes, such as energy or pollution taxes.

Although not found in the taxation of energy, full pricing has been applied successfully in environmental tax schemes in other areas. The Dutch wastewater tax scheme incorporated full cost pricing of providing wastewater treatment services,

and there is evidence that this has led to a more efficient water quality management system than in other European countries. Also, full pricing in the Swiss road charge system for lorries has reportedly led to more efficiency in transport.

The burden of environmental taxes, competitiveness, equity

As discussed in many reports in the economic literature, the risk of loss of competitiveness is one of the main obstacles to the introduction of further environmental taxes (OECD, 2001, 2003; Ekins and Speck, 1999; Ekins and Barker, 2001; Zhang and Baranzini, 2003). It was also a stumbling block during the process of negotiating the recently adopted directive on energy products taxation. EU Member States with energy/CO₂ taxes in addition to the taxes required under EU law have all established rules either partly or fully exempting potentially vulnerable industrial sectors from these taxes. Such special tax provisions are not restricted to the taxation of energy products alone but can also be found in other sectors (agricultural and water sectors).

There is hardly any evidence of taxes damaging competitiveness. An in-depth analysis of a

range of different environmental taxes in terms of their environmental effectiveness and risks of employment, trade and competitiveness losses (Ecotec *et al.*, 2001) showed that there was no evidence of significant negative impacts on employment. However, the major concern expressed in the design of levies was their effect on the competitive position of the sectors affected, especially in international markets. This concern has resulted a plethora of exemptions of polluters from these taxes because of the perceived danger to the competitive position. As a result, the impact of levies on competition and trade is generally negligible since the potential for such impacts was eliminated in the design.

What would then be the impact on competitiveness in the largely hypothetical case of major tax schemes with no exemptions? A recent *ex ante* assessment of the EU emissions trading system ⁽⁶²⁾ (Carbon Trust, 2004) showed that an assumed price of EUR 10/t C would not lead to any significant competitiveness effects for UK industry. The only sector likely to suffer would be the aluminium industry (not under the EUETS) because of its immense use of electricity.

Although tax provisions for industries are common practice and not the exception, these tax relief programmes are approved under the EU State aid rules that require industries to have an incentive to further reduce energy consumption, either by paying a significant amount of the tax or by entering into binding environmental agreements. This trend is particularly recognisable in the context of energy and climate change policy. One of the consequences of this trend is that countries pursue a policy by using 'softer' options, such as voluntary/negotiated agreements, instead of environmental taxes in environmental policy. Another way of gaining greater acceptability for levy-based instruments would be to recycle revenues in ways which incentivise positive behaviour among the actors affected by the levy (making the instrument 'revenue neutral' across the targeted actors, after the Swedish system of NO_x charges). This can enhance stakeholder acceptability, while also allowing for the application of higher marginal rates, with consequent effects on effectiveness.

Equity issues are particularly important in central and eastern Europe, but not only there. In the United Kingdom, for example, a reduced rate of VAT is levied on domestic fuels to address fuel poverty. There are differences across Europe as regards the

level of VAT on domestic heating fuels, and on the provision of water supply, wastewater treatment and waste services, as well as a range of exemptions for paying for these services in cases of economic hardship. Such exemptions, however, also imply the loss of any intended incentive to reduce energy use, or amounts of waste to the collection system. Such incentives would be maintained if exemptions were replaced by flanking policies of financial compensation.

Transfer of knowledge

This report attempts to assess the situation in more than 40 European countries with their specific economic and political conditions and diverse administrative and institutional frameworks. Obviously, no coherent picture of the use of environmental taxes and charges can be found. Differences in the applied instruments are not restricted to traditional market economies and economies in transition, for example between the old EU Member States and most of the new EU Member States, and other eastern European countries, and the Balkans. Large variations in their use are also found between old EU Member States, ranging from the still increasing number of environmental levies in northern European countries to the rather limited number in some southern Member States. However, the sheer number of environmental taxes implemented may be no guide to their effectiveness and can only be used as a very rough indication of the inclination to use market-based instruments in these countries, or of the relative strengths of their environmental policies against the background of common EU legislation.

Environmental levies can be seen as important instruments for achieving environmental policy objectives, considering their increasing numbers (e.g. compare the first comprehensive survey of environmental economic instruments (OECD, 1989) with the present study). Although political decision-makers are sometimes fiercely criticised when new environmental taxes are being implemented, a measure of success is that the experience of recent years shows a growing public acceptance; they have become a standard potential tool for policy-makers.

The effectiveness of all market-based instruments, such as taxes, trading regimes or subsidies, depends critically on the functioning of the political, institutional and regulatory framework. Strong institutions are crucial for assigning property rights fairly, distributing subsidies fairly and efficiently,

⁽⁶²⁾ Whether the emissions trading system or an environmental tax scheme would lead to the price of EUR 10/t C is immaterial to the outcomes of the study for competitiveness.

enforcing environmental standards and representing the public interest against the vested interest of powerful economic groups. Economies in transition are making extensive use of pollution charges, but set the charge rates at a low level, therefore providing only a minor incentive for behavioural change. In addition, monitoring and enforcing environmental compliance often lag in economies in transition, limiting their incentive impact and revenue-generating capabilities even further (OECD, 2003c). Based on the positive experience of environmental taxes in some western European countries, the conclusion must be drawn that they can only be effective when a well-functioning institutional framework is in place, as a World Bank report sums up:

'In a country where environmental regulations are not enforced and environmental agencies are weak, economic instruments are not of much help either. Introducing pollution charges should go along with improving the overall environmental policy framework and strengthening the institutional capacities of environmental agencies' (World Bank, 1998, p. 166).

Transfer of knowledge between countries about the use of economic instruments in environmental policy is desirable and actually happening, whereby country-specific conditions are being considered when such a transfer is done.

Developing instrument mixes

In the past, environmental taxes have often been juxtaposed with other policy instruments, such as command and control regulation. However, there has been a significant shift and these different types of policy instruments are now seen more as complementary tools for achieving policy objectives. Examples are observed in water management policies where a combination of water quality standards and effluent charges is commonly used, and in energy policies where an environmental levy is combined with voluntary agreements. Such an approach, in which a mix of different policy instruments is chosen, is becoming more common for reasons of competitiveness, i.e. exempting a particular sector from an environmental tax but demanding that the sector implements some efficiency improvements.

This development is also a consequence of the clearly defined rules and regulations on State aid as adopted by the European Union. Tax exemptions and reductions for specific economic sectors usually constitute State aid and are being examined by the European Commission on the basis of Article 87 of

the EU Treaty. Specific tax provisions are assessed on the basis of the guidelines on State aid for environmental protection (European Commission, 2001c) and are usually approved if they are limited in time and an environmental benefit is achievable by applying, for example, voluntary agreements, although it seems that such agreements seldom contribute to environmental improvement beyond what could be expected without them (OECD, 2003).

In practice, most policy instruments are either linked explicitly to other instruments within a portfolio instrument mix or package, or work together with (or sometimes against) existing or new instruments that have been launched outside an explicit portfolio. The linkage of instruments can be crucial in delivering environmental benefits. This also makes it difficult to assess the contribution of a particular instrument to changes in environmental pollution or natural resource use (the allocation problem). In some cases, the existence of certain instruments in an instrument mix is the only practical way of getting the instrument package launched. Some taxes and charges are linked to standards, other levies, deposit-refund schemes, voluntary agreements, awareness-raising campaigns, R & D, funds, subsidies or exemptions (see Box 3.18). Some are directly linked/launched together, while others interact.

Insights are, however, growing that policy mixes need a careful design, and that accumulating several instruments to address the same problem is not automatically the best solution. Johnstone (2003), for example, discusses four reasons for applying emissions trading systems in combination with other instruments, including taxes: (i) to reduce abatement cost uncertainty, for example by setting penalty taxes for non-compliance; (ii) to overcome technological market failures, for example by financial support for R & D; (iii) to increase behavioural response, for example by providing information through eco-labelling; (iv) to address differences in local impacts, for example by imposing technological standards.

Administrative costs tend to rise when the number of instruments addressing one problem increases, which negatively affects cost-effective solutions. Johnstone formulates three main conditions for increased efficiency and effectiveness when combining ETS with other instruments. These conditions hold, *mutatis mutandis*, for environmental taxes and include that the complementary instruments should be a necessary, efficient and administratively feasible measure.

Box 3.18 Selected examples of how taxes/charges are linked to other instruments

- The German water effluent charge is an example of a link of a tax with environmental standards — the link plays an important role in the final effect.
- The Danish energy tax scheme is linked to voluntary schemes for energy conservation — with tax reductions or exemptions for signatories (see, for a discussion, OECD, 2003d).
- The UK climate change levy (CCL) and the voluntary climate change agreements (CCAs or 'umbrella agreements') are linked to regulation (IPPC directive), to partial exemptions from the CCL (80 % reduction from CCL for the signatories of CCAs) and the national emissions trading (ET) scheme, as major instruments under the UK climate change strategy.
- The Swedish NO_x charge scheme combines charge payments with a revenue recycling package under fiscal neutrality of the affected economic sector.
- The Danish abstraction tax is explicit linked to awareness-raising campaigns.
- The link between taxes and subsidies can be found in the Austrian landfill tax: revenues generated from the tax are used as subsidies for the clean-up of contaminated sites.

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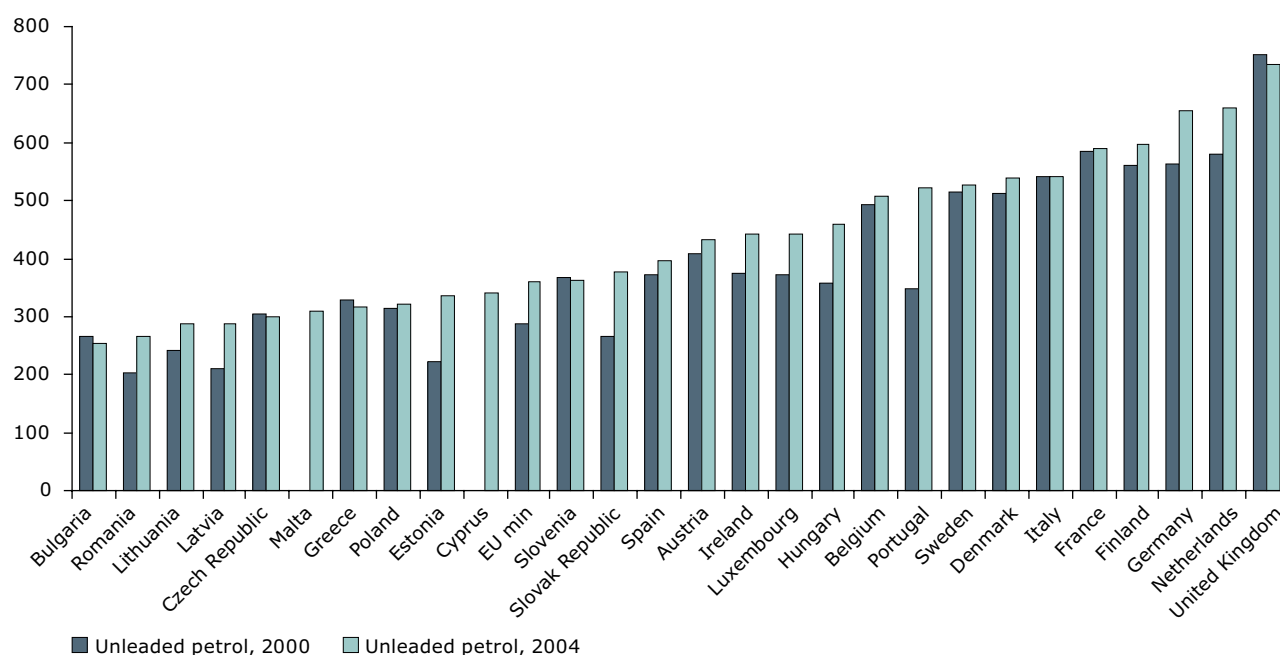
Appendix

Table 3.A.1 Comparison of minimum tax rates of EC directives (1992 and 2003) and the 1997 proposal

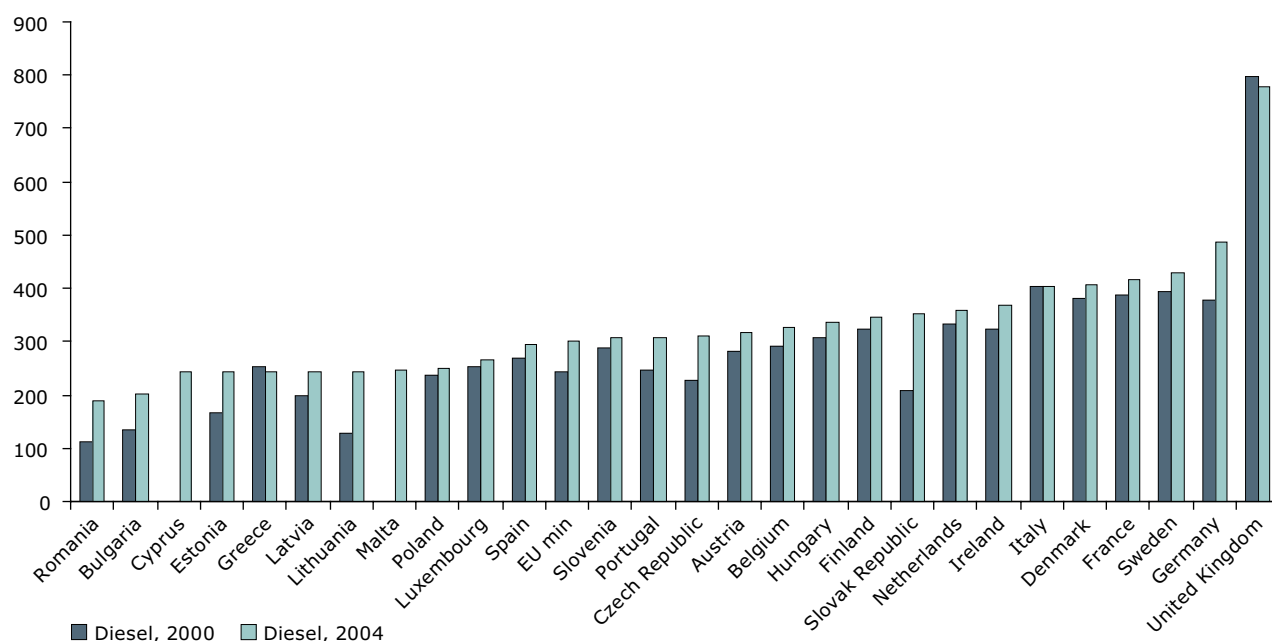
	Minimum rates	Minimum rates	Minimum rates	Minimum rates	Minimum rates	Minimum rates
	Directive 92/82/EEC	Proposal COM(97) 30	Proposal COM(97) 30	Proposal COM(97) 30	Directive 2003/96/EC	Directive 2003/96/EC
		valid from 1.1.1998	valid from 1.1.2000	valid from 1.1.2002	valid from 1.1.2004	valid from 1.1.2010
Transport fuels						
Petrol (EUR/1 000 l)	337	417	450	500	421	421
Unleaded petrol (EUR/1 000 l)	287	417	450	500	359	359
Diesel (gas oil) (EUR/1 000 l)	245	310	343	393	302	330
Kerosene (EUR/1 000 l)	245	310	343	393	302	330
LPG (EUR/1 000 kg)	100	141	174	224	125	125
Natural gas (EUR/GJ)	100/1 000 kg	2.9	3.5	4.5	2.6	2.6
Heating fuels						
Diesel (gas oil) (EUR/1 000 l)	18	21	23	26	21	21
Heavy fuel oil (EUR/1 000 kg; 1 % sulphur)	13	18	23	28	15	15
Kerosene (EUR/1 000 l)	0	7	16	25	0	0
LPG (EUR/1 000 kg)	0	10	22	34	0	0
Natural gas (EUR/GJ; GCV)	0	0.2	0.45	0.7	0.15 (bus) – 0.3 (non-bus)	
Coal and cokes (solid energy products) (EU/GJ)	0	0.2	0.45	0.7	0.15 (bus) – 0.3 (non-bus)	
Electricity (EUR/MWh)	0	1	2	3	0.5 (bus) – 1 (non-bus)	
Fuels used for industrial or commercial purposes						
Diesel (gas oil) (EUR/1 000 l)	18				21	21
Kerosene (EUR/1 000 l)	18				21	21
LPG (EUR/1 000 kg)	36				41	41
Natural gas (EUR/GJ)	36/1 000 kg				0.3	0.3

Note: Bus – business; non bus – non business such as households, etc.

Sources: Kwon (2003); Ernst & Young (2004).

Figure 3.A.1 Unleaded petrol – Tax rates EU-25 (2000 and 2004 – EUR/1 000 l) ⁽⁶³⁾


References: European Commission, Taxation and Customs Union DG, *Excise duty tables* (2000 and 2004); Speck *et al.* (2001a).

Figure 3.A.2 Diesel – Tax rates EU-25 (2000 and 2004 – EUR/1 000 l)


References: European Commission, Taxation and Customs Union DG, *Excise duty tables* (2000 and 2004); Speck *et al.* (2001a).

⁽⁶³⁾ It is noteworthy to report that some of the changes in the tax rates expressed in euro per 1 000 litres between 2000 and 2004 are influenced by variation in the exchange rates. For example, the United Kingdom increased the taxes on ordinary unleaded petrol from GBP 488.2 per 1 000 litres in 2000 to GBP 517 per 1 000 litres in 2004. However, some of the tax rates expressed in euro per 1 000 litres illustrate the opposite, i.e. the tax rates have been decreased. This is the result of the variation in the exchange rate.

Table 3.A.2 Development of excise taxes on petrol and diesel in Russia (EUR/1 000 l) ⁽⁶⁴⁾

	1998	1999	2000	2001	2002	2003	2004
High-octane petrol	12	11	17	50	51	66	69
Low-octane petrol	9	9	13	37	37	48	51
Diesel				17	17	23	24

Sources: Kwon (2003); Ernst & Young (2004).

Table 3.A.3 Air and water pollution charge rates in eastern European countries

	Air pollution	Air pollution	Water effluent	Water effluent	Water effluent
	SO ₂	NO _x	Nitrates (NO ₃)	Phosphorus	BOD
	EUR/tonne	EUR/tonne	EUR/tonne	EUR/tonne	EUR/tonne
Belarus 2001	37.0	111.8			
Moldova 2001	34.3	35.1	0.1	7.8	0.6
Russia 2001	1.2	1.6	0.9	39.9	2.7
Ukraine 2001	11.1	11.1	0.7 (2001) 8.8 (2003)	5.8 (2001) 7 (2003)	2.9 (2001) 3.5 (2003)
Romania 2002			6.9	27.8	6.9
Estonia 2003	6.1	13.9	236	377	250 (BOD7)
Latvia 2003	20.3	20.3	47	47	47 (COD)
Lithuania 2003	83	139	159	580	207 (BOD7)

Sources: BEF (2003); OECD (2003a); Eftec (2004).

⁽⁶⁴⁾ Russian tax rates are expressed in roubles per tonne. They are converted into euro per 1 000 litres using average conversion factors for petroleum products.

4 Environmental tax reform

4.1 Introduction

Environmental taxes ⁽⁶⁵⁾ have historically been applied on a one-by-one basis — as a way of meeting particular environmental objectives. However, the early 1990s saw the beginning of a more general shift of the tax burden from labour and other economic functions to environmentally damaging activities such as resource use and pollution. Countries in the Nordic region were the first to launch such reforms, followed by the Netherlands and other countries in the EU. In most cases, the shifts were from labour taxes and social contributions to taxes on energy.

Environmental tax reform (ETR) is the term used for changes in the national tax system where the burden of taxes shifts from economic functions, sometimes called 'goods', such as labour (personal income tax), capital (corporate income tax) and consumption (VAT and other indirect taxes), to activities that lead to environmental pressures and natural resource use, sometimes called 'bads'. This redistribution of tax burdens across the economy should provide appropriate signals to consumers and producers and lead to a better functioning of markets and increased welfare, as it moves society towards a more sustainable development path.

Environmental fiscal reform (EFR) is a broader concept that includes reform of environmentally harmful subsidies. EFR is mentioned in this report, but is not dealt with extensively (see Box 4.1 for definitions).

Support for and implementation of environmental tax or fiscal reform — especially where it also includes commitments to fiscal neutrality — have increased in European countries over the past decade.

This chapter ⁽⁶⁶⁾ provides an overview of the major developments in ETR and identifies lessons for the future.

4.2 The use and development of ETR

Governments in Finland (1990), then in Sweden (1991) and Denmark (1993) were the first to embrace the concept and strategy of ETR and launch new taxes or revise existing (energy) taxes within this context. Other countries launched or changed taxes with a de facto ETR-like fiscal neutrality, but without noting this as part of a dedicated strategy. Such a broader strategy helps to offer a clear rationale and can make acceptance of further environmental taxes easier. However, having no ETR strategy has the benefit of avoiding giving the impression of having to continue the process and hence restrict freedom of action. Countries with a declared ETR strategy have sometimes installed 'green tax commissions' — high-level panels, assigned with the task of discussing and recommending possible developments (see Section 4.2.2).

Revenue neutrality is often seen as an important characteristic of ETR, with additional revenues from environmental taxes being used to decrease revenues from other taxes, so that the government budgetary position is unchanged and the overall tax burden remains the same. There will, of course, be changes in the burdens on different parts of the economy. Revenue neutrality is a choice, and ETR can also form part of an overall tax reduction or even a tax increase approach. The basis of ETR is the **shift** in the tax burden, from economic functions such as labour, capital and consumption to activities that burden nature and the environment.

The Nordic examples have been followed by developments in other European countries, such as the Netherlands (1996, 2001), Germany (1999) and the United Kingdom (1996, 2001 and 2002).

ETR is regularly associated with the 'double dividend' hypothesis (Pearce, 1991; Repetto *et al.*, 1992). This argues that ETR can lead to improvements both in the environment (by properly pricing externalities), and, by reducing distortions in

⁽⁶⁶⁾ Environmental charges are not addressed in this chapter. According to the definitions in Chapter 3, charges are required payments of which the revenues are earmarked for financing services in return for the payment. Environmental charges therefore do not play a role in tax shifts and environmental tax reform.

⁽⁶⁵⁾ This chapter has been drafted for the EEA (contract reference 3223/B2003.EEA.51620) by Stefan Speck and Patrick ten Brink (IEEP). It has benefited from the comments of the expert group (see 'Foreword and acknowledgements') and from the EEA's national focal points.

Box 4.1 Definition of ETR and EFR

Environmental tax reform (ETR) is a reform of the national tax system where there is a shift of the burden of taxation from conventional taxes, for example on labour, to environmentally damaging activities, such as resource use or pollution. The burden of taxes should fall more on 'bads' than 'goods' so that appropriate signals are given to consumers and producers and the tax burdens across the economy are better distributed from a sustainable development perspective.

The economic rationale is that welfare gains are generated by reducing taxes on labour or capital and increasing taxes on externalities and hence helping to avoid 'welfare-reducing' activities. A typical case is an increase in the tax on energy, and a simultaneous reduction in labour taxes or social security contributions ⁽⁶⁷⁾.

The terms 'ecological tax reform' and 'green tax reform' are also used.

Environmental (or ecological) fiscal reform (EFR) is a broader approach, which focuses not just on shifting taxes and tax burdens, but also on reforming economically motivated subsidies, some of which are harmful to the environment and may have outlived their rationale (see Chapter 5). EFR is a more recent development than ETR and offers more opportunities for progress, and is more in line with the 'polluter pays' principle and the concept of sustainable development.

For the sake of simplicity, this report uses 'environmental tax reform (ETR)' for the former and 'ecological fiscal reform (EFR)' for the latter, unless the text quotes directly from sources using different terminology.

tax burdens, in the functioning of the economy as a whole, leading, for example, to more employment (Goulder, 1995; Hourcade, 1996; Ekins, 1997).

For several years, the main rationale for the introduction of ETR has focused on the idea of creating this double dividend. Both environmental and employment benefits can be achieved by decreasing the size of pollution externalities and reducing labour costs so that unemployment can be reduced (Binswanger *et al.*, 1983). The EU supported the idea of an ETR in 1993 in the Delors' White Paper on growth, competitiveness and employment in order to benefit from the double dividend: '... if the twin challenge of unemployment/environmental pollution is to be addressed, a trade-off can be envisaged between lower labour costs and higher pollution charges' (European Commission, 1993).

There are at least two caveats that might reduce the double dividend (Bach and Bork, 2001). First, an environmental tax (in particular, an energy tax) may have a negative impact on aggregate output through increasing the costs of production factors other than labour. Such an effect is reported in most simulation studies. Depending on the framework assumptions, it could outweigh the factor substitution effect so that there is no increase

in overall employment. Second, wage bargaining behaviour could change in such a way that real wage rates increase with the consequence that the economy/employment benefit does not materialise – so while there is a reduction in the pressure on labour, this does not lead to more jobs. This has led to the view that the double dividend argument should not be used as the rationale for launching tax reform. The environmental arguments should be enough, especially if coupled with the clear public message of no net tax increase and transparent communication of where the tax burden will be reduced. Then, if there are other benefits (e.g. for employment), that would be a welcome outcome (see Box 4.2).

4.2.1 An overview of practice

Environmental tax reform policies

Table 4.1 gives an overview of tax shifts implemented in selected European countries. In most cases the shifts were from labour taxes and social contributions to taxes on energy. This may reflect a general tendency in Europe to aim for lower tax levels, in particular to protect and increase employment. Energy taxes have generally been rising since 1990, compensating for falling fossil fuel prices during most of the 1990s.

⁽⁶⁷⁾ The objective of this reform process is to reduce the distortion brought about by taxes. Economic theory distinguishes between taxes which can be welfare neutral, such as taxes on economic rent, welfare reducing (taxes on labour, capital or consumption), or welfare enhancing (taxes levied on externalities). ETR is therefore the attempt to reduce taxes that reduce welfare and increase taxes that are good for the economy (Roy *et al.*, 2003).

Box 4.2 Double dividend

Quantification of the employment side of the double dividend hypothesis has become a major argument in the many past political and public debates and discussions about the introduction of ETR. Many studies have focused on assessing the macroeconomic effects of different ETR options. Generally, research in this area has been judged difficult because of the necessary isolation of specific policy effects. The need for more research on specific environmental taxes, and evaluation of their effect on the overall health of the environment, has been recognised by the OECD (1997). Theoretical studies assessing the potential economic/employment effect of the double dividend hypothesis often refute this theory, but empirical and simulation studies often argue in favour of an employment dividend (Barker, 1997; Ekins, 1997; Ribeiro *et al.*, 1999; Park and Pezzey, 1999). The findings of an analysis of macroeconomic studies examining the double dividend hypothesis are summarised in a recent OECD publication: 'that the results of many models converge, to indicate that a carbon-energy tax combined with cuts in labour taxation would yield some double employment-environment dividend. However, the employment effect is limited' (OECD, 2001, pp. 37–38). Some conclusions of the OECD report are as follows:

- In general, a tax shift from the relatively abundant factor (labour) to the scarce factor (the environment) leads to positive effects on employment (**substitution effect**) and negative effects on GDP (**nominal income effect**).
- Positive employment effects can be expected if the revenues are used to reduce **labour taxation**, in general, and employer/employee social security contributions, in particular. In contrast, if the revenue is used for lump-sum payments to households or to lower VAT, it leads to less significant or even negative employment effects.
- For most European countries, larger employment effects can be expected if the cuts in social security contributions are targeted at the **unskilled labour** force.
- **Earmarking** a large proportion of the revenues raised, for example for environmental investment, reduces the potential double dividend benefit.
- Negative impacts on **international competitiveness** can be effectively controlled by introducing offsetting methods such as border tax adjustments, sectoral recycling of the revenues or a rebate scheme for buffering the negative short-term effects on energy-intensive industries.

Reference: OECD (2001, p. 38).

A more recent OECD report that studied the results of the different modelling approaches used to analyse the economy-wide employment impacts of environmental policy emphasises: 'that an employment dividend is possible when the revenues raised when implementing economic instruments — such as taxes or auctioned tradable permits — are recycled in the form of a reduction in labour costs. The employment increase is likely to be greater when payroll tax reductions are concentrated on unskilled workers. However, these findings are conditional on the possibility of lowering labour costs and the elasticity of demand for labour. Using general equilibrium models leads to similar results. ... If the findings of the literature review on economy-wide employment impacts of environmental policy suggest that an employment dividend may exist in the case when payroll taxes are lowered, and especially when the measures are targeted at low wage earners, the effects are very small. Also, the employment dividend can be expected to be temporary since labour costs are likely to increase in the longer run, as a result of wage pressure. In addition, it should be noted that environmentally related taxes that succeed in changing behaviour will lead to lower revenues.' (OECD, 2004, p. 72).

For a more detailed analysis and description of ETR, see Baranzini *et al.* (2000), Hoerner and Bosquet (2001), European Commission (1997), and EEA (1996, 2000); and for an assessment of economic impacts of ETR policies based on econometric modelling techniques, see European Commission (1998, 1999) and OECD (2004). The theoretical merits of ETR and the policy options for its introduction have been discussed extensively since the 1980s (e.g. Bovenberg and van der Ploeg, 1994; Bovenberg and Goulder, 1996; Böhringer and Rutherford, 1997; for an overview, see Bosquet, 2000).

Russia also shows a de facto shift from labour to energy taxes, but these are based on the need to maintain overall tax levels as revenues from taxes on income have dropped.

Development of environmental tax revenues

Most environment-related taxes have the double function of raising revenues and creating incentives for better environmental behaviour. Although the magnitude of the revenues cannot

Table 4.1 Tax shifts in European countries

Country	Tax shift		Comments and remarks – Tax revenue shifted
	From	To	
Finland 1990 and 1997	Taxes on labour, personal income, employers' social security contributions	Energy tax, CO ₂ tax and landfill tax	Reduction in tax revenues of FIM 5.5 billion was planned to be partly financed by revenues from the energy tax (FIM 1.1 billion) and from higher landfill tax rates (FIM 300 million) in 1997 Energy tax rates (including CO ₂ tax) were increased only in 2003 by 5.2 %. This increase is not directly linked to income tax cuts that are more substantial than additional energy tax revenues; hence this tax reform was not revenue neutral
Sweden 1991, and a 10-year tax-shifting programme (2001–2010)	Personal income tax and social security contributions	Environmental and energy taxes including CO ₂ tax and SO ₂ tax	A total of SEK 30 billion (EUR 3.3 billion) will have been shifted by the end of the 10-year programme in 2010 (corresponding to almost 1.4 % of GDP)
Denmark (68) 1993, 1995 and 1998	1993 reform: Reduction in tax rates on personal income	1993 reform: Increase in existing taxes on fossil fuels, electricity and waste and new taxes on piped water, wastewater and carrier bags	1993 reform: In 1998, the revenue loss of DKK 45 billion was offset by increase in energy taxes, payroll taxes and broadening the tax base (elimination of special tax privileges)
	1995 reform: Reduction in social security contributions, supplementary pension payments and investment subsidies for energy savings	1995 reform: Increase in energy taxes (but industry is reimbursed when entering voluntary agreements) and new tax on SO ₂ and natural gas	1995 reform: The major part of revenues generated from the energy taxes were planned for funding investments of energy-saving measures in enterprises, to reduce employers' social security contributions and support small and medium-sized enterprises
	1998 reform: Reduction in tax rates on personal income for lower and middle incomes	1998 reform: Increase in energy taxes (by 15–25 %) and property tax	1998 reform: Loss in income tax of DKK 10 billion was offset by revenue gains of DKK 6 billion (energy taxes) and DKK 7 billion (property taxes) in 2002
Netherlands 1996, 2001 (new green tax package in the framework of a complete overhaul of the fiscal framework)	Personal income, corporate profits, employers' social security contributions	Energy and CO ₂ (regulatory energy tax), water, waste disposal	Revenues were planned to be recycled back by cutting employers' social security contributions by 0.19 %, raising the tax credit for self-employed people by NLG 1 300, reducing the corporate income tax by 3 % for the first NLG 100 000 of profits, reducing the income tax rate by 0.6 %, and by raising the standard income-free allowance by NLG 80 and the tax-free allowance for older people by NLG 100 About NLG 930 million was planned to be recycled to industry and NLG 1 230 million to households
UK 1996	Employers' national insurance contribution (NIC)	1996: Landfill	1996: Revenues are used for a reduction of 0.2 % in employers' NIC from 10.2 % to 10 %
UK 2001	Employers' national insurance contribution (NIC)	2001: Energy/CO ₂ emissions under the climate change levy (CCL)	2001: Revenues are used for a reduction of 0.3 % in employers' NIC; revenue is estimated to be about GBP 1 billion per annum
UK 2002	Employers' national insurance contribution (NIC)	2002: Aggregates levy (sand, gravel, crushed rock)	2002: Revenues are used for a reduction of 0.1 % in employers' NIC; revenue estimated at approximately GBP 305 million in 2002/03
Norway 1999	Personal income tax	CO ₂ , SO ₂ and energy tax	
Germany 1999–2003 (a five-year programme)	Employers' and employees' social security contributions	Energy (mineral oils, natural gas and electricity)	A reduction of about 1.7 % of employers' and employees' pension contributions in 2003; revenues from energy taxes amounted to EUR 18.6 billion in 2003
Russia 2001	Personal income tax, road fund tax, payroll tax/unified social tax	Energy tax	Part of a major tax shift programme; to offset the reduction in federal taxes (personal income tax, payroll tax, etc.), energy taxes (petrol, diesel, etc.) have been increased by almost 300 %
Austria 2004	Personal income tax, corporate tax	Energy tax	The tax reform is not revenue neutral and is implemented over a two-year period; total tax reductions exceed the increase in revenues generated by energy taxes

Sources: Vermeend and Van der Vaart (1998); Ecotec *et al.* (2001); Hoerner and Bosquet (2001); OECD (2001); Larsen (2002); Kwon (2003); BMU (2004).

(68) The reform in 1993 concerned mainly households and was phased in between 1994 and 1998, the reform in 1995 concerned industry and trade and was phased in from 1996–2000, and the latest reform in 1998 concerned mainly households and was phased in between 1998 and 2002 (Larsen, 2002).

be used to assess the effects of the environmental taxes, it gives an indication of the significance of these taxes in terms of their share of the total tax burden, and of the potential for (further) tax shifts.

The share of environmental tax revenues in total tax revenue increased during 1990–1999 in the EU-15, reaching 6.8 % in 1999. Since 1999, the share has dropped slightly, to 6.5 % in 2002 (Eurostat, 2003a).

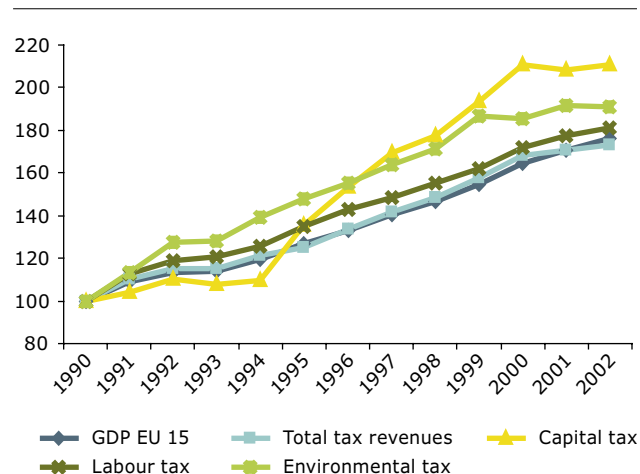
Table 4.2 Situation in some central and eastern European countries

	Revenues of environmental taxes as a percentage of total tax revenues	Revenues of environmental taxes as a percentage of GDP
Bulgaria	15	4.1
Croatia	6	2.3
Estonia	9	2.4
Hungary	12	4.0
Lithuania	8	1.9
Poland	6	1.7
Slovakia	5	1.6
Slovenia	8	3.2

Source: World Bank (2002).

Compared with GDP, a steady increase in the environmental tax/GDP ratio was reported for the 1990s, increasing from 2.4 % in 1990 to 2.9 % in 1999 for the EU as a whole. A drop in this ratio occurred during the following years, resulting in a figure of 2.6 % in 2002.

Figure 4.1 Development of the revenue of environmental taxes compared with the revenues of total, capital and labour taxes, and GDP, EU-15 (indices; 1990 = 100)



Source: Eurostat (2000, 2004).

The shares of environmental tax revenues in some of the new EU Member States (in the pre-accession period) and candidate countries are comparable to those in the EU-15 (see Table 4.2). The figures should, however, be interpreted with caution and only be used as indicative, since data collection and methodologies in all countries had not been harmonised with the statistical systems of the EU.

Figure 4.1 illustrates how total tax revenues (including social contributions) in the EU-15 developed between 1990 and 2002 compared with GDP. The figure also shows the trends of the revenues generated by capital, labour and environmental taxes during the same period.

Total tax revenues at the EU-15 level developed rather similarly to GDP from 1990 to 2002, with an increase of 70–80 %. Environmental tax revenues grew more, by about 90 %, to 2001, but then levelled off, partly as a result of the strong increase in world crude oil prices, which, in particular, caused petrol sales in Europe to decrease. This accelerated the switch towards diesel, leading to a drop in energy tax revenues as the taxes on petrol are higher in all the EU-15 Member States except the United Kingdom.

Revenue figures can reveal a trend with regard to the application of environmental taxes. However, the interpretation of this trend is not straightforward since it is not possible to make any statement about the 'environmental friendliness' of the general and fiscal policy and the effectiveness of the environmental policy of a country based solely on revenue figures (see OECD, 2001, and EEA, 2000). For example, countries that are not considered forerunners in environmental tax policy, such as Greece, Ireland and Portugal, have had the highest environmental tax/total tax revenue ratio in the EU-15 in the past. Countries may implement economic instruments which are environmentally effective but have no revenue-raising implications. For example, the Swedish NO_x charge is assessed as rather effective, but does not raise revenues for the general budget because of the refund mechanism (see Chapter 3). Furthermore, environmental tax revenues can decrease as a result of the gradual adaptation of consumer behaviour and technological improvement, making environmental tax revenue a poor indicator of effectiveness.

In order to further assess the significance of environmental tax revenues and their potential to facilitate environmental tax reform, a breakdown of environmental taxes into energy, transport, and pollution/resource taxes is given in Table 4.3,

Table 4.3 Trend in categories of environmental taxes as share of total tax revenues at the EU-15 level, 1990, 1997 and 2002

	1990	1997	2002	Change between 1990 and 2002 (%)	Change between 1997 and 2002 (%)	Change between 1990 and 1997 (%)
In % of total tax revenues						
Energy	4.7	5.2	5.0	6.2	- 3.5	10
Transport	1.3	1.3	1.3	0.5	2.8	- 2
Pollution/resources	0.2	0.3	0.2	22.7	- 18.7	51
Total environmental taxes	6.2	6.7	6.5	5.3	- 3.1	9
Labour taxes	49.7	50.8	51.0	2.6	0.4	2

Sources: EEA (2000); Eurostat (2000, 2004).

which shows developments of the revenues of these categories, and of labour taxes.

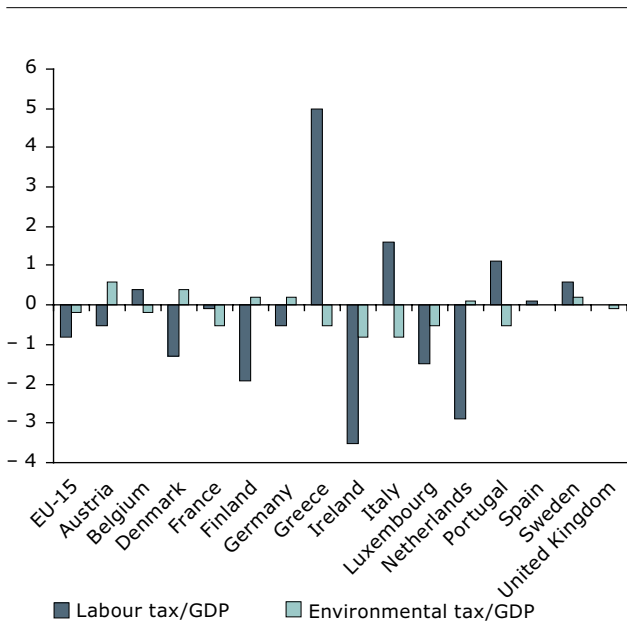
Revenues from all environmental taxes, as a share of total tax revenues, increased between 1990 and 1997, decreased between 1997 and 2002, but reached a higher level than in 1990. The main variation in the environmental tax share is found in the main component of environmental taxes: that on energy. Transport taxes have been fairly stable. Taxes on pollution and resources have varied much more, but this variation is insignificant because of the very small share of such taxes in the environmental tax take.

The decline in total environmental taxes in recent years is in contrast to the share of labour taxes,

which increased between 1997 and 2002. However, both types of taxes increased their share of total tax revenue between 1990 and 2002: environmental taxes by 0.3 and labour taxes by 1.3 percentage points. The growth of environmental taxes is larger in relative terms, but much smaller in absolute terms, because of their small share of total tax revenues. It is difficult with only these data to conclude whether a tax shift has actually taken place at the EU-15 level. That is, however, possible with a different type of analysis (see below).

Figure 4.2 presents changes in the ratio of labour taxes and environmental taxes to GDP for the EU-15 Member States and the EU for 1995–2002.

Figure 4.2 Change in the ratio of labour taxes and environmental taxes to GDP, 1995–2002 (% change)



Source: Eurostat (2004).

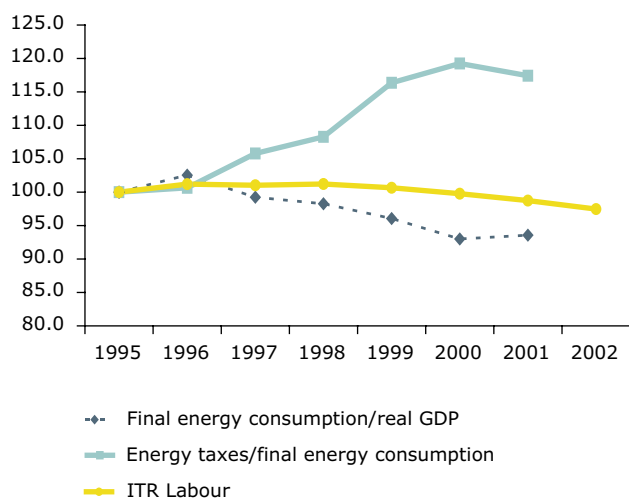
Actual implementation of policies based on the idea of an ETR would be indicated by a fall in the labour tax/GDP ratio and simultaneously by an increase in the environmental tax/GDP ratio. Such a movement occurred in several EU-15 Member States (Austria, Denmark, Finland, Germany and the Netherlands) during 1995–2002. No such shift appears to have occurred at the EU-15 level.

Findings about the occurrence of environmental tax reforms derived from environmental tax/GDP versus labour tax/GDP ratios must be treated with caution. The latter is only indicative of the actual burden of labour taxes on the economy, whereas the former has very little to say about the actual efforts of governments to properly internalise external costs in the market prices. A somewhat closer analysis is, however, possible.

Eurostat, attempting to overcome some of these shortcomings, suggests using implicit or effective tax rates⁽⁶⁹⁾ as tools to measure the effective tax on labour and on energy use, as the main base for environmental taxes (Eurostat, 2004). This approach of determining an effective tax burden is being

⁽⁶⁹⁾ The effective tax rate, or implicit tax rate (ITR), is the amount of tax revenues divided by the value of the economic factor (e.g. labour, energy consumption) on which the tax is imposed.

Figure 4.3 Developments of the effective tax rates on labour and energy at the EU-15 level, 1995–2002



Source: Eurostat (2004).

regularly used in other areas of taxation, such as labour taxation where the implicit tax rate on labour is frequently used for comparing developments between countries. The Eurostat report states that 'tax revenue data alone are not enough to make a conclusive statement about causal relationships, but the indicators of average effective tax burden ... show signs of a relative 'green tax shifts' over the last years' (Eurostat, 2004). Furthermore, the report draws the following conclusion based on analysis of the effective tax burden: 'However, it seems that increased energy taxes have helped to ease somewhat the tax burden on labour. This relative shift of the effective tax burden from labour to energy is also visible ... for Denmark, Germany, the Netherlands, Austria, Sweden and the United Kingdom, Member States which actually have implemented green tax reform. However, a similar shift is also discernible in Ireland and — less pronounced — in Luxembourg and Finland' (Eurostat, 2004, p. 111).

Taking the effective tax rates and applying them to the EU-15 as a whole also reveals such a green tax shift. Such a shift in the tax burden occurred between 1995 and 2002, with the implicit tax rate on energy increasing by 15–20 % and the effective tax rate on labour dropping slightly, by 3 %. An improvement in EU-15 energy efficiency was also visible during that period.

Environmental taxes other than energy taxes are also part of national ETR schemes, for example the aggregates and landfill tax in the United Kingdom,

groundwater and landfill tax in the Netherlands and the taxes on tap water and pesticides in Denmark. However, the rather limited revenue-generating capacity of these environmental taxes explains why energy taxes are and will probably remain the main component of any ETR. This does not argue against the imposition of 'minor' (seen from the economy as a whole) environmental taxes while reducing labour taxes, as these can be important for the objectives at hand; but one cannot expect any macro changes to be visible.

Countries such as the United Kingdom and Germany, which have recently implemented an ETR, introduced policy packages which limited the full potential of the ETR as new energy taxes were combined with reductions in tax rates: an 80 % reduction in tax rates for energy-intensive industries in the United Kingdom and special tax provisions for energy-intensive sectors in Germany. This led to a reduction in the effective tax burden on industry. These parts of the overall ETR instrument package, however, hardly impair the revenue-generating effect of energy taxes in general, given the small contributions of industry and the dominance of the transport and consumption sectors in energy tax revenues.

Ecological fiscal reform

Recently, there has been growing interest in environmental/ecological fiscal reforms (EFRs) in European countries. This broader concept adds a new component to the general model idea of an ETR, namely the dismantling of environmentally harmful subsidies. Probably one of the most far-reaching approaches for the introduction of an EFR was developed in Germany, but it was turned down. The rationale behind the German proposal was to extend the already implemented ETR measures by reducing environmentally harmful subsidies, such as the VAT exemption for international flights and cutting the distance-based commuters' allowance (BMU, 2004). In addition, further measures, such as the reduction in the VAT rate for rail passenger transport and the reductions of subsidies for the German hard-coal mining industry, were proposed as part of the move towards an ecological fiscal reform by the governmental coalition in 2002. So far, the proposed measures have not been implemented in the way suggested by the government because the legislation was rejected by the German upper house. Instead the 'lawnmower method' of subsidy reduction was applied, meaning that subsidies were reduced by a certain percentage rate without considering or emphasising any political objectives (BMU, 2004). The outcome of this policy is conflicting because it combined the reduction of environmentally damaging subsidies, such as the reduction of

commuters' distance-based deduction, with the reduction of environmentally motivated subsidies, such as the reduction of electricity taxation relief for public rail transportation (see Chapter 5 for a more detailed discussion on subsidies and subsidy reform proposals).

4.2.2. Green tax commissions

Some countries have designated 'green tax commissions' or interministerial committees to make proposals for environmental tax reform or ecological fiscal reform, and to act as a forum for

Box 4.3 Green tax commissions in Europe

Green tax commissions were established in the Nordic countries, the Netherlands and Belgium in the 1990s. The members of these commissions covered a broad and varied background representing politicians, scientists, representatives of different interest groups, such as employer and employee federations and environmental organisations, research agencies and officials from different ministries: Ministry of Finance, Ministry of the Environment, Ministry of Economic Affairs.

The commissions were generally asked to analyse and assess existing environmental fiscal measures and make proposals for the introduction of new environmental levies, including proposals on how to make use of the revenues generated. Proposals for transforming the existing fiscal system into one that takes ecological considerations into account were also elaborated.

Norway: In 1989, the Norwegian government established a green tax commission and implemented some of its proposals. The second green tax commission was formed in 1994, comprising approximately 70 members, to investigate how the tax system could be changed by shifting taxes on labour to environmental activities. This commission published a final report in 1996. One of the key aspects of the work of this second commission was the removal of environmentally harmful subsidies. The Norwegian government acted on and afterwards implemented numerous proposals of the commission. The suggested transformation of the CO₂ tax encountered major opposition, especially from the industrial sector, which was no surprise since the proposed changes foresaw the extension of the tax to industrial sectors that were exempt from it.

The Netherlands: Two green tax commissions were set up in the Netherlands (1995 and 2000). The first commission published three reports between 1995 and 1997. The reports of this commission contained many recommendations that aimed to foster environmental objectives through the tax system. The task of the commission included the evaluation of fiscal measures taken thus far and the identification of tax expenditures that may have detrimental consequences on the environment. The implementation of the regulatory energy tax goes back to one of the proposals of this commission. The second green tax commission, appointed in 2000, was given a very broad mandate. A large number of different fiscal measures including environmentally harmful subsidies have been investigated, based on clearly defined criteria. The advantages and disadvantages of these measures were weighed against one another and, based on this evaluation, the commission drew up a list of recommendations for further greening of the Dutch taxation system.

Sweden: The Swedish green tax commission was established in 1995. The tasks to be carried out are very similar to the work done by the other commissions. It should evaluate the prevailing economic instruments implemented in Swedish environmental policy and analyse conditions and potential effects of different kinds of revenue-neutral tax reforms. Based on this analysis, the commission was asked to provide suggestions for or against a tax reform. Concrete recommendations for future actions have not been part of the final report.

Instead of setting up a green tax commission with members from a wide background, as in Norway, Sweden and the Netherlands, the governments of **Denmark** and **Ireland** appointed an interministerial committee. The task of the Danish committee was to develop models for imposing additional environmental taxes.

A green tax commission has not been established in **the United Kingdom**, but extensive public consultations preceded the introduction of the landfill tax, the climate change levy and the aggregates levy. These consultations are seen as analogous to the work of green tax commissions.

Sources: Finansdepartementet (1996, 2001); Vermeend and Van der Vaart (1998); Ekins and Speck (2000); OECD (2001); Dutch green tax commission (2001); Ecologic (2002).

discussion on topics that include design, rates and the likely impacts. Such green tax commissions were already set up in Belgium, Denmark, the Netherlands, Norway and Sweden in the 1990s, and generated proposals for new environmental taxes and facilitated their implementation. Other countries also set up similar bodies, though performance

has been variable. In addition, there has been huge interest in analysing and recommending ETR/EFR by political parties and in academic and institute circles, particularly in the new EU Member States, such as the Czech Republic, Hungary, Poland and Slovenia.

Box 4.4 The German ETR/EFR

The German ETR was introduced in 1999 and has two objectives. The first is environmental protection and, in particular, the reduction of greenhouse gas emissions as a means of climate change mitigation. The second is to reduce employers' and employees' statutory pension contributions in order to reduce labour cost and increase employment.

It is implemented through two laws endorsing five steps of increases in the taxes levied on the main transport fuels (petrol and diesel) and, in addition, increases in the tax rates on other energy products over a period of five years and the introduction of a tax levied on electricity. Special tax provisions are granted to businesses that are statistically classified as producing industries, agriculture, fishery, and forestry, and factories employing disabled people; all these are entitled to a 40 % reduction in tax rates (originally it was 80 % but this threshold was revised in 2003), as long as a minimum consumption of 50 000 kWh per energy source is exceeded (from not more than two different energy sources). It is noteworthy that eligibility for tax relief is based on statistical categories, for example whether a company belongs to an economic sector that is entitled to the tax relief. This classification system does not take into account the energy intensities of companies, leading to the paradox that companies can profit from the tax exemption even if they are not at all energy intensive. Furthermore, energy-intensive companies in the manufacturing sector are entitled to a further tax relief, if the company's environmental tax burden exceeds its relief from the reduction in the statutory pension contributions by at least 20 %. The full difference (i.e. 100 %) was refunded to the company. In 2003, this provision changed so that companies are eligible for a refund amounting to only 95 % of the difference, with the result that energy-intensive companies are faced with a tax rate of 3 % instead of zero as was the case before this tax revision was introduced.

In principle, the German ETR is designed to be revenue neutral except for a small, though increasing, amount, about EUR 200 million in 2004 (about 1 % of the revenues) which is used for a programme to promote renewable energies. The remaining, much larger, share of the revenue is used for a gradual reduction in statutory pension contributions on equal terms for employers and employees. About EUR 18.6 billion was used for the reduction and stabilisation of the pension contributions paid by employers and employees in 2003, leading to a 1.7 % reduction in the pension insurance contribution. The German government refrained from the strict principle of revenue neutrality by using EUR 1 billion for budget consolidation as a temporary measure.

A review of social responses to the ETR in Germany shows that acceptance has generally appeared to rise and fall over the years. Before and during the implementation of the ETR, industries and business associations raised most criticism. Once in force, criticism spread to other interest groups and the general public. In May 2000, when fuel prices exceeded the symbolic price of DEM 2 per litre (EUR 1) for the first time, the debate reached its climax of negative social response. While protests were organised against rising fuel prices in several other European countries at that time, public protest in Germany was directed mainly against the ETR. The ensuing discussion between opposition parties and those in government, various lobby groups and government administration was so intense that the ETR was close to being abandoned. Countervailing forms of tax relief programmes safeguarded the ETR, and the discussion relaxed with decreasing crude oil prices in 2001. With its re-election in 2002, the coalition government of Social Democrats and Greens decided not to continue to increase the energy tax rates beyond 2003.

As regards the impact of the scheme, proponents argue that it has been very successful and cite the example of reductions in levels of car use (in kilometres per year terms). A full *ex post* assessment of the scheme's impact was not available at the time of writing of this report.

Source: BMU (2002, 2004). See, for further information, Federal Ministry of Finance: <http://www.bundesfinanzministerium.de/Steuern/Oekologische-Steuerreform-.727.htm>; Federal Ministry of the Environment, Nuclear Conservation and Nuclear Safety: http://www.bmu.de/en/1024/js/topics/oekosteuer/base/?id=1047&nav_id=11272&page=1; Green budget Germany: <http://www.eco-tax.info/>.

Establishing green tax commissions has been a sign of the horizontal, integrative character of environmental tax reform, where different ministries, such as the Ministries of Finance and of the Environment, and a wide range of stakeholders were involved. Furthermore, the central principles of ETR/EFR had arguably already won some political backing before these commissions were established. A summary is given in Box 4.3, also covering historical examples. Currently, no green tax commissions function in Europe in this specific form. This may be a sign that discussions about labour-to-environment shifts are often already integrated into budget activities and consultation across ministries.

4.2.3 Recent developments in some Member States

Some countries have shown considerable activity in developing ETR/EFR in recent years. Examples include Germany, the United Kingdom and Sweden and are described in turn in Boxes 4.4 to 4.6.

These examples of ETR/EFR implemented in different EU Member States illustrate different designs. They are all revenue neutral in the sense that all revenues generated by environmental taxes are recycled back to the economy. All countries use a small share of the revenues to support environmental protection measures. It is not always appreciated that using hypothecation of revenues to subsidise energy-efficiency investment also returns the money to the public and businesses in the form of lower energy bills (RCEP, 2000; European Commission, 2000). Differences can be observed concerning the variety of environmental taxes used and the time frame of ETR.

An interesting programme in terms of introducing or increasing environmental taxes is the Swedish ETR, which covers 10 years compared with the five of the German ETR/EFR, although the German tax-shifting programme exceeds the Swedish programme. Environmental tax revenues have increased by about 36 % since the launch of the

Box 4.5 The UK experience

Environmental levies introduced in the United Kingdom since 1996 were all introduced in a revenue-neutral form. Revenues generated from the landfill levy (introduced in 1996), the climate change levy (CCL — introduced in 2001) and the aggregates levy (introduced in 2002) were recycled back to the economy by reducing the costs of employing labour via a cut in employers' national insurance contribution (NIC). In addition, a small part of the revenues was hypothecated for setting up specific funds. These are aimed at supporting the underlying objectives of the different environmental levies by funding research projects and investment schemes.

For example, the Sustainability Fund ⁽⁷⁰⁾, part of the aggregates levy scheme, focuses on the promotion of environmentally friendly extraction and transport, including funding projects on cleaner and quieter lorry transport and encouraging the use of rail and water transport, and on reducing the local effects of aggregate extraction, including funding of biodiversity projects and the conservation of geological features.

The Carbon Trust (<http://www.thecarbontrust.co.uk/carbontrust/>), funded principally from recycled CCL revenues, supports energy-efficiency improvements by business. The programme includes:

- the energy-efficiency best practice programme and the environment and energy helpline, which provide businesses with independent information to help save energy, cut waste and reduce carbon emissions;
- administration of the enhanced capital allowance (ECA) scheme for investments in energy-saving technologies;
- the low-carbon innovation programme, through which the Carbon Trust is developing a flexible support framework to encourage the development of new low-carbon technologies.

There are as yet no comprehensive *ex post* analyses of the CCL and aggregates levy, given their relatively recent date of introduction.

Source: Budget reports of various years (www.hm-treasury.gov.uk).

⁽⁷⁰⁾ The Sustainability Fund will be distributed by different institutions, such as English Heritage, English Nature, The Countryside Agency, the Department of Trade and Industry (DTI), the Department for Transport (DfT), the Office of the Deputy Prime Minister (ODPM), Somerset County Council, Derbyshire County Council, Leicestershire County Council and the Centre for Environment, Fisheries and Aquaculture Science (CEFAS).

Box 4.6 The Swedish ETR

In 1991, Sweden was one of the first countries in Europe to introduce an environmental tax reform. The concept of a revenue-neutral tax reform by offsetting lower labour taxes by higher environmental taxes was again implemented when the government stated a policy goal in the 2000 Spring Fiscal Policy Bill of environmental tax shifting of SEK 30 billion (EUR 3.3 billion) in 10 years from 2001 onwards. By 2003, tax shifts of more than SEK 8 billion (EUR 870 million) had been implemented. Further increases in environmental taxes amounting to about SEK 2 billion (EUR 220 million) were proposed and introduced in 2004, accompanied by a reduction in taxes on individuals and companies of an equal amount.

Tax cuts

- There will be a tax cut of SEK 200 per year for everyone who pays income tax.
- The social insurance contributions paid by employers and the self-employed will be lowered by 0.12 percentage points.

Increases in energy and environmental taxes

- The carbon dioxide tax rate will go up by 18 %.
- The tax on diesel will be raised by SEK 0.10 per litre.
- The electricity tax charged on industry will go up by SEK 0.005 per kilowatt-hour (until 2004, electricity consumption of industry was tax exempt).
- The electricity tax charged on households and other business sector users will rise by SEK 0.01 per kilowatt-hour.
- The tax on pesticides will go up by SEK 10 per kilogram of active ingredient.

The Swedish government periodically reviews the effects and implications of environmental taxes. Some of these studies are providing interesting results: for example, the CO₂ tax has been a decisive factor in the dynamic expansion of bioenergy, in particular for district heat production in the 1990s. The findings of a more recent study assessing the distributional implications of environmental policy measures illustrate that the design of the energy tax system is critical for the continuation of environmental tax reform because the impacts of changes in environmental tax can affect both households and business competitiveness.

Source: Swedish government (2003).

German ETR/EFR in 1999. As part of the German programme, about an additional EUR 20 billion was raised by energy taxes in 2003, amounting to about 0.9 % of GDP. The Swedish ETR contributes about 0.1 % of GDP.

4.3 Where are we going with ETR/EFR?

Overview

Looking to the future development of ETR and EFR in Europe, the most significant observations are as follows:

- The combination of economic interests in reducing the overall tax burden in the economy (particularly on employment and business competitiveness) with environmental concerns would suggest a much broader role for, and

application of, ETR, either as part or not as part of a much broader general tax reform.

- The application of ETR could be extended to other countries.
- The scope for expanding ETR depends on the potential for raising unrequited revenues with market-based instruments. This potential is the result of developments in the use of market-based instruments in environmental policy at the national level. Relevant developments include the increasing popularity of emissions trading systems, changing insights on transport taxation systems, and options for energy taxation.
- Efforts to reduce subsidies that do not have defensible social, economic or environmental rationale are expected to continue, and, where successful, to result in budget savings and to contribute to reducing the tax burden on the economy.

Discussion

The past decade has seen a growth in support for and implementation of environmental tax or fiscal reforms in European countries, especially where they also include commitments to fiscal neutrality. This development relates to the need to respond to public interest in reducing economically distorting taxes on economic functions such as labour (personal income tax), capital (corporate income tax) and consumption (VAT and other indirect taxes). Instead, taxing activities that lead to environmental pressure and natural resource use would lead to a better functioning of markets and increased welfare, as it moves society towards a more sustainable development path.

However, the introduction of new or increases in existing environmental taxes has, like any tax increase, always met with opposition, even when combined with reductions in taxes levied on labour, thus reducing labour costs.

Interest in implementing ETR is being shown by the new EU Member States. The Czech Republic, supported by the Czech–German initiative on environmental tax reform in the Czech Republic, introduced components of ETR (raising fuel taxes and decreasing taxes on corporate income) in 2003, and is intending to broaden this (Scasny, undated). In 2004, the positive example of this successful cooperation has helped to establish a similar cooperation between

the German and the Polish Environment Ministries, though there is not yet a government-agreed introduction of ETR in Poland.

What is the potential for shifting the tax burden from traditional economic functions to the environment? Figure 4.4 shows the development of the tax burdens in the EU-15.

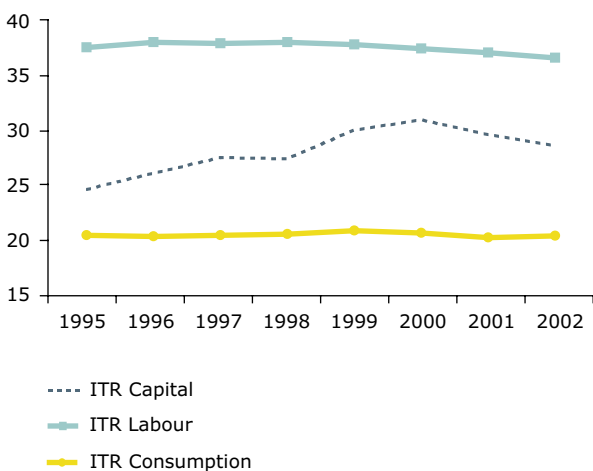
The highest effective tax burden ⁽⁷¹⁾ is on labour, which has decreased slowly since 1998. Information on the shares of the revenues from the various tax bases in total tax revenues are needed to investigate the potential for a balanced reduction in labour taxes and increase in environmental taxes (see Table 4.3).

If a decrease in the share of labour tax were financed by an increase in environmental taxes, a shift of 1 percentage point would imply a 2 % reduction in taxes on labour and a 15 % increase in environmental tax revenues. This would require not only bending the downward trend since 1997, but also a considerable expansion of environmental taxation.

Of the three components of environment-related taxes, taxes on transport have been rather stable in the recent past as a proportion of total tax revenues. The scope for significant expansion depends on the options for increasing one-off taxes (car registration) or annual circulation taxes. In order to reduce differences in tax treatment between different modes of transport and ensure a fairer tax treatment of the transport sector as a whole, the trend is towards a reduction of fixed taxes, and a shift towards taxes or charges based on the use of infrastructure. With a shift from fixed and unrequited taxes to variable and requited charges (e.g. for maintenance and improvement of infrastructure), the potential for ETR would decrease rather than increase. If countries follow the recommendation of the European Conference of Ministers of Transport (ECMT) and charge for the use of infrastructure on the basis of marginal social cost pricing, revenues are likely to be larger than the revenues forgone by abolishing fixed transport and energy taxes (Roy *et al.*, 2003; ECMT, 2003). If such revenues are not earmarked (as the ECMT recommends), then they can be a source for ETR.

A relatively growing but still tiny part of environmental tax revenues comes from taxes on pollution and resources. The share (0.2 % of total tax revenues) covers all environment-related taxes other than those imposed on the transport and energy

Figure 4.4 Effective tax rates on labour, capital and consumption (%), EU-15, 1995–2002



Source: Eurostat.

⁽⁷¹⁾ The effective or implicit tax rate on labour is defined as all direct and indirect taxes and employees' and employers' social contributions levied on employed labour income divided by the total compensation of employees working in the economic territory (Eurostat, 2004).

sectors, and includes taxes on waste, water pollution, air pollution, chemicals and packaging. As far as levies are being applied in these domains, charges are dominant. Their revenues are used outside the fiscal domain and are not available for shifting the tax burden. Clearly, the scope for developing pollution and resource taxes as a major driver of environmental tax reform is negligible, at least in the near future.

That leaves energy taxes as the main component of environmental taxes, with about 5 % of total tax revenues. The energy tax burden is unevenly spread among target groups (Eurostat, 2003b), with the bulk of the tax burden resting on consumers. In the Nordic countries, for example, households consume about 20 % of all energy, but pay about 60 % of all energy taxes. By far the biggest contribution comes from taxes on motor fuels (petrol and diesel). Energy carriers such as coal, and heavy and light oil, typically used in manufacturing, are taxed at a much lower level, mainly through reduced tax rates.

Within the body of environment-related taxes, the largest scope for a shift is in broadening the energy tax base by abolishing reductions for commercial sectors and establishing a more level treatment with households. There are concerns about competitiveness which would work against substantial increases in such tax rates. Moreover, high taxes on commercial energy use would act as an incentive to divert use away from the taxed energy carriers and increase the potential for renewable sources. This would benefit the environment, but would erode the tax base and reduce the potential for tax shifts.

Another potential source of revenues is the taxing of energy products currently not subject to taxation, such as aviation fuel (i.e. kerosene tax for commercial aviation). However, bringing the aviation sector into the EU emissions trading scheme would limit the possibility of tax shifts using revenues generated by taxing aviation fuel, unless auctioning of allowances is used to create revenues. In addition, the interplay between different economic instruments, such as environmental taxes and emissions trading, will be of relevance when considering the implementation of ETR in the future because of the revenue-generating effect forgone in the case of giving emission allowances away free of charge. Furthermore, there will be a plea for reducing taxes in those parts of the commercial sector that already fall under the EU emissions trading scheme for greenhouse gases, in particular in the case of tightening targets and shrinking allocations, and for those parts of the commercial sector that might come under the scheme in the future.

An interesting and promising step towards implementing wider reforms by reducing environmentally harmful subsidies has been initiated in EU Member States, such as the Nordic countries and Germany. More attention needs to be paid to subsidy reform proposals since such policy reforms are being promoted by international organisations, such as the OECD, noting that subsidy removal is a priority area for their work (e.g. OECD, 2003). The potential for tax shifts through reducing such subsidies is difficult to assess, since reliable data on the magnitude of subsidies are still largely lacking.

Furthermore, many other instruments that address climate change, for example voluntary agreements, do not generate revenues. When such instruments are used in place of taxation, extensive application of ETR will be limited.

4.4 What lessons can we learn?

The main insights from experience of ETR/EFR are as follows:

- One of the major lessons learnt from experience in countries that have already implemented ETR is the need for a gradual phasing-in of the reforms. In the German case, automatic escalators were built into the design of the energy taxes so that they increased by a given margin every year. In the Swedish case, the total reform programme is planned to be implemented over 10 years. This policy gives industry the chance to adjust to the situation with regard to a potentially higher energy tax burden and therefore reduces the possibility of relocation of industries to other countries.
- The German ETR has made extensive use of a public information campaign to generate public support for the shift in taxation from goods to environmental bads. The changes that have been set in motion would have been more difficult to implement without the support generated by this campaign. At the same time, the United Kingdom has been less public in displaying the motivations for its use of new fiscal instruments. There may be lessons to be learnt from examining different experiences in this regard.
- Cross-national analysis suggests that the extensive use of environmental taxes is not detrimental to economies, at least where these taxes are used to reduce the revenue take from taxes such as those on income and labour.
- Most ETRs began with a focus on energy taxes, but have subsequently been extended to cover

other sources of negative externalities such as waste and pesticides. However, the revenue-generating potential of the latter is rather limited and therefore offers only limited potential for reducing other distortionary taxes if a revenue-neutral stance is adopted. Broadening the tax base that links into fiscal reform can be a useful indicator of the policy intention and commitment to fiscal reform even if the sums involved are not large. It can therefore act as an early-warning signal that other environmental taxes might be levied in the future. Furthermore, as a 'strategy' for ETR/EFR develops, it becomes easier to add new taxes and charges that implement this policy commitment.

Energy taxes seem to be the most promising route to shifting the tax burden from labour to the environment — at the macro level. Most other environmental taxes cannot combine significant tax income with significant environmental effects. Shifting the tax burden from labour to the environment does not seem to have substantial benefits for the economy or for employment, at least at a macro level. Such a shift, however, can be justified by two independent motives: the desire to lower income tax levels to make the overall tax system better balanced and internationally competitive; and the need to protect the environment by reducing environmental pollution and natural resource use.

Increasing energy taxes should be done with moderation. In the short run, income effects can be quite substantial for low-income groups with energy use far above average, even if the energy tax is fully recycled via the reduction of labour taxes, for example personal income taxes or social security contributions. In the past, households have suffered the largest environmental tax increases compared with industry. Compensation measures to protect the less well-off households from suffering from fuel poverty or other deprivation as a result of increased environmental tax burdens are often integrated into ETR. Industry has always received generous cuts, rebates and exemptions based on the risk of loss of international competitiveness and the need to protect national production and exports. Tax relief granted exclusively to individual industrial sectors can also have an impact on sectoral and regional competitiveness.

For example, companies in the Swedish manufacturing industries were fully exempt from the electricity tax until July 2004. This tax relief was

seen as State aid by the European Commission and not compatible with the common market because it provided companies in the manufacturing industries with a competitive advantage compared with other companies. Tax exemptions based on regional consideration, as found in the Norwegian electricity tax scheme where the tax rates are distinguished between the northern and southern parts of Norway, can also influence the competitive situation of companies.

Discussions of the potential risk to competitiveness should therefore not be restricted to international considerations but should also take account of national (e.g. sectoral and regional) issues. Although taxes on business inputs will inevitably increase production costs, any analysis of competitiveness that examines international, regional or sectoral issues will only result in limited findings, since only the price element of competitiveness is under scrutiny. The competitive situation of a company is also determined by non-price elements, such as production methods, different abatement costs resulting from such production methods, substitution possibilities and regulations (see European Commission, 2004, and Baranzini *et al.*, 2000). The development of compromises between environmental taxes and measures that aim to protect or improve business competitiveness in the international and national (regional or sectoral) context illustrates a dilemma with regard to ETR because of competing political objectives.

Special treatment of the industrial sector, in particular of energy-intensive industries, is contrary to the objectives of environmental improvement and raising revenues for tax-shifting programmes. This policy leads to a situation where households and small businesses face a higher overall tax burden than energy-intensive industries, particularly when recycling of the revenues is accounted for (see, for example, Hillebrand, 1999)⁽⁷²⁾. This problem with regard to the design of ETR is also noted by Kohlhaas (2003). The special tax provisions granted to energy-intensive industries can be inefficient considering that 'energy-intensive sectors have a substantial potential for energy-saving measures, especially if technological innovation is taken into account. If those branches expect to profit from special provisions in the long run, the adjustment process will not be set off and the government will face a similar situation in the future. Moreover, if taxes are set arbitrarily and under pressure from political groups, eco-taxes will not display the qualities of a market-based policy

(72) Hillebrand (1999) uses a modelling approach to analyse the sectoral implications of the German energy tax reform. The analysis determines the overall tax burden/relief for individual sectors by considering the tax burden of increased energy taxes as well as the tax relief as a consequence of reduction in labour cost.

instrument that gives an economic incentive and serves as a filter to undertake energy-saving measures at least cost' (Kohlhaas, 2003, p. 11).

The key dilemma of this approach is that ETR/EFR, such as the German ETR, regularly attempts to achieve several conflicting policy objectives simultaneously (e.g. to achieve an environmental benefit by reducing environmental pollution and to create new jobs by reducing labour costs) by directly applying only a single instrument.

This policy approach goes against economic theory (the 'Tinbergen rule' — see Tinbergen, 1952) which states that the number of economic instruments applied should match the number of political objectives to be achieved. A variety of different economic instruments can be implemented, in combination with environmental or energy taxes,

to achieve these objectives. Kohlhaas discusses potential instruments in the context of the German ETR, such as the use of energy audits as a tool that aims to reduce environmental pollution or implement a general tax reform that particularly addresses an economic objective, for example the creation of new jobs (Kohlhaas, 2003). ETR/EFR should therefore be integrated into a much broader fiscal policy package for overhauling the fiscal system and not be perceived as an individual and autonomous fiscal programme, for example as in the Netherlands.

The significance of green tax commissions for implementing ETR should also be emphasised, particularly because of their value for improving understanding of the concepts and process. The work of green tax commissions is useful for several reasons: they bring together different stakeholders, they scrutinise the potential for new environmental

Box 4.7 Findings of the Petras project

The findings of the Petras project ('Policies for ecological tax reform: Assessment of social responses'), a major Research DG-funded project, show that a significant impediment to the ETR concept is the lack of plausibility in the eyes of the general public. Many view it as some sort of pointless shifting of money from one place to another and even the business interviews suggest a lack of understanding. This may be explained partly by anecdotal evidence of a lack of understanding of the necessity for taxes to fund public goods and a desire to see the money spent where it is raised.

A major problem in selling the ETR concept to the general public is establishing trust that the government will honour its promises in terms of using the revenue to reduce labour taxes rather than it just disappearing into a black hole. In general, people felt that the government would have to prove itself capable and committed to ETR and convince them of this before any reforms were introduced. This lack of trust in government was considered a key impediment in all countries. In Denmark and Germany, where ETR has been implemented, there was still scepticism about the government's intentions.

Therefore, for this approach to ETR to be socially and politically acceptable, firstly a considerable effort will have to be made to explain the rationale for changing the tax base from labour to pollution. Secondly, a degree of transparency will have to be created, so that the public and businesses trust that such a change will occur. In France, Ireland and the United Kingdom, it was stated by the general public that revenue distribution being carried out by an independent body would increase trust, but, of course, it would be impossible to hand responsibility for distributing public money to a private body. Highlighting the revenue recycled to individuals on their payslips could improve acceptability. This need for visibility was emphasised in the results of German empirical work, where ETR has been implemented, but there is a lack of comprehension of the labour tax returns. Most payslips follow a certain standard format and it would be administratively simple to add a new category which explains the savings or extra income earned as a result of the tax reform.

The results of the interviews and focus groups show that much work remains to be done to make the ETR policy approach acceptable to the public. Policy-makers, business groups and the general public all cited lack of public awareness of ETR as a major impediment to its political acceptance. However, the first requirement is an improved understanding of the environmental implications of everyday activity. For example, there seemed to be poor understanding of the connection between energy use, greenhouse gas emissions and climate change. The public are unlikely to support the introduction of an energy tax if they do not understand the environmental implications of using energy. The generation of a climate of support is necessary for political success in this arena.

References: Dresner *et al.* (forthcoming); Clinch *et al.* (forthcoming).

Source: <http://www.soc.surrey.ac.uk/petras/reports.html>.

taxes, and they examine the current fiscal system thoroughly, as seen in the report published, for example, by the Norwegian green tax commission in 1996 and the different reports published by the Dutch green tax commission. In many countries, the function of green tax commissions is carried out through interministerial discussions through working groups.

A further important aspect of the successful implementation of ETR is the role of public information about the potential winners and outcomes of such programmes. Mitigation measures to address the potentially negative implications of ETR are commonly applied in the EU Member States that have implemented such reform programmes. Tax rebates or exemptions can impair the overall effectiveness of ETR and deprive it of the main goal of achieving environmental benefits by reducing natural resource use, especially in the form of energy products, and environmental pollution. Generally, energy-intensive sectors are the beneficiary of these tax rebates and exemptions, which is partly counterproductive because these sectors also have the potential for saving energy and opportunities to invest in cleaner technology. Where the rebates and exemptions are perceived as inescapable, they should be only temporary so that the transition to a more sustainable development is delayed rather than avoided.

The recently finished EU-funded research project Petras examined the responses of members of the general public and businesses to ETR policies and proposals. It investigated the barriers to ETR in more detail, specifically with regard to the recycling of the revenues from carbon or energy taxes, in five European countries (Denmark, France, Germany, Ireland and the United Kingdom). The barriers were examined by interviewing politicians, business people and decision-makers, and some of the main findings can be found in Box 4.7.

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5 Subsidies, subsidy reform, support schemes and green purchasing

Subsidies have traditionally been used for economic or social reasons, for example to support ailing industries, to help develop vital infrastructure or to protect domestic producers from overseas competition. They can be seen as a way of protecting jobs, either generally or in specific regions, for example support for fishermen to protect coastal fishing communities. The use of subsidies for environmental purposes, however, is a more recent and less well-established policy.

In any discussion of this form of market-based instrument, it is important to remember that: (a) not all economic subsidies are harmful to the environment; (b) not all environmental subsidies are actually good for the environment (as sometimes there is a threshold above which subsidies have no incremental effect); and (c) getting rid of subsidies seen as environmentally harmful may not actually improve the environment — if the reform package does not take economic, policy and environmental interlinkages properly into account.

Subsidies, subsidy reform, support schemes and green purchasing are major issues in themselves, each worthy of in-depth research and meriting major policy attention given the broad implications of their application. The use of such instruments for environmental purposes is the source of much debate. Some argue that there would not be any need for subsidies in the presence of a fully functioning market system in which all externalities are internalised. However, subsidies can help create markets, and speed the development of markets and technologies, but they can also slow market development and encourage 'lock-in' to existing systems. They can be a catalyst and at the same time a brake, encouraging increased efficiency, or hindering it — depending on their design, objective and to what they are applied. Support schemes and green purchasing in favour of the environment are similarly under debate, with some arguing for rectification of existing market failures rather than further complicating the picture through the introduction of even more pro-environment measures.

Since it is impossible in this chapter ⁽⁷³⁾ to go into each of these instruments in great detail, the aim is to give an overview of each, accompanied by examples of its use for the purposes of environmental improvement ⁽⁷⁴⁾.

5.1 What have we got?

5.1.1 Defining subsidies

The OECD broadly defines a subsidy as 'any measure that keeps prices for consumers below market levels, or for producers above market levels, or that reduces costs for consumers and producers' (OECD, 1998).

The WTO definition of subsidies contains three basic elements (WTO, 1994):

- a financial contribution, including direct transfers of funds (e.g. grants, loans, and equity infusion) and potential direct transfers of funds or liabilities (e.g. loan guarantees). A financial contribution also exists where government revenue that is otherwise due is forgone or not collected (e.g. fiscal incentives such as tax credits); where a government provides goods or services other than general infrastructure, or purchases goods; or where a government entrusts or directs a private body to carry out these functions;
- the financial contribution must be made by a government or any public body, including subnational governments and public bodies such as State-owned companies;
- it must confer a benefit.

Other authors have looked at the concept of subsidies in a different way. To know what a subsidy implies knowing exactly what a 'no-subsidy world' might look like. In other words, defining subsidies implies developing a baseline from which the subsidy is measured. Pieters (1997) points out that what the 'without subsidy' world looks like is a

⁽⁷³⁾ This chapter has been drafted for the EEA (contract reference 3223/B2003.EEA.51620) by Ian Skinner, Patrick ten Brink, Agata Zdanowicz, Saskia Richartz and Dirk Reyntjens (all of the IEEP) with valuable inputs from Marloes van der Winkel, Martin Farmer (IEEP), Dominic Hogg (Eunomia) and Stefan Speck. It has benefited from the comments of the expert group (see 'Foreword and acknowledgements') and comments of the EEA's national focal points (NFPs).

⁽⁷⁴⁾ This chapter should be read in conjunction with other research, as noted in the references at the end of the chapter. In particular, work by the OECD, such as OECD (2003a), should be consulted.

normative judgment. He suggests beginning with a definition of subsidies as 'deviations from full cost pricing'. These may include:

- income transfers such as exist through the fiscal system — for example, grants for energy-saving technologies, nuclear energy, renewable energy or coal mining. Income transfers can take several forms: not just direct grants, but also tax exemptions. This is the general use of the term subsidies;
- implicit income transfers resulting from non-internalisation of externalities — if there are activities that lead to a burden elsewhere (e.g. pollution damage) and this burden is not paid for (no compensation), then the activity is implicitly subsidised;
- direct price support for producers (and consumers) — for example, guaranteeing higher prices than would be on offer in a free market (as is the case with products under the common agricultural policy) or guaranteeing lower prices to consumers (e.g. bread and transport in Russia).

Pieters proceeds to focus on the first and last of these, suggesting that problems of measurement make it unrealistic to include externalities within the definition of subsidies, adding further justification for this omission by stating that 'passively leaving external costs external does not have the same political "feel" as actively handing out subsidies' (Pieters, 1997, p. 8). Pieters' (1997) definition of subsidies is 'forms of economic support by means of cash payments, tax expenditures, price regulations and trade restrictions'.

In this chapter, we use the broad OECD (1998) definition of a subsidy, as above, and the definition in the same publication of an environmentally harmful subsidy as 'a subsidy that encourages more environmental damage to take place than would occur without the subsidy'.

5.1.2 *The application of subsidies*

From a broad economic perspective, it could be argued that subsidies are inefficient and would not be needed if the external costs of all activities were internalised. In some respects, therefore, one can see the application of some subsidies,

for example those introduced for environmental purposes, as attempting to rectify market failures. Subsidies become inefficient if their existence leads to overproduction of the subsidised product, or if it creates 'economic rents', in other words undue profits for individuals or parts of the sector. The latter occurs when the subsidy is no longer needed or larger than the incremental support needed — in other words, above the needed threshold. Even green subsidies should be temporary, otherwise they can effectively slow the development of innovative technologies.

In recent years, the reform of environmentally harmful subsidies has moved significantly up the political agenda. The OECD has been developing a framework to help identify and measure environmentally harmful subsidies to help support the need for more analytical rigour in the assessment of whether subsidies are in fact needed ⁽⁷⁵⁾. EU leaders, at their spring summit in 2003, urged 'the Council [of EU finance ministers] to encourage the reform of subsidies that have a considerable negative effect on the environment and that are incompatible with sustainable development'. This is being taken on board in other EU policy documents; for example, according to the EU's environmental technologies action plan ⁽⁷⁶⁾, the Commission will work with Member States and regional governments, using the OECD methodology as far as possible, to identify the most significant subsidies that have a negative effect on the environment.

From an environmental perspective, therefore, there are two important parallel approaches that need to be taken with respect to subsidies. First, subsidies can be used in the short term to address market failures or encourage environmentally beneficial behaviour. Second, it is important to reform those subsidies that are currently harmful for the environment. It is important to understand explicitly the impacts of the subsidies on the different dimensions of sustainable development and whether the benefits merit the costs of the instrument. If not, reform is needed.

Subsidies are present in all sectors of the economy: some aim to encourage more environmentally beneficial behaviour, and some are environmentally harmful. Areas where subsidies exist include:

⁽⁷⁵⁾ The main steps of this can broadly be described as: (a) 'intuition' as to whether a subsidy is harmful to the environment; (b) description of the subsidy of potential concern; (c) is there an effective policy filter? (i.e. there may be a measure in place to address any negative impacts — if so, the removal of the subsidy may not lead to environmental benefits); (d) are there benign alternatives available? — if not, subsidy removal may not improve matters; (e) does 'conditionality' lead to higher volumes? — if so, one can conclude that subsidy removal is likely to benefit the environment. The OECD and other stakeholders argue for more analytical rigour and the use of comprehensive 'what-if analysis', since removing subsidies may not only bring improvements.

⁽⁷⁶⁾ COM(2004) 38.

- **agriculture** — under the common agricultural policy (CAP) in order to support EU farmers through direct aid and, more recently, to encourage less environmentally harmful practices;
- **energy** — subsidies exist in a number of countries to support coal, nuclear and renewable energy. Historically there have also been subsidies to develop oil and gas infrastructures in several European countries;
- **fisheries** — to support the EU fishing sector, in the form of grants, for example for vessel building and vessel decommissioning projects;
- **industry** — support through wide-ranging exemptions from taxes and charges, and also by the status as limited liability companies and given the protection under bankruptcy law;
- **transport** — in many countries, it has been tax advantageous to have a company car and there are stimuli to encourage the use of private cars for business use. Increasingly, though, subsidies are being introduced to support the diffusion of cleaner vehicles in the market.

Within the EU, and in particular before the advent of the single market, it was common to find national governments supporting domestic industry through subsidies.

The aim of the State aid rules is to ensure that no Member State favours its own industry with subsidies, including tax exemptions or reductions, to the potential detriment of industry in other Member States. According to the Treaty of Rome, assistance is classified as State aid if it:

- is funded by the State or from State resources;
- favours certain undertakings or the production of certain goods;
- distorts, or has the potential to distort, competition;
- relates to an activity that is tradable between Member States.

This includes direct grants or cash injections, loans, and tax deferrals or exemptions. However, Member States are allowed to apply tax reductions, for example, for environmental reasons, although in such cases permission has to be given by the Commission. The Commission examines all requests it receives for such exemptions on the basis of Treaty and accompanying State aid guidelines in order to identify whether or not they are acceptable (see Box 5.1 for details).

Tax exemptions/reductions for competitiveness reasons are usually approved if limited in time and balanced by environmental benefits, for example through an associated voluntary agreement. For example, recent UK and German tax reforms have included subsidies for energy-intensive industries, as part of a broader environmental tax reform package. The guidelines allow operating aid to support renewable energy as well as waste management in line with the Community waste hierarchy. A review of the State aid guidelines in the light of experience since 2001 is planned.

In spite of EU State aid rules, there are many policies, both within Member States and at the EU level, that utilise subsidies in ways that could be

Box 5.1 State aid guidelines

New guidelines on state aid for environmental protection were adopted by the Commission in December 2000, came into force in February 2001, expire at the end of 2007 and are set for revision in 2005. The new guidelines allow support in specified circumstances to a range of activities, including renewable energy, waste management and, for small and medium-sized enterprises (SMEs), time-limited aid for meeting Community environmental standards. They set maximum rates and periods for support, but provide a range of flexible options from which Member States may choose. Aid may be authorised up to a maximum percentage of gross eligible costs, as follows:

- **aid for investments by firms to comply with new legal environmental standards** — 15 % for SMEs;
- **aid to encourage firms to go beyond mandatory Community environmental standards or where there are no standards** — 30–40 %, with higher rates available for energy-saving, combined heat and power or renewable energy investments;
- **aid for firms in assisted regions** — 5–10 percentage points above the regional aid rate;
- **aid for the rehabilitation of polluted sites** — if the person responsible is not known, 100 % of eligible costs (cost of work less increase in the value of the land) plus 15 % of the costs of the work.

Source: http://www.europa.eu.int/comm/competition/environment/#state_aid.

considered to be environmentally harmful. Below, we discuss those present in the agricultural, energy, fisheries, industry and transport sectors.

The agricultural sector

Agriculture both creates pressures on the environment and plays an important part in maintaining many cultural landscapes and farmland habitats. By driving forward agricultural intensification, the EU common agricultural policy (CAP) has historically led to environmentally negative changes in the farming sector. It is also an important policy tool, however, for supporting farming systems and practices that are favourable to biodiversity. The CAP absorbs 49 % of the EU's entire operating expenditure and EU expenditure on agriculture totalled EUR 44.4 billion for the EU-15 in 2003 (Budget DG, 2004). Table 5.1 shows the allocation of funds within the overall budget, and the figures as a percentage of total expenditure on agriculture and as a proportion of the entire EU budget.

Expenditure on direct aid amounted to approximately two thirds of the entire agricultural budget for 2003. Rural development accounted for 10.5 % of the total expenditure, with expenditure on less favoured areas (LFAs) and agri-environment measures amounting to 2.2 and 4.5 % of total agriculture expenditure respectively (see Table 5.1 for details).

A key question is the extent to which there is a link between negative environmental impacts and the various policy instruments under the CAP. The impact of the CAP, its price and income support and intensive forms of agriculture are difficult to determine as there are also policy-independent factors that drive agricultural change, such as

Table 5.1 Structure of 2003 agricultural expenditure in the EU-15

Agricultural expenditure on:	Expenditure (million EUR)	% of agricultural budget	% of total EU budget (*)
Direct aid	29 698.5	66.9	32.8
Export refunds	3 729.6	8.4	4.1
Storage	928.0	2.1	1.0
Rural development	4 679.6	10.5	5.2
Of which: LFAs	991.7	2.2	1.1
Agri-environment	2 011.6	4.5	2.2
Other expenditure	5 342.3	12.0	5.9
Total agricultural budget	44 378.1	100	49

(*) Total EU operating expenditure for 2003 was EUR 90 557.5 million.

Source: Budget DG (2004).

Table 5.2 Summary of the environmental impacts of agriculture in Europe

Issue	Major sectors
Eutrophication of water (and related biodiversity decline)	Pigs, dairy, beef, horticulture, arable, olives, sugar
Pesticides in water	Horticulture, arable, olives, vines, sugar
Soil erosion	Cereals, maize, oilseeds, horticulture, sugar, sheep and goats
Overabstraction of water for irrigation	Arable, dairy, maize, olives, horticulture, sugar, wine
Ammonia from indoor livestock	Cattle (dairy and beef), pigs
Greenhouse gas production and potential contribution to climate change	Cattle, pigs (contribution), grassland, energy crops (mitigation)
Biodiversity/landscape — loss of valuable habitat to intensive agriculture	Arable, dairy, beef, sheep and goats, horticulture, olives, wine, sugar
Biodiversity decline in farmland species (pesticides, nutrients, field enlargement)	Arable, dairy, intensive 'southern' crops, sugar
Management of farmland habitats and landscapes	Negative impacts where traditional pastoral or mixed systems are abandoned Positive impacts where extensive farming practices are maintained, for example traditional olives and vines in southern Member States or wet grasslands in north-western Europe

rising labour costs, falling product prices, and technological development. Table 5.2 summarises the environmental impacts of agriculture in Europe, which may be related to the CAP and to economic pressures to intensify farming practices.

There have been progressive attempts to 'green' the CAP budget, to replace production subsidies with income support, and to shift the emphasis towards rural development. The World Trade Organisation has been an important external influence, forcing gradual decoupling of agricultural support from production. The CAP has been operated in a highly centralised fashion, but the strengthening of rural development measures since 1992, in particular, has given more flexibility to the Member States.

Following the 2003 reform of the CAP, those in receipt of EU funds have had to meet a series of environmental and animal-welfare standards in order to qualify for a subsidy payment from 2005. This payment will no longer be coupled to the production of specific products, and farmers should reorientate their farming practices towards meeting market demands. Rural development measures are now co-financed by Member States at a rate of 15–50 %.

From 2005, cross-compliance will be applicable to most of the farmland in the EU, as most of the EU farmers apply for some kind of area-based payment under the CAP. The concept of cross-compliance in agriculture (setting conditions which farmers have to meet in order to be eligible for government support) has been gaining ground since the 1970s, and was first applied in the United States. In Europe, the discussion about the relevance of cross-compliance to European agricultural policy began only in the 1990s, along with the growing commitment within the European Community to integrate environmental considerations into agricultural policy. The 1992 reforms of the CAP further increased the potential relevance of cross-compliance by obliging Member States to apply 'appropriate environmental conditions' to the management of compulsory set-aside in arable cropping. In addition, they were allowed to introduce environmental conditions on the direct payments offered as subsidies on beef cattle and sheep.

Agenda 2000 agreements on the reform of the CAP brought further opportunities for Member States to use cross-compliance requirements, as they are now able to attach environmental conditions to direct payments. The amounts recovered as a result of applying cross-compliance under Regulation (EC) No 1259/1999 could be used by the Member States concerned only as supplementary funds for agri-environment, early retirement, afforestation and compensatory allowances under other schemes. This option was applied very selectively by a few Member States, which led to the introduction of obligatory cross-compliance in the latest reforms of the CAP in June 2003. Farmers in receipt of direct CAP payments will be required to respect a set of statutory management requirements under the common rules for direct support schemes under the CAP and to meet good agricultural and environmental conditions in line with standards set by Member States. The statutory management requirements refer to Community legislation in the areas of public, animal and plant health, the environment and animal welfare. The five pieces of environmental legislation included cover the protection of groundwater, birds and habitats and the use of nitrates and sewage sludge in agriculture.

The legislation also requires Member States to ensure that all agricultural land is maintained in good agricultural and environmental condition, which is defined in the legislation. It also allows Member States to continue to encourage conversion to arable under certain agri-environment schemes for specified environmental and/or nature conservation benefits.

Agri-environment measures became an obligatory part of the CAP in 1992. Member States have to include agri-environment schemes in their rural development programmes, although participation by farmers or other land managers is voluntary. Support under this measure is granted to farmers who commit themselves for a period of at least five years to use agricultural production methods designed to protect the environment or maintain landscape features, as determined by the rural development programme of the country or region concerned. However, the rate of enrolment by farmers and budgetary commitments to agri-environment schemes vary considerably between EU Member States (EEA, 2005).

The energy sector

Historically, energy subsidies existed in order to support the development of public sector industries. These have gradually been privatised and so subsidies in the oil and gas sectors are far less common than they used to be. Coal subsidies still exist in a number of countries such as Germany and, to a lesser extent, Spain, and even in the United Kingdom. These were launched to support a key industrial sector and now remain, often to support employment in areas with few alternatives, and also, as in Germany, to ease the restructuring process. Nuclear power also benefits from direct subsidies, transparent payments (e.g. the UK's non-fossil fuel obligation), and other subsidies, which are less transparent, including the use of guarantees and limiting liability (e.g. in case of accident, and guarantees for waste disposal and decommissioning). Renewable energies — such as wind, passive solar, photovoltaics, biomass and micro-hydro — are a growing focus for subsidies in order to support the development of these energy forms to enable them to become competitive with established energy sources. Renewable energy is being supported in a number of ways, such as the government setting up purchase requirements (Germany and the United Kingdom) and setting the purchase price (e.g. Germany's feed-in tariffs). Importantly, the case of Germany's feed-in tariffs obtained a Court of Justice ruling confirming that it is not regarded as State aid under EU law.

A report published by the EEA presents an overview of energy subsidies provided in the EU-15 (EEA, 2004b). The difficulty in carrying out such a stocktake is that 'there is no agreed definition of energy subsidies among European Union (EU) Member States. The term may include cash transfers paid directly to producers, consumers and related bodies, as well as less transparent mechanisms, such as tax exemptions, and rebates, price controls, trade

Table 5.3 Indicative estimates of total energy subsidies in the EU-15, 2001 (billion EUR)

	Solid fuels	Oil and gas	Nuclear	Renewables	Total ⁽⁷⁷⁾
2001 – on-budget	> 6.4	> 0.2	> 1	> 0.6	> 8.2
2001 – off-budget	> 6.6	> 8.5	> 1.2	> 4.7	> 21
Total	> 13	> 8.7	> 2.2	> 5.3	> 29.2

Source: EEA (2004b, p. 14).

restrictions, planning consent and limits on market access' (EEA, 2004b, p. 5). Based on a whole range of different studies and reports, it is estimated that total subsidies in the energy sector amounted to around EUR 29 billion in the EU-15 in 2001 (EEA, 2004b).

Many reasons are given by governments to justify providing this support, covering issues such as security of supply, environmental improvement and further economic benefits as well as providing employment and social benefits ⁽⁷⁸⁾. A reform of the current practice of energy subsidisation is high on the political agenda as specifically mentioned in the sixth environment action programme of the EU, especially with respect to reforming subsidies that have considerable negative effects on the environment. Subsidies for fossil fuels, for example oil and coal, pose greater threats to the environment in general than support schemes for renewable energies that are often portrayed as environmentally beneficial, although the full range of impacts, including indirect effects, should be taken into account.

Experience shows that classification of subsidies is difficult. Attempts have been made to classify them according to the beneficiary, instrument or incidence. A rather different approach was followed in the EEA report, which distinguishes between 'on-budget subsidies' ⁽⁷⁹⁾ and 'off-budget subsidies' ⁽⁸⁰⁾. This simple form allows Member States to provide a clearer picture of the amounts given to different energy products, as shown in Table 5.3.

The figures provided in Table 5.3 are estimates illustrating the range of financial support given to different energy products. Solid fuels receive by far the greatest share of financial support, followed by oil and gas, although renewable energy receives the largest subsidy per unit of energy produced. Fixed feed-in tariffs are a relatively common instrument

for increasing the share of renewables in the energy mix in the EU-15. The underlying principle of this support mechanism is the setting of a fixed price which is binding on all electricity supply companies, meaning that they have to purchase all electricity generated from renewable energy sources and delivered to the distribution grid at this price. This instrument is used mainly in Germany and Spain and the final consumer has to pay a premium, which is part of the electricity tariff, to cover the additional costs.

The figures in Table 5.3 show that the lowest share of energy subsidies is provided to nuclear power. However, the EEA report states that these figures 'exclude the potential cost of not having to pay full-liability insurance cover for a critical nuclear accident or fuel incident since commercial and State liabilities are limited by international treaty. This risk would be too large to be commercially insurable' (EEA, 2004b, p. 14).

The fisheries sector

The overall level of government financial transfers (GFTs) in the EU has been estimated at more than USD 1.1 billion (OECD, 2003b), which is made available through a combination of EU-wide programmes and national State schemes. About a quarter of these GFTs are spent on general services such as support for research, management, enforcement and infrastructures. These are currently not considered to be subsidies by the WTO. Aid is available for a range of project types, including vessel building and decommissioning projects, aquaculture investment, and marketing and processing projects. However, subsidies for building new vessels were not available after 2004.

The most significant single source of aid for the EU's fisheries sector is the EU's Financial Instrument for Fisheries Guidance (FIFG), with funds programmed over a seven-year period, currently 2000–2006,

⁽⁷⁷⁾ There was no information on subsidies for energy savings.

⁽⁷⁸⁾ For example, with the expiry of the European Coal and Steel Community Treaty, coal subsidies had to be transformed into a new legal framework (Regulation (EC) No 1407/2002). One of the aims is to use the subsidies for restructuring the coal industry.

⁽⁷⁹⁾ On-budget subsidies cover instruments, such as cash transfers, grants and low interest loans, which are recorded on national balance sheets as government expenditure (EEA, 2004b, p. 11).

⁽⁸⁰⁾ Off-budget subsidies are not recorded on national accounts as government expenditure. For example, tax exemptions and rebates as well as market access restriction regulatory support mechanisms fall under this category (EEA, 2004b, p. 11).

targeted mainly at the EU's poorest (known as 'Objective 1') regions. Although the Fund is EU-driven, wide responsibility for both drafting and implementing expenditure programmes is left to the Member States. Money is distributed through a series of regional or sectoral expenditure programmes, which map out the priority areas for development within constraints set by the EU. The release of FIFG funds is dependent on part-funding from national public and (normally) private sources. In practice, this means that even relatively small EU assistance budgets can lead to significant amounts of aid being mobilised under each programme. In the past, Member States have tended to focus investment on three key areas: fleet building or modernisation, fleet capacity reduction measures, and investment in marketing and processing facilities. Significant funding has also been injected into the aquaculture sector.

The Community's common market regime for fish and fish products includes a price support system that sets minimum prices below which certain fish products should not be sold. A set of guide prices are agreed annually to help secure producers' income and selling prices are calculated on this basis, as are prices paid for fish withdrawn from the market. This system is backed by compensatory payments and carry-over aid for freezing and storing products. In most cases, a flat level premium is available for withdrawals. This has not been a significant area of subsidy to the EU fisheries sector, amounting to EUR 42.8 million in 1998, although support may be more significant in relation to certain products, for example tuna. Overall, however, there is a general pattern of continued reduction in EU market support, particularly as regards support for the withdrawal of unsold fish, due to high prices.

Reform of the EU fisheries subsidies regime began in the early 1990s as the amount of aid for construction and modernisation was reduced significantly, with corresponding increases in money available

to withdraw vessels altogether, or move them to other (non-European) fishing grounds. Further significant fisheries subsidy reforms followed in 1999, as part of the EU's Agenda 2000 process. A stronger environmental element was included in the relevant EU regulations that determine the framework for aid (Regulations (EC) No 1260/1999 and (EC) No 1263/1999). This resulted in improved opportunities to deploy funds in the interest of sustainable development. However, in practice, much of the aid is still designed to increase supplies of fish, improve the private economic performances of vessels and strengthen competitiveness on the global market.

In spite of the fact that fisheries subsidies can generally be considered to be environmentally harmful, the existing subsidy framework has also been used for environmentally beneficial purposes, although these are the exception rather than the rule. For example, in UK non-Objective 1 areas, FIFG funding has been used to support various projects aimed at the fish processing and marketing sector, with environmental benefits. These projects have sought to:

- reduce wastage;
- reduce energy consumption;
- increase the use of local raw materials;
- reduce live fish mortality;
- enable the use of ISO 14001 environmental management systems.

Subsidies can also be used to encourage the adoption of more selective fishing methods (see Box 5.2).

Subsidies to industry

Direct subsidies to industry in the EU are controlled by State aid rules, which are enforced by the European Commission. Under these rules, subsidies are permitted, particularly to support the uptake of environmentally beneficial behaviour.

One example is the so-called 'enhanced capital allowances' in the United Kingdom, which enable a

Box 5.2 Support for a selective fishing method

A fisherman in the south-west of England was granted EUR 2 800 of Objective 1 FIFG funding to install jigging machines on his vessel. These are effectively small robots that imitate the 'jigging' action of a fishing line to catch fish. This concept, relatively new to British waters, is becoming popular with Cornish fishermen. This is because the machines catch high-quality fish, which makes this sustainable method of fishing economically viable for fishermen. This method is also regarded as environmentally friendly because it has little impact on the marine habitat, does not catch fish when they are breeding, and the fishermen can throw back any unwanted fish while the fish are still alive. This means that fish not suitable for the market can be returned to the sea unharmed. The machines also help to improve quality, as the fish are pulled fresh from the sea and iced, rather than left in nets to deteriorate.

business to claim 100 % first-year capital allowances on spending on a range of machinery, including energy-saving plant and machinery, low-CO₂-emission cars, natural gas and hydrogen refuelling infrastructure, and water conservation plants and machinery⁽⁸¹⁾. Other examples of similar policies exist in the Czech Republic where eco-labelled or energy-efficient products can obtain lower VAT ratings. There has also been a list of equipment that can be subject to accelerated depreciation in place in the Netherlands since 1991, with the instrument formally known as the 'accelerated depreciation of environmental investments measure' (VAMIL). Apart from its favourable effects on the environment, the measure is an incentive for the development and supply of environmental technologies. The VAMIL list is regularly updated and has been growing. The 1992 list had 120 items, the 1993 180. The ambition is that around 30 % of all environmental investments will be on the VAMIL list⁽⁸²⁾. Since 2004, the MIA facility (environmental investment deduction) has given additional fiscal advantages to Dutch companies for certain environmental investments.

It is expected that subsidies will continue to play an important role in the development and uptake/diffusion of technologies and practice in industries, particularly with the advent of the environmental technologies action plan (ETAP) in the EU. With ETAP, the Commission commits itself to investigating the possibility of setting up performance-based requirements in public procurement procedures. This might again increase the role of public authorities in promoting the integration of environmental considerations in both production and consumption decisions.

Subsidies in the transport sector

In the context of European transport policy, support for environmentally friendly forms of transport includes the promotion of a modal shift towards

railways, intermodal transport, inland waterways and maritime transport (Decision No 884/2004/EC; COM(2001) 370).

Subsidies in the transport sector exist for a number of reasons, and increasingly to encourage more environmentally beneficial behaviour. One category is infrastructure funds, which are discussed below, and other policies, such as the trans-European transport networks (TEN-Ts). The TEN-Ts act as a driver for the development of trans-border transport infrastructure in the EU. They help to focus the funding of European banks, Member States and accession countries through preferential access to key funds and are thus linked to other subsidy mechanisms.

On the environmentally positive side, subsidies are increasingly being used to encourage the diffusion of cleaner technologies in the vehicle market. For example, low-emission vehicles can be encouraged in a number of ways through the application of subsidies and support. One example is the 'Power shift' programme, launched in 1996 by the UK's Energy Saving Trust, a company set up by the government to promote energy efficiency in the transport and domestic sectors. The programme offers grants to help with the purchase of clean-fuelled vehicles, which include vehicles running on natural gas (CNG and LNG), liquefied petroleum gas (LPG) and electricity (including hybrids), or the conversion of current vehicles to operate on cleaner fuels. A parallel programme offers grants to operators of commercial vehicles and public operators, for example buses and emergency vehicles, to assist with the cost of fitting emission reduction technology, while a third programme aims to stimulate the development of low-carbon vehicle technology⁽⁸³⁾. In the Netherlands, fuel-cell buses are supported in cities such as Amsterdam (see Box 5.3). Other countries, for example Luxembourg, have similar grant schemes to stimulate the purchase of low-CO₂-emitting cars⁽⁸⁴⁾. In France, there are

Box 5.3 Municipality support for fuel-cell buses in Amsterdam

The municipal transport authority of Amsterdam (GVB) is taking part in a two-year field programme, led by DaimlerChrysler and sponsored with an EUR 18.5 million EU grant, on the development of fuel-cell vehicles. The local authority is testing fuel-cell buses in the northern part of the city. The special task of the GVB is to test the buses under specific city conditions. It is carrying out the project with the support of the local environment agency, Shell Hydrogen, NUON and the municipal waste management firm GDA. The cost of the project is around EUR 6 million.

Sources: Building on GVB (2004), CUTE (2004) and Brander *et al.* (2003).

⁽⁸¹⁾ <http://www.eca.gov.uk/>.

⁽⁸²⁾ <http://www.vrom.nl/pagina.html?id=6551>.

⁽⁸³⁾ www.est.co.uk.

⁽⁸⁴⁾ OECD/IEA (2002), *Dealing with climate change: Policies and measures in IEA Member countries*, 2002 edition, OECD, Paris.

Box 5.4 Subsidies available for cleaner vehicles in France

In France, subsidy schemes are in place to:

- encourage technology diffusion or new techniques;
- open and develop the market for cleaner vehicles;
- address the barriers that are hampering the diffusion of mature technologies.

One key example is ADEME's programme bus, under which it is possible to get subsidies to support LPG vehicles (new and conversions). The amount can go up to EUR 7 500 per vehicle, though there are limits to the number of vehicles and the timescale. The focus here is on local private transport companies or public transport companies that offer a public service. Other incentives include a possible 30 % (maximum) subsidy for innovative systems to reduce pollution from buses and support for electric and hybrid buses (up to 20 % of additional costs compared with traditional alternatives). Natural gas buses now make up 8 % of the market and 30 % of new sales.

For light commercial vehicles there are also subsidies available for low-emission vehicles, but with a maximum of EUR 1 500 per vehicle. These can be for public or private owners. There is also support for electric vehicles, with a maximum of EUR 225 per vehicle.

Source: <http://www.ademe.fr/auto-diag/transports/rubrique/AidesFinancieres/OE.asp>.

also a number of subsidies for passenger cars, heavy goods vehicles (HGVs), waste collection vehicles, buses, and electric bicycles (see Box 5.4).

In other countries, the tax system is used to encourage the acquisition and use of alternatively fuelled vehicles. For example, in 2001, Sweden introduced tax breaks for employees who receive alternatively fuelled cars from their employers as part of their remuneration package, and the use of tax credits for the purchase of gas vehicles has been considered in France⁽⁸⁵⁾. In Germany, a tax reduction on low-CO₂-emitting cars has been applicable since 1997 with differing rates for cars emitting less than 120 g CO₂/km and 90 g CO₂/km⁽⁸⁶⁾. In the Netherlands, subsidies for low-emission vehicles have been set and linked to vehicle labelling (see Box 5.5).

Some subsidy schemes have addressed SO₂ and NO_x emissions from maritime transport. The Swedish government subsidised the installation of NO_x-abatement technologies as part of a differentiated dues scheme — its 'differentiated fairway dues'. Fees during the period 1998–2004 showed that overall the 'cleanest' paid half the costs of the 'dirtiest', and that more ships used low-sulphur fuels and installed NO_x-abatement equipment, with the result that

NO_x emissions were assessed to have dropped by 10 % and SO₂ emissions by 30 %. NO_x-abatement equipment was encouraged by capital investment subsidies available during the first two years. The scheme will have a new design in 2005, with greater environmental differentiation for NO_x (12 levels) and sulphur content (four levels). Norway has also sponsored NO_x abatement, with 45 pilot projects during 1996–2000, covering a range of vessels and technologies⁽⁸⁷⁾.

5.1.3 Environmental support schemes

A wide range of environmentally motivated support schemes exist across Europe. Environmental funds include major international funds like the EU Cohesion Fund, which aim to support water, wastewater and waste treatment infrastructure in certain Member States, and the EU instrument for structural policies for pre-accession (ISPA), which was put in place to provide similar assistance to EU accession States⁽⁸⁸⁾. Such funds can also include national funds, which were prevalent in the new Member States to help support investment in environmental infrastructure. In addition, there are also national funds in the older Member States — for example, the State financial funds for sustainable development in Sweden, the water fund in France

⁽⁸⁵⁾ Ibid.

⁽⁸⁶⁾ DLR (2004), Preparation of the 2003 review of the commitment of car manufacturers to reduce CO₂ emissions from M1 vehicles, final report to the European Commission, German Aerospace Centre, Institute of Transport Research, Berlin.

⁽⁸⁷⁾ Source: Presentation by Daniel Radov of NERA, 'Market approaches to reduce ship emissions in the EU', at the CAFE workshop 'Policy instruments to reduce air pollution', 11 and 12 November 2004. Original data sources from Stefan Lemieszewski, Swedish Maritime Administration.

⁽⁸⁸⁾ While ISPA still exists for the remaining accession States, the eight new Member States that were eligible for ISPA are now covered under the Cohesion Fund.

Box 5.5 Subsidy on energy-efficient cars: the Netherlands

EU Directive 1999/94/EC on labelling of new passenger cars came into force in 1999; it requires that a label indicating fuel efficiency and CO₂ emissions be displayed in relation to all new passenger cars sold in showrooms. The Netherlands government took the opportunity presented by the label to stimulate new technologies by providing subsidies for the most fuel-efficient cars, as measured relative to a standard that is regularly updated to ensure the continued stimulation of new technologies. The subsidy was introduced in 2002, where the lowest-emission cars (labelled 'A') received a subsidy of EUR 1 000 and cars with a 'B' label were subsidised to the level of EUR 500. The subsidy was abolished in 2003.

An evaluation study (VROM, 2003) suggested that the existence of the subsidy had significant benefits in terms of stimulating the market for lower-emission vehicles. The *ex ante* expectation of the effectiveness of the subsidy was that the number of A-labelled cars sold to private buyers would increase by 100 % and of B-labelled cars by 33 %. No effect on the sale of company cars was expected. In the event, the purchase of A-labelled vehicles by private purchasers increased by 967 % in the course of its year of operation, and the purchase of B-labelled vehicles by 41 %.

Source: Building on VROM (2003).

and the Carbon Trust in the United Kingdom. Such funds are subsidies that are potentially beneficial to the environment in that they support investment in infrastructure that can result in environmental improvements, for example water treatment installations, although not all investment supported by these funds is necessarily environmentally beneficial, for example road developments.

A Cohesion Fund of EUR 15 billion was established until the end of 1999, which was increased to EUR 18 billion in 1999, to cover the period 2000–2006. Its beneficiaries were restricted to Member States with a gross national product (GNP) per capita of less than 90 % of the EU average, i.e. Greece, Ireland, Portugal and Spain. To be eligible from 2000, Member States had to submit economic convergence and stability programmes. Projects eligible for support fall into two categories:

- environmental projects, contributing to the achievement of stated objectives, i.e.
 - preserving, protecting and improving the quality of the environment,
 - a prudent and rational utilisation of natural resources,
 - promoting international action to deal with environmental problems;
- transport infrastructure projects identified in EU guidelines on trans-European transport networks, as set out in Decision No 1692/96/EC, modified in April 2004 (Decision No 884/2004/EC).

The rate of assistance from the Fund for an individual project is set at 80–85 % of public or equivalent expenditure.

Instrument for structural policies for pre-accession (ISPA) was adopted as part of Agenda 2000 and provides financial assistance for the eight central and eastern European countries that joined the EU in 2004, as well as two of the remaining candidate countries — Bulgaria and Romania, as they prepare for EU membership. The stated aim of ISPA was and remains to align the applicant countries to 'Community infrastructure standards, particularly — and by analogy to the Cohesion Fund — in the transport and environment spheres'. ISPA offered approximately EUR 3.5 billion for environmental projects in the 10 countries over a seven-year period.

While an analysis of the environmental impacts of these funds is a major study in itself, it is clear that extensive investment in environmental infrastructures, notably on water supply, wastewater treatment and waste management, would not have been possible without this funding.

The establishment and development of environmental funds in central and eastern Europe have a relatively long history — such 'extra-budgetary' units were introduced in the 1980s (OECD, 1999b; Speck *et al.*, 2001). Environmental funds as established in central and eastern Europe are institutions designed to channel public revenues earmarked for environmental protection purposes. They administer revenues from a number of sources, including environmental charges, which are often the major revenue source, central budget transfers, foreign loans or grants, and debt-for-nature swaps. These revenues are spent on investments and projects designed to achieve environmental policy goals by providing subsidised financial assistance, mainly in the form of grants and soft loans. This policy approach regularly leads to discussions on

whether environmental funds are in accordance with the key tenets of environmental policy, such as the 'polluter pays' principle (PPP) and thus with the 'no-subsidy' philosophy. In addition, the Austrian government provides support for measures undertaken by its neighbours to the east to promote environmental protection⁽⁸⁹⁾.

A potential problem is that environmental funds might distort competition if they provide subsidies to the private sector in excess of the environmental values that the market prices do not cover. Furthermore, it is argued in the economic literature that well-targeted subsidies, especially during the transition phase towards a market economy, are in accordance with the 'polluter pays' principle, considering that most of the subsidies are generated from pollution charges (Peszko and Zylicz, 1998).

The phenomenon of subsidising environmental investment projects is not exclusive to central and eastern European countries — it is also common practice in many OECD countries, where a half or more of water and wastewater infrastructure investments have been financed via government subsidies (OECD, 1999b). Similar environmental funds can be found in the EU-15 Member States. For example, the fund for environment and nature (the so-called MINA fund) in the Flemish Region of Belgium is such a comprehensive fund. Revenues from different environmental charges are allocated to the MINA fund and used to finance a broad range of environmental projects in various sectors (Deketelaere, 2003). The French system of earmarking environmental charges in the water sector was an example of a specialised environmental fund, although the revenues are now integrated into the general budget. Water effluent as well as water abstraction (water intake) charges were deposited in the water basin agencies' accounts to provide grants or soft loans to public and private entities for investments to improve water resources and quality. During 1991–1996, the six French water basin agencies financially supported 43 % of total water-related investment costs (Kaczmarek, 1997). Another approach is currently being followed in other EU-15 Member States, such as Austria and Germany, where the governments contract either a commercial or a State-owned bank to support private sector or public environmental investment programmes via soft loans.

In addition, some funds focus on the provision of funding for other types of environmental projects. An obvious example is the EU LIFE (financial instrument for the environment) programme. The

most recent programme made EUR 640 million available for the period 2000–2004 for projects in three categories: LIFE-Nature; LIFE-Environment; and LIFE-Third countries, with the majority of resources split between the first two strands. The objective of LIFE-Nature is to contribute to the implementation of EU legislation aimed at protecting habitats and birds and the following categories of project are eligible for support:

- nature conservation projects which contribute to maintaining or restoring natural habitats and/or species to a favourable conservation status;
- accompanying measures to prepare projects involving partners in several Member States; exchanges of experience between projects; monitoring, evaluation and dissemination of results.

Contributions from LIFE-Nature to projects are set at 50 % (or up to 75 % for projects concerning priority species or habitats); and 100 % for accompanying measures. LIFE-Environment supports the following three categories of projects:

- Demonstration projects with one of the following purposes:
 - integration of the environment and sustainable development into land-use planning, including urban and coastal areas;
 - promotion of the sustainable management of surface or groundwater;
 - development of clean technologies, including the reduction of greenhouse gas emissions;
 - promotion of the prevention, reuse, recovery and recycling of waste streams;
 - reduction of the environmental impact of products over their life cycle.
- Projects which contribute to the development of new Community environmental actions or instruments, and/or the updating of environmental legislation and policies.
- Accompanying measures, to disseminate information, and to monitor, evaluate and promote actions under LIFE.

Financial support for LIFE-Environment projects is established at 30 % for projects developing substantial net revenue, and 50 % for all other projects. For accompanying measures, 100 % support is available. The objective of LIFE-Third countries is to contribute to the establishment of capacities and administrative structures needed in the environmental sector in the countries that border

⁽⁸⁹⁾ Technopolis BV (2004), 'Policy instruments for sustainable innovation', Amsterdam.

the Mediterranean and Baltic which do not have association agreements with the Community.

The 2000–2004 LIFE III programme has been extended by the new LIFE regulation (Regulation (EC) No 1682/2004), extending the scheme until the end of 2006. The Commission will be allocating EUR 317 million to cover the period from 1 January 2005 to 31 December 2006.

In recent years, there have been moves to integrate the environment into other funds that were put in place primarily for economic or social reasons, as, for example, the EU's Structural Funds.

The Structural Funds comprise a number of funds: the European Regional Development Fund (ERDF), the European Social Fund (ESF), the European Agricultural Guidance and Guarantee Fund (EAGGF) (Guidance Section), and the Financial Instrument for Fisheries Guidance (FIFG). For 2000–2006, the resources available to the Structural Funds amount to EUR 195 billion at 1999 prices, and Structural Fund expenditure accounts for more than one third of the Community's annual budget. The main purpose of the Structural Funds is to promote the economic and social development of disadvantaged regions, sectors and social groups within the EU and to 'contribute to the harmonious, balanced and sustainable development of economic activities, the development of employment and human resources, the protection and improvement of the environment, and the elimination of inequalities, and the promotion of equality between men and women'. Projects that are potentially eligible for support from the Structural Funds include:

- environmental infrastructure (e.g. water treatment, waste management);
- environmental enhancement for business (e.g. new business parks on derelict land);
- developing new environmental products (green technologies);
- developing new environmental services (e.g. recycling, repair, reuse, energy conservation);
- advisory services (e.g. environmental management systems);
- habitat management;
- environmental training to support any of the above, through the ESF.

For earlier periods, the Structural Funds could finance selected environmental projects. However, for the current period, 'the environment and sustainable development' were identified as one of three 'horizontal', or cross-cutting themes to which all projects should contribute. As a consequence,

finance available through the Structural Funds for environmental projects is substantially greater than through the exclusively environmental LIFE programme, and may be used in a wider range of Member States than is the case with the Cohesion Fund (see above). Following a significant revision of the Structural Fund regulations in 1993, various safeguards to ensure that projects supported by the Structural Funds do not inflict environmental damage have provided an opportunity for official environmental agencies to become more closely involved in regional economic development programmes.

The designation of environmental sustainability as a horizontal theme creates both opportunities and challenges. To improve their chances of securing funding, environmental projects need to demonstrate that they are also contributing to economic, employment and social priorities. However, at the same time, there are opportunities for using a wide range of non-environmental projects to make a positive contribution to environmental sustainability.

5.1.4 Green public procurement

In January 2002, the OECD Council recommended that OECD member countries take greater account of environmental considerations in public procurement of products and services (including, but not limited to, consumables, capital goods, infrastructure, construction and public works). Almost simultaneously, Court of Justice rulings (see Boxes 5.6 and 5.7) allowed for environmental and social criteria to be taken into account in public tenders. The new EU directives regulating public procurement further clarify the possibilities for public purchasers (national or local administrations, schools, hospitals, etc.) to integrate environmental considerations into the tender documents when they decide to buy goods, services or works for their day-to-day activities (Directives 2004/17/EC and 2004/18/EC). These possibilities have been further clarified by the Commission services in their recently published handbook on environmental public procurement (SEC(2004) 1050), which contains many examples of best practice.

This legislation allows contracting authorities to require specific environmentally friendly production methods, such as organic production for foodstuffs for schools, provided that the criteria are expressly mentioned in the contract documents or the tender notice, are connected with the subject matter of the contract, do not give the contracting authority an unrestricted freedom of choice, and comply with all the fundamental principles of

Box 5.6 Court of Justice ruling on low-pollution buses in Helsinki, Finland

In 2002, a Court of Justice decision supported the Helsinki city authority's purchase of a fleet of low-pollution buses. The Court said that Helsinki was justified under EU law to take into account the emission profile of the buses as one of the criteria determining its choice. EU legislation states that authorities can choose to adopt one of two award criteria, either the 'lowest price' or the 'economically most-advantageous' tender. The latter provides the opportunity to include other criteria — such as environmental ones — and to get 'best value for money'. The Court investigated the procurement choice following the case being submitted by the competitor who would have won on a least-cost basis. It concluded that the procurement decision, which took account of NO_x emissions and noise levels of the buses, was fair since it followed the environmental criteria laid down in the public procurement tender. The Court noted the conditions on the way in which these criteria can be applied. They must be 'non-discriminatory', 'connected to the subject matter of the contract', they must not give 'unrestricted freedom of choice' to the contracting authority, and they must be explicitly mentioned in the tender documents or notice. Given that the rules on how to award points for NO_x emissions and noise levels were clear and the fact that all companies offering proposals could have used natural gas buses and hence obtained the additional procurement points, the final conclusion was that there was no discrimination or restriction and that the procurement decision was fair.

Note: See also Court ruling in Case C-513/99 at <http://www.curia.eu.int>.

Community law, in particular the principle of non-discrimination. Similar conditions are attached to the use of social criteria. The text also allows contracting authorities to exclude companies that have not complied with EU legislation in economic, social or environmental fields, if such non-compliance is considered as grave professional misconduct. Already under the EU-15, public procurement equals EUR 1.4 trillion or 14 % of the countries' total GDP; the public sector thus has a large potential for providing substantial support for the integration of environmental considerations into the production of goods and services.

More broadly, the utility of green public procurement has been recognised at the global level. A plan of implementation for green public procurement was agreed at the 2002 World Summit on Sustainable Development in Johannesburg. Paragraph 18c of that plan states that relevant authorities at all levels should 'promote public procurement policies that encourage development

and diffusion of environmentally sound goods and services'.

Some countries have subsequently developed frameworks for taking forward their green public procurement policies (see Box 5.8), while others, such as Denmark, have set up voluntary agreements between national and local government to implement such policies. One such agreement was set up in Denmark in 1998 and by the end of 2001 almost all Danish local authorities had a green public procurement policy in place. Guidelines are developed centrally, but the implementation of policies is left to the respective administrations ⁽⁹⁰⁾.

5.2 Where are we going?

Some likely developments and development needs in relation to subsidies for various sectors, and more broadly in relation to environmental funds and green procurement, include the following:

Box 5.7 Court of Justice ruling on green procurement: renewable energy in Austria

On 4 December 2003, the Court of Justice settled a dispute between an Austrian electricity supplier and the national authorities. It recognised the possibility for contracting authorities to consider the renewable character of the sources of the electricity to be supplied as one of the award criteria for letting a public supply contract, basing itself on the fact that renewable energy helps to protect the environment, and that such a criterion (the source of the electricity) is clearly linked to the subject matter of the contract. Despite the 45 % weighting attributed to this environmental criterion, the Court ruled that this was in principle not incompatible with EU law.

Note: See also Court ruling in Case C-448/01 at <http://www.curia.eu.int>.

⁽⁹⁰⁾ Technopolis BV (2004), 'Policy instruments for sustainable innovation', Amsterdam.

Box 5.8 Greening public procurement in the United Kingdom

At the national level, there is an online toolkit, in relation to 'greening government', which includes:

- 'Note on environmental issues in purchasing';
- 'Green guide for buyers';
- 'Green claims code'.

Following the deliberations of an interdepartmental working group, government departments are expected to buy goods that meet certain 'quick win' specifications that include buying products that meet certain standards for energy efficiency, recycled content and biodegradability. Examples of quick win specifications are:

- PCs should meet current 'Energy Star' requirements;
- copying paper should have a 100 % recycled content, with a minimum 75 % post-consumer waste;
- paper for printed publications should have a minimum 60 % recycled content, of which 75 % is post-consumer waste;
- kitchen and toilet tissue should have a 100 % recycled content;
- improvers for growing media and soils should consist of ingredients derived from the processing and/or reuse of waste materials.

The relevant central government department has also published a strategy for local authority public procurement, which includes a range of targets and a statement to the effect that '[e]very council should build sustainability into its procurement strategy, processes and contracts'.

Sources: <http://www.sustainable-development.gov.uk/delivery/integrating/estate/procurement-intro.htm>; http://www.odpm.gov.uk/stellent/groups/odpm_control/documents/contentservertemplate/odpm_index.hcst?n=5005&l=3.

- **Agriculture:** Pressure to reform the CAP is likely to continue and further reforms will be implemented, including greater use of cross-compliance linking of CAP expenditure to compliance with EU environmental legislation. External pressure for subsidy reform is likely to come from the WTO, but this will be more in relation to the reform of existing subsidies than the development of environmentally beneficial subsidies.
- **Energy:** Subsidies for fossil fuels are likely to continue to decline, and there will be increasing pressure to phase out those that remain, for example those on coal. Nuclear subsidies are likely to remain for the foreseeable future due to the expensive nature of the industry and the need for government support in the form of guarantees and limiting liability in the case of accidents, waste disposal and liabilities. In the short term, it is likely that subsidies for renewable energy will increase in order to ensure that these energy sources will be able to compete with traditional energy sources and overcome the still-existent situation of 'lock-in' to traditional (fossil) energy and to move the new technologies forward on their learning curve. When this occurs, direct support may decline, whereas indirect support, for example in terms of targets for the proportion of energy sources from renewables, will remain. The longer-term market price development of oil and efforts to continue to include external costs in prices will prove to be major determinants of the market penetration of renewable forms of energy, in addition to the need for financial support.
- **Fisheries:** As with agriculture, it is likely that there will be continued pressure to reduce existing environmentally harmful subsidies, and the use of subsidies to support environmentally beneficial purposes could increase.
- **Industry:** Subsidies to industry in the EU are, under State aid rules, allowed for environmental reasons, and there is the prospect of an increase in the use of such subsidies, for example to encourage the development, incubation and market penetration of clean technologies (as is already happening in the transport and energy sectors).
- **Transport:** It is likely that the subsidy of transport infrastructure in central and eastern Europe will continue for the foreseeable future, until the transport infrastructure in these countries is similar in quality and coverage to that in western Europe. The use of subsidies to encourage the diffusion of cleaner-vehicle technologies is also likely to continue and perhaps become more widespread.
- **Environmental funds:** As with transport infrastructure, it is likely that environmental funds will continue to support the development of environmental infrastructure, particularly in

central and eastern Europe. There will also be further pressure to improve the environmental performance of other funding mechanisms, such as the Structural and Cohesion Funds in the EU.

- **Green procurement:** With the recent landmark rulings at the European level in favour of the use of green procurement to support environmental ends, it can be expected that the application of green procurement will increase substantially in the coming years.

Broadly speaking, three broad issues can be identified:

- a general recognition of the need to remove environmentally harmful subsidies;
- concerted efforts to safeguard competitiveness;
- interest in supporting clean technologies – which responds to the Lisbon and Gothenburg agendas and the ETAP interests. The ambition is to obtain the triple dividend – environmental benefits, economic efficiency and improvements in competitiveness, as well as employment through developing markets for new technologies and the safeguarding of sectors where clean technologies offer needed efficiency gains.

If environmental externalities are better internalised, there will be more of a level playing field for technologies and there should be less need for pro-environmental subsidies. We are, however, far from the point where externalities are fully internalised, and the ideal objective, of prices reflecting all costs including external ones, still seems an unachievable ideal, despite rhetorical support.

Most developments of subsidies take place at the national level. These are, however, carried out in the European context, with some limitations set (e.g. State aid), and others in place de facto (e.g. concerns about impacts on competitiveness). There are also opportunities, in the informal process of 'learning from others' that can lead to a type of 'soft harmonisation', or the potentially more formal process of the open method of coordination (OMC) ⁽⁹¹⁾, where better coordination on progress can be developed for instruments across Europe. This OMC process is being considered for use with

regard to subsidies to support clean technologies, and subsidy reform in Europe.

5.3 What lessons can we learn?

Some key lessons from the use of subsidies, subsidy reform, support schemes and green purchasing are as follows:

- Subsidies should be applied with care since they intervene in the market and use scarce public resources. They should be structured to avoid a dependency on financial support, for example, by being time limited, or related to some level of market penetration or technological maturity. They should be made relevant to the purpose for which they are designed, implying, for example, that longer-term support may be needed for technologies with long payback periods. They should be well targeted and their performance monitored to avoid unintended results such as the development of interest groups that seek to profit from subsidies and waste the resource, resulting in lower value for money.
- For pro-environmental subsidies, the scale of the need should be carefully assessed to ensure that it is enough to offer the encouragement needed; in other words, to get the leverage and move the feasibility of the initiative to just above the threshold ⁽⁹²⁾, and not lead to excessive support. This is important not just as a resource issue (i.e. to keep some resources for supporting other projects or technologies that need them), but also for the sake of the reputation of the instrument. Having too much support can lead to deception at some stage and a weakening of the environmental argument in the long term ⁽⁹³⁾.
- It is now acceptable for public procurement to take environmental criteria into account so that broader-based measures of value can inform the adjudication of tenders for public goods and services.
- There has been a progressive integration of environmental concerns, including pricing, into infrastructure and economic development funds, for example Cohesion and Structural Funds, though little is known about their effectiveness.
- Subsidies have been extremely important in accelerating the commercialisation of new technologies, for example, for photovoltaics

⁽⁹¹⁾ See Homeyer *et al.* (2004). A further report on OMC will be forthcoming in the second half of 2005 by ten Brink *et al.*

⁽⁹²⁾ This is, however, a dynamic concept since the marginal need for a technology to be viable generally falls over time as the marginal cost of production drops (as can be seen with wind power, photovoltaics, etc.).

⁽⁹³⁾ This is already being seen in some places where those hostile to wind or other technologies criticise subsidies as being beyond the necessary level and that policy-makers are becoming affected by vested interests. This complicates efforts to move forward and ensure appropriate support for needed technologies.

in the domestic sector and the development and use of wind turbines. The development and uptake of new technologies also, however, depend on other factors (attitudes of households, municipal authorities and commercial organisations) and initiatives (e.g. ensuring appropriate facilitating planning rules to ensure access to markets and infrastructures).

- Subsidy reform needs to be based on a careful analytical exercise that takes into account the interrelations of instruments, subsidy leakage to other parts of the economy, the existence of policy filters that may reduce the harm of the subsidy, the potential negative effects (i.e. not just the benefits) of subsidy removal (including distributional effects), and the existence of viable alternative instruments if and where policy objectives still need to be supported.
- Finally, the term 'subsidies' is generally perceived pejoratively — in short, 'subsidies are bad'. This can run counter to needs. In some places⁽⁹⁴⁾, the term 'subsidies' is being replaced by 'incentive payments' to give the right message.

5.3.1 Sectoral insights

Some key sectoral insights, building on the above and the broader literature on subsidies, subsidy reform, support schemes and green procurement, are noted below for different sectors of the economy.

Agriculture

- It has proved possible to reform major subsidies that have clearly had some harmful environmental impacts, and reform them in a manner that takes greater account of environmental impacts and encourages more environmentally responsible behaviour.
- Subsidies can build on the link between the environment and rural development — for example, with subsidies to encourage organic farming practices in remote rural areas, supporting employment and the viability of rural communities.

Energy

- There are different national approaches within Europe to supporting the development of renewable energies and in many cases they are part of an instrument mix that facilitates their effectiveness.
- Subsidies have proved valuable in encouraging the development and uptake of renewable energy technologies in the face of competition

from more mature and established conventional energy technologies such as coal, nuclear and gas. The subsidies have supported the development of these technologies from nascent non-competitive technologies of high cost and technological risk to ones of greater market maturity and lower risk. In some cases, these technologies are getting close to competitiveness in the market (e.g. wind in high-wind zones). Longer-term development of the market price of oil remains a major and uncertain factor.

- Historically and currently, there have been considerable subsidies for conventional fuels — coal, gas, oil and nuclear. Some subsidies are being phased out (e.g. coal, albeit at different rates across countries) and some are ongoing and still fundamental to the survival of the industry (e.g. nuclear through accident liability coverage, waste storage, etc.).

Fisheries

- Fisheries subsidies have in general contributed to overcapacity in the industry and major pressure on some fish stocks, in some cases to the point of collapse. Subsidy reform can be used to address some of these problems and encourage less environmentally damaging behaviour.
- Direct subsidies — in the form of support payments — are exacerbated by a lack of fuel taxation which can be seen as an indirect subsidy (in some countries, for example the United States, fuel tax exemption is not considered a subsidy by law).

Industry

- Industry is often exempt from all or part of some environmental taxes, often on the grounds of competitiveness concerns for sensitive industries and ensuing employment concerns. Where the exemptions relate to international competition, border tax adjustments could be a solution as far as they are allowed under internal market and WTO rules.
- In many cases, the arguments for tax exemption are founded on the lack of substitute products or processes and hence on the lack of options to respond to the tax. While many of the exemptions are still in place, industry has sometimes been able to develop or source substitute products, rendering the exemptions inappropriate.
- Given State aid guidelines, new exemptions are now more difficult to grant in the EU, although

⁽⁹⁴⁾ There is a move in this direction in the United Kingdom.

it is still possible to grant reductions in tax rates if there is proof of equivalent action. This approach is used in the United Kingdom and Denmark. In the case of the United Kingdom, industry can obtain an 80 % reduction in the climate change levy if an acceptable climate change agreement is in place.

Transport

- There is a precedent for the inclusion of environmental concerns in public procurement and hence considerable scope for using public procurement as a mechanism for the appropriate uptake and diffusion of cleaner-transport technologies.
- The use of subsidies for low-emission (CO₂) vehicles has been successfully linked to the existence of labelling schemes.
- Municipal leadership has proved a key to forward-looking approaches to public procurement — leading to cases where electric or fuel-cell buses have been purchased on environmental and health grounds.

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6 Liability and compensation

Liability and compensation are old terms, historically dealt with through criminal and civil law. Fines and penalties can be levied in cases of non-compliance with environmental laws or legal requirements (e.g. through permit or licence conditions); in some cases, compensation can be demanded from polluters, and in extreme cases prison sentences may be passed.

Liability and compensation have not typically been regarded as market-based instruments. However, they do have some potential to produce a number of economic impacts and to affect the market, and they can therefore be classed as economic or market-based instruments. The impacts include:

- fines and non-compliance penalties (e.g. for breach of emissions standards);
- the risk of liability and the need (where applied) to have insurance or contingencies to cover eventual liabilities;
- the effects of liabilities on price (e.g. in the sales/privatisation of industries, installations and sites, the price can be affected by perceived liabilities to clean up contaminated land);
- the costs of addressing liabilities (e.g. clean-up of land);
- the costs of compensation (e.g. for oil spills).

The extent and importance of many of these vary and often depend on the case and the country. The impact on the market — in terms of economic signals — is often quite limited, as a consequence of current applications and indeed formal liability requirements or limitations in place. There is a general limit to liability and potential compensation levels — most companies are 'limited liability', so by definition there is a limit to the economic risk companies face⁽⁹⁵⁾ and the potential compensation available. Governments also sometimes take on board some of the risk on behalf of companies/activities (the most obvious case being nuclear

power⁽⁹⁶⁾). The current system can therefore lead to the companies' provisions for ensuring potential compensation often being far less than the potential level of damage and appropriate compensation, and therefore still far from implementation of the 'polluter pays' principle. That said, many of these issues and applications of liability and compensation provisions are becoming increasingly important⁽⁹⁷⁾ and interesting, and, hence, it is timely to include liability and compensation issues in a report on market-based instruments.

In the context of damage to the environment, the development and enforcement of liability legislation inherently recognise the rights of the public to environmental goods, specifically placing responsibility on the polluter for restoring the environment or compensating for environmental damage. A most notable development, which has raised the profile and importance of liability legislation in the EU, occurred in March 2004, when the European Parliament and the Council approved their long-awaited directive on liability for damage to the environment — following 10 years of discussions. The directive entered into force on 30 April 2004 with formal compliance required by 30 April 2007, by which time all EU Member States must have adopted legislation specifying liability for environmental damages, including damage to protected species and natural habitats.

A number of European countries have already adopted legislation dealing with liability for soil contamination and the costs of clean-up. However, the instrument could be employed on a much wider scale.

This chapter⁽⁹⁸⁾ introduces liability regulation and related economic incentives, and explores recent developments in national legislation in Europe, the EU liability directive, and associated topics such as insurance and risk assessments. It also touches on relevant US experience and on various international

⁽⁹⁵⁾ There is also, of course, risk of legal action and potential criminal proceedings so the economic risk is only one aspect to take into account. Note also that this is a general limitation and not one just for the environment. It is also a provision arguably necessary for the functioning of economies, with due benefits in terms of employment and economic development.

⁽⁹⁶⁾ See *The Economist*, 3–9 July 2004.

⁽⁹⁷⁾ Recent developments in EU law include Directive 2004/35/EC on environmental liability and Council Framework Decision 2003/80/JHA of 27 January 2003 on the protection of the environment through criminal law.

⁽⁹⁸⁾ This chapter was drafted for the EEA (contract reference 3223/B2003.EEA.51620) by the team comprising Patrick ten Brink, Karen Hoyer, Jason Anderson and Saskia Richartz (all of the IEEP). Valuable inputs were also received from Ian Skinner (IEEP) and Marc Clement (EEA). It has benefited from the comments of the expert group (see 'Foreword and acknowledgements') and comments of the EEA's national focal points (NFPs).

conventions that have influenced the development of liability regimes at the European level. It then discusses possible future developments and notable lessons learnt.

6.1 What systems of liability and compensation are in place?

Environmental liability has been an issue on the international political agenda for almost half a century. Early conventions dealing with liability include the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy and the 1963 Vienna Convention on Civil Liability for Nuclear Damage. A range of international conventions establishing liability for damage to the environment has subsequently emerged. These conventions concentrate especially on hazardous activities that could lead to transboundary pollution (see Box 6.1).

Furthermore, Principle 13 of the 1992 Rio Declaration on Environment and Development stipulates that 'States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage; they

shall also cooperate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction'.

The 1993 Lugano Convention on Civil Liability for Damage resulting from Activities Dangerous to the Environment is an attempt to implement liability regulations. It 'aims at ensuring adequate compensation for damage resulting from activities dangerous to the environment and also provides for means of prevention and reinstatement' (Article 1 of the Convention).

The Lugano Convention has not yet entered into force, not having received the ratifications required. The financial requirements of the Convention are an interesting development in a European context. Operators conducting dangerous activities in a signatory territory are required to participate in a financial security scheme or to have and maintain a financial guarantee. Furthermore, the Convention takes a first step in referring to the reinstatement of damaged components of the environment, provided it is considered reasonable. The lack of ratification

Box 6.1 International conventions and commitments

- 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy.
- 1963 Vienna Convention on Civil Liability for Nuclear Damage — entry into force 12 November 1977.
- 1969 International Convention on Civil Liability for Oil Pollution Damage — entry into force 19 June 1975.
- 1976 Convention on Limitation of Liability for Maritime Claims — entry into force 1 December 1986.
- 1988 Strasbourg Convention on Limitation of Liability in Inland Navigation — entry into force 1 September 1997.
- 1989 Convention on Civil Liability for Damage caused during Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels — not yet in force.
- 1992 International Convention on Civil Liability for Oil Pollution Damage — replaces the 1969 Convention — entry into force 30 May 1996.
- 1992 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage — entry into force 30 May 1996.
- 1993 Lugano Convention on Civil Liability for Damage resulting from Activities Dangerous to the Environment — not yet in force.
- 1996 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea — not yet in force.
- 1997 Protocol to amend the Vienna Convention on Civil Liability for Nuclear Damage — entry into force 4 October 2003.
- 1999 Basle Protocol on Liability and Compensation — not yet in force.
- 2001 International Convention on Civil Liability for Bunker Oil Pollution Damage (Bunkers Convention) — not yet in force.
- 2003 Protocol on Civil Liability and Compensation for Damage caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters — not yet in force.

Main source: Yearbook of International Cooperation on Environment and Development 2003/2004. Online version at <http://www.greenyearbook.org/about/ab-ind.htm>.

may indicate reluctance on the part of European States to impose comparatively strict liability regimes on their industries, potentially distorting competitiveness with non-signatory States. Some argue that the implementation of the EU liability directive (see Section 6.1.2) may make ratification of the Lugano Convention by Member States easier.

Establishing liability for environmental damage could be done on the basis of the 'polluter pays' principle. This specifies that the polluter should bear the expenses of ensuring that the environment is in an acceptable state and that environmental costs should be reflected in the cost of goods and services which cause pollution in production and/or consumption. The interpretations of 'polluter' and 'costs' associated with environmental damage vary (EEA glossary; OECD, 1974).

A number of other principles also lend support to establishing liability for environmental damage — including the principle of preventive action, the precautionary principle, the principle of sustainable development, and the principle of restoration — however, not as directly as the 'polluter pays' principle.

6.1.1 Legislation on liability in Europe

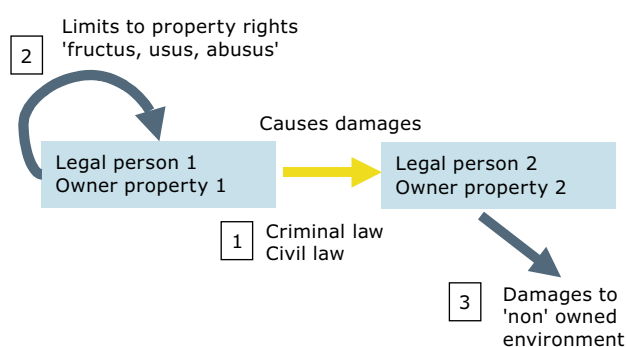
Overview

Although liability is a well-established concept in law, liability for environmental issues leads to specific difficulties. Three different situations can be identified:

- where a legal person or owner or property causes damage to another;
- where a legal person damages his or her own property;
- where a legal person damages the environment for which no property rights have been established (the non-owned environment).

This is represented in the figure below.

Figure 6.1 Types of environmental liability – Different situations



The first situation ¹ falls under traditional civil and criminal law: if a legal person causes damage to the property of another legal person, this could lead to compensation through civil law mechanisms. This applies partly to damage resulting from oil spills, for instance. The main question with these mechanisms is that the possibilities of compensation could be limited by the financial capacity of the polluters.

The second situation ² occurs where the owner damages his or her own property. Traditionally, property rights include the possibility of destroying the property ('abusus'). Therefore, limits to the property rights apply which can have consequences, for example in the case of soil contamination where an obligation to restore polluted sites is imposed on the owner.

The third situation ³ occurs when damage is done to 'non-owned' goods. An example is damage to groundwater resources. In such cases, a special regime of liability has to be set up, with public authorities playing a major role.

Legislation in place in European countries addresses environmental liability to differing levels of completeness, for the three categories of situations for different environmental problems, and build on different legal terms (see Box 6.2).

Existing regimes range from the clean-up of soil and water contamination to habitat protection. Examples include the following (see also Boxes 6.3 to 6.8):

- **Marine:** Belgium has a liability regime that seeks restoration or monetary compensation if damage occurs to marine areas, with specific attention to biodiversity and site integrity (environmental liability situation 3).
- **Oil spills:** This is covered by international regimes, with national implementation and extension in some cases. Compulsory insurance and compensation funds are provided for by the international instruments (Civil Liability Convention and IOPC) to which most European countries are a party — for example, see Box 6.3 for Finland (environmental liability situation 1 addressing the problem of limited financial capacity of the polluter).
- **Contaminated land/soil:** Liability regimes are in place in many European countries, including Denmark, Finland, France and Ireland (environmental liability situation 2).
- **Habitats/biotopes:** In Germany, the Federal Nature Conservation Act addresses impairment of ecosystems and landscapes. Sweden also has legislation addressing the restoration or

Box 6.2 Legal terms

Strict liability: Automatic responsibility without having to prove fault or negligence for damages. Control, ownership and damages are sufficient to hold the owner liable.

Fault-based liability: Liability can only be established if it can be proved that the polluter was at fault or negligent.

Joint liability: When two or more persons are responsible for the damage.

Several liability: Referring to the responsibility of one party for the entire damage.

Joint and several liability: Makes each of the parties responsible for the damage liable for all the damages awarded in a lawsuit.

Strict, joint and several liability are generally referred to when dealing with activities that are potentially dangerous/hazardous to the environment, while fault-based liability is used for activities not categorised as hazardous.

replacement of damaged biodiversity or habitats (environmental liability situation 3).

- **Contaminated groundwater:** Countries with liability regimes in place include Denmark, Finland, and France (environmental liability situation 3).
- **Air:** Denmark, under the Environmental Damage Compensation Act of 1994 (environmental liability situation 3).
- **Noise and vibration:** Countries with liability regimes in place include Finland (environmental liability situation 3).
- General need to have **funds to cover environmental liabilities:** Belgium (related

to marine risks) and Ireland (environmental liability situations 1 and 3).

- **General liability through the civil code:** For example, in France, where the civil code adopts a fault-based approach and enforces liability for damage caused to a third party as a result of fault or negligence. It calls for monetary compensation from operators. It is widely interpreted to cover environmental damage (environmental liability situation 2).

Box 6.3 presents a case example (from Finland) and other issues are addressed in subsequent sections where media-specific issues are discussed in turn.

Box 6.3 Case example – European environmental liability regimes: Finland

Environmental liability in Finland is covered by three main acts — the Act on Compensation for Environmental Damage (1994), the Environmental Damage Insurance Act (1998) and Environmental Protection Act No 86/2000 which came into force on 1 March 2000.

The first is a strict liability regime covering: (i) pollution of water, air or soil; (ii) noise, vibration, radiation, light, heat or smell; and (iii) other similar nuisance. Compensation should cover the costs of reasonable measures taken to prevent or limit environmental damage and for clean-up and restoration of the environment to its previous state. So far, not many claims have been made.

The Environmental Damage Insurance Act helps to set up a compensation fund that guarantees full compensation for environmental damage in cases where those liable for compensation are insolvent, or the liable party cannot be identified. This is, however, not retroactive. Oil spills are not covered here but by a specific oil pollution compensation fund, administered by commercial insurers and financed from compulsory insurance premiums⁽⁹⁹⁾.

The 2000 Environmental Protection Act includes requirements for compulsory insurance for contaminated soil and groundwater and builds on strict, joint and several liability, in the order of (i) causer; (ii) site holder and (iii) local authority.

⁽⁹⁹⁾ See <http://www.vakes.fi/yvk/> (in Finnish).

Box 6.4 Case example – Damages caused by oil pollution: *Prestige* 2002

In November 2002, the oil tanker *Prestige*, laden with 77 000 tonnes of heavy fuel oil, broke into two off the coast of Galicia (Spain) spilling an unknown but substantial quantity of its cargo.

A major offshore clean-up operation was carried out using vessels from Spain and nine other European countries. The oil from the *Prestige* affected the Atlantic coast at least from Vigo in Spain to Brest in France, as well as causing intermittent and light contamination on the French and English coasts. Around 141 000 tonnes of oily waste have been collected in Spain and some 18 300 tonnes in France. The bow and stern sections, which are lying in 3 500 metres of water, are estimated still to contain 13 300 tonnes and 900 tonnes of oil respectively.

Approximately EUR 22 million of compensation is available from the shipowner's liability insurer and approximately EUR 150 million from the 1992 IOPC Fund, making a total of EUR 172 million available for compensation claims. It is estimated that the total losses following the *Prestige* incident could total EUR 1 100 million, which greatly exceeds the amount of compensation available. For this reason, the Executive Committee of the Fund decided in May 2003 that the 1992 Fund's payments should be limited to 15 % of the loss or damage actually suffered by the respective claimants.

Oil spills

Liability for damage caused by oil spills is established through international conventions (see Box 6.1). In the case of oil pollution, the International Oil Pollution Compensation Fund (IOPC Fund) was established in 1992 and is financed by contributions from oil receivers. The maximum compensation that could be paid for one incident, including the amount paid by the shipowner and his/her insurance, was limited to EUR 240 million (2003). The incidents with the oil tankers *Prestige* (see Box 6.4) and *Erika* (see Box 6.5) have made it clear that if compensation claims exceed the maximum amount, damages will only be partly compensated (see Box 6.4). This has led to an increase in the maximum compensation amounts. A supplementary fund protocol, agreed in May 2003 and extending the available funding to EUR 975 million, entered into force in March 2005. Further increase in the available funding is expected.

In addition, there is also a range of measures to address oil spills from oil storage tanks on land. In many countries, schemes are in place to help avoid damage and ensure that funds are available in case of leaks. For example, in Denmark, there is a strict liability scheme – 'Olietanksbekendt-gørelsen' – that covers domestic oil tanks smaller than 6 000 litres. Clean-up of contaminated soil is the tank owner's responsibility, and there is a compulsory insurance required (maximum liability of EUR 270 000). Interestingly, oil companies have decided to pay insurance for customers, to help ensure consumer loyalty⁽¹⁰⁰⁾.

Nuclear

Liability for nuclear damage is established *inter alia* through the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy and the 1963 Vienna Convention on Civil Liability for Nuclear

Box 6.5 Case example – Damages caused by oil pollution: *Erika* 1999

In the 1999 incident involving the oil tanker *Erika*, 6 908 claims for compensation were submitted by 1 April 2004 for a total of EUR 207 million, while only EUR 185 million was available. The French government and the French oil company TotalFinaElf undertook to pursue their claims only if all other claimants were compensated in full, making it possible for the Fund to raise compensation payments from 80 % to 100 % for all other claimants.

The criteria for admissibility are a major issue in a number of court actions in the *Erika* case. In four court cases, a French court held that it should take its decision as to admissibility in accordance with the criteria of French law and that the Fund's criteria were not binding. Another French court rejected a claim in the light of the Fund's criteria. Considering the importance of this issue for the proper functioning of the international compensation regime, the Fund is pursuing appeals against the first four judgments.

Source: International Oil Pollution Compensation Fund (<http://www.iopcfund.org/>).

⁽¹⁰⁰⁾ See BEK No 829, 24.10.1999 (www.retsinfo.dk/ (in Danish)).

Damage (entry into force 12 November 1977) and subsequently by the 1997 Convention on Civil Liability for Nuclear Damages (see Box 6.1) ⁽¹⁰¹⁾. The Convention includes liability for measures to reinstate damaged environmental components and establishes a minimum level of compensation at 300 million SDR as defined by the International Monetary Fund ⁽¹⁰²⁾. States installing nuclear power plants can specify a maximum compensation level equal to or above this threshold. However, States may decide to reduce operator liability by setting the maximum compensation to be paid by the operator to as little as 5 million SDR, provided that the State makes public funds available to cover further compensation payments up to the specified maximum (see Box 6.6).

In practice, different countries have different liability thresholds, with different maximum amounts that the different national nuclear industries would have to face in case of accidents, and also different national maximums for compensation. In other words, the companies' liability is limited through this as the government picks up some of the liability, and the government's liability is also capped. This can be seen as a subsidy for the industry as the government is a guarantor for covering liabilities above the ceiling rate. Without the government accepting some share of the liability, the nuclear industries, where privatised, would not have been able to have been privatised. Without the public de facto being asked to accept some of the risk (as not all damage would be compensated), it is questionable whether the industry would have been viable. A similar argument applies to the issue of limited liability companies and the role of bankruptcy laws, which apply to all sectors. It leads to cases where damages are not recoupable, which leads back to the issue of externalities. The use of limited liability creates a specific risk of externalities, a share of which will not be compensated. Ultimately, it becomes a question of

whether the wealth and livelihoods the industry creates outweigh the risks and externalities and therefore whether or not they are welfare-creating activities. This depends in part on regulation and performance.

According to the definition of subsidies by the WTO Uruguay Round agreement on subsidies and countervailing measures (see Chapter 5), the Convention on Liability for Nuclear Damages effectively offers subsidies to liable parties through its compensation mechanisms. The same goes for the IOPC Fund to the extent that governments contribute to the Fund and/or assist in covering unsettled compensations for oil spills.

Protection of biodiversity and habitats

At the EU level, compensation and mitigation measures are part of the habitats directive (see Box 6.7), and protection of biodiversity and habitats through liability and compensation regimes has taken further steps forward under the EU liability directive (see Section 6.1.2).

There are also national schemes of note, including those in Belgium, Germany and Sweden (see Box 6.8 for Belgium and Box 6.9 for Germany).

Liability for cross-contamination with genetically modified organisms

Proposed legislation in Denmark and Germany will establish liability for damage caused by the use of genetically modified organisms (GMOs) in agriculture. In both countries, farmers choosing to grow genetically modified (GM) crops will have to bear the responsibility of ensuring coexistence with conventional and organic farmers in the event of cross-contamination. In Denmark, farmers wishing to grow GM crops will have to undergo special training in biotech farming. A compensatory fund will be established, to which GM crop farmers will be obliged to pay an insurance fee of EUR 8/ha

Box 6.6 Layering special drawing rights: country example: Belgium

A first layer of a minimum of 5 million SDR is to be financed by the operator of the nuclear plant and covered by insurance or other financial guarantees, a second layer of up to 175 million SDR, by the State where the nuclear plant is located, a third layer, up to 300 million SDR, jointly by the States party to the Treaty. An amendment of the Belgian implementing legislation, adopted on 11 July 2000, eliminates the second layer by increasing the liability of the operator up to BEF 12 billion, or roughly 215 million SDR.

Source: Taken from Bocken (2002).

⁽¹⁰¹⁾ See also <http://www.nea.fr/html/law/legal-documents.html> for the list of conventions/protocols.

⁽¹⁰²⁾ IMF Rule O-2(a) defines the value of the US dollar in terms of the SDR as the reciprocal of the sum of the equivalents in US dollars of the amounts of the currencies in the SDR basket, rounded to six significant figures. Each US dollar equivalent is calculated on the basis of the middle rate between the buying and selling exchange rates at noon on the London market (<http://www.imf.org>).

Box 6.7 Compensatory and mitigation measures under the EU habitats directive

Article 6(4) of the EU habitats directive requires Member States to 'take all **compensatory measures** necessary to ensure that the overall coherence of Natura 2000 is protected'. These are measures specific to a project or plan, and additional to the normal practices of implementation. They aim to offset the negative impact of a project and provide compensation corresponding precisely to the negative effects on the species or habitats concerned. They should also constitute the last resort, used only when the other safeguards provided for by the directive are ineffectual.

Compensatory measures are distinct from **mitigation measures**, which aim at minimising or even cancelling the negative impact of a plan or project, during or after its completion. Unlike compensatory measures, they may cover:

- the dates and the timetable of plan/project implementation (e.g. not to operate during the breeding season of a particular species);
- the types of tool and operations to be carried out (e.g. to use a specific dredge at an agreed distance from the shore in order not to affect a fragile habitat);
- the strictly inaccessible areas within a site (e.g. hibernation burrows of an animal species).

That said, well-implemented mitigation measures limit the extent of the necessary compensatory measures by reducing the damaging effects which require compensation.

Box 6.8 Case example – Liability and compensation for biodiversity in Belgium

In Belgium, there is a law safeguarding the marine environment on Belgian territory. This builds on the strict, joint and several liability concepts. Restoration or monetary compensation can be required if damage occurs, including to the specific environmental character of a site, its biodiversity and integrity. Authorities can demand financial security for foreseeable costs if there is an identified risk of pollution. Studies on monetary compensation where damage cannot be directly restored are under way.

Source: <http://www.mumm.ac.be/EN/Management/Law/mmm.php>.

Box 6.9 Case example – Law on impairments of ecosystems and landscapes in Germany

Habitats/biotopes: In Germany, the Federal Nature Conservation Act addresses impairments to ecosystems and landscapes. An impairment is considered to have been compensated for (*Ausgleichsmaßnahme* – compensatory measures) as soon as the impaired functions of the ecosystem have been restored and the natural scenery restored or relandscaped in a manner consistent with the landscape concerned.

An impairment is considered to have been offset in some other way (*Ersatzmaßnahme* – substitute remediation) as soon as the impaired functions of the ecosystem have been substituted in an equivalent manner or the natural scenery has been relandscaped in a manner that is consistent with the landscape concerned.

If biotopes that are irreplaceable for the strictly protected species of wild animals and plants that they harbour are destroyed as a consequence of the intervention concerned, the intervention is admissible only if justified by imperative reasons of overriding public interest.

This law is to be implemented in 2005; similar legislation existed earlier, but it was upgraded through this new law.

Source: www.bmu.de/files/bundnatschugesetz_neu060204.pdf.

annually. Additional details relating to GMOs and coexistence rules are given in Box 6.10.

Contaminated land and soil

Liabilities for contaminated land and soil are generally addressed through normal market operations whereby there is an obligation to return the state of the land to certain conditions. This is taken into account in the purchase/sale price of properties, whether private transactions or major privatisation initiatives. Generally, audits are carried out to ascertain the extent of the contamination and the liability. The cost of clean-up and rehabilitation can be taken into account in the price.

How this is addressed varies among countries: some countries have chosen to make the buyer responsible, some the seller (i.e. clean-up before sale), and others have historical liabilities covered by the government (e.g. to help privatisation programmes). This issue was of major importance during the 1990s, when many companies in the new Member States that were then in economic transition were privatised.

In some countries, the challenge of contaminated land is addressed by general legislation. For example, in France, in the absence of a specific liability regime for environmental protection, ICPE (*installations classées pour la protection de*

Box 6.10 GMOs and coexistence rules

German coexistence rules

Ending the de facto moratorium on GMOs in the EU has heightened concerns over the coexistence of GM and conventional crops. Germany, as one of the first EU Member States to do so, is in the process of approving controversial new rules on GMOs (adopted by the German Parliament on 18 June 2004), which amongst other things introduce rules on coexistence.

While the law's main aim is to bring current legislation into line with the recent EU deliberate release directive (Directive 2001/18/EC), it also builds on the principle of precaution and good practice to avoid or minimise contamination between GMOs and conventional varieties. In particular, it requires the following:

- Precautionary action to protect GMO-free farming and prevent 'material negative effects' (i.e. economic damage), which may occur when products cannot be placed on the market because of cross-contamination. The rules recognise that economic damage can occur even when the contamination remains below the European labelling threshold of 0.9 %.
- In cases of cross-contamination, a system of 'joint and several liability' holds liable all neighbouring farmers who may have caused the contamination. Applying the 'polluter pays' principle, this allows farmers to claim compensation for damage caused by a neighbouring GM crop farmer. Producers of GM seeds would be liable in cases of insufficient labelling of the product.
- A public register, indicating the location of planned GMO cultivations.

While GMO critics have welcomed this new law as a first step in the right direction, they have also identified some unresolved and weak elements. In particular, they warn that the potential length and cost of court actions could deter farmers from claiming compensation. The burden of proof in compensation claims should therefore, according to these critics, be on the polluter and not on the one suffering damage.

Danish coexistence rules

The Danish government has also adopted laws for the cultivation of GM crops, requiring farmers wishing to grow GM crops to bear the responsibility of ensuring safe coexistence. The law also establishes separation distances between conventional and GM crops for several species. Unlike the German proposal for national coexistence rules, the Danish bill foresees a licence for the growing of GM crops, which requires farmers to complete a course on biotech farming. It would further create a fund to compensate farmers for losses incurred through cross-contamination.

The fund will be established through the payment of insurance-type levies of EUR 13.4/ha, to be paid by GM crop farmers. However, the Danish authorities will always try to recover compensation costs by prosecuting the GM crop farmer. Some GM crops, namely rapeseed, grasses and clover, are for the time being banned (in Denmark), as no effective coexistence measures could be established for these crops.

The compatibility of these national rules will have to be examined in the light of EC law, in particular Directive 2001/18/EC.

Box 6.11 Contaminated Soil Act in Denmark

In Denmark, the Contaminated Soil Act was passed in 1999, setting up a regime of strict but not retroactive liability for the clean-up of contaminated soil. There is no restriction on activities causing pollution. There is provision for State clean-up as a last resort when the polluter cannot be identified, and provisions are established for orphaned pollution on private land. Through own payment of EUR 2 000 to EUR 5 500, a State fund covers additional costs for investigation and clean-up (*Vaerditabsordningen*). A pilot project is currently testing the setting-up of a government loan scheme for private landowners to increase the speed of clean-ups.

Sources: Law No 370 of 2 June 1999 (www.retsinfo.dk/ (in Danish)); Redegørelse om lov om forurennet jord of December 2003 (www.mst.dk (in Danish)).

l'environnement) has been used to deal with contamination of soil and groundwater. It is applied to activities listed in a national list. This has been widely used by French authorities to oblige clean-up by the site operator or, in the case of insolvency or ceased existence of the operator, the site holder is held liable⁽¹⁰³⁾.

Liability and privatisation

Liability for past environmental damage has been an important issue during privatisation in central and eastern European countries — often the priority environmental concern among potential investors (World Bank/OECD, 1992). Governments reacted with several measures to allocate liability, of which there are three main mechanisms: price reductions for the new owner, who then assumes strict and retroactive liability; indemnification for all or part of the clean-up cost given some condition, such as future compliance (in which case the State bears the costs of past damage), known as limited or non-retroactive liability; and establishment of an escrow fund with set-asides from sales revenue to pay for clean-up (Earnhardt, 2000; Auer *et al.*, 2001). In fact, while the benefits of other approaches have been widely discussed, in all but a few cases 100 % liability was transferred to the new owners, with little evidence of explicit price negotiation on the basis of clean-up costs (Bluffstone and Panayotou, 2003).

Transition economies: new Member States

New EU Member States face environmental challenges often stemming from the decades of Soviet rule. In Latvia, there are 850 abandoned Soviet military sites, and in Estonia 1 500, in both cases covering up to 2 % of the countries' land area (Andersen, 2000). In Lithuania, where over 1 % of the land area was used for military purposes, environmental audits following the withdrawal of Soviet troops showed serious ecosystem impacts in these areas, with over half being contaminated with oil products and heavy metals (Fancoj and

Duffy, 1998). Nevertheless, during the privatisation process, environmental clean-up was almost never considered, and liability is presumed to be assumed by the buyer which is to be contested under civil law. The government only negotiated a deal in the case of the 1993 purchase of the tobacco company Klaipedos Tabakas by Philip Morris, where it shut down a competitor in exchange for Philip Morris' promise to remediate site contamination (Bluffstone and Panayotou, 2003).

In the early 1990s, the Czech government completed a survey of more than 2 500 contaminated sites and concluded that clean-up would cost almost EUR 1 billion. By 2000, some 270 agreements between buyers and the State had been reached and 70 remediation projects begun, where the State has taken on a significant portion of the burden (Andersen, 2000). Clean-up costs are estimated to be even higher in Poland (Auer *et al.*, 2001). Following an initial period of privatisation in which the issue was largely overlooked, its approach to dealing with this contamination has resulted in Poland becoming a leader in liability rules, and its advice has been asked for elsewhere. In 1992, the government set up an Interministerial Environmental Unit, composed of the Ministries of Privatisation, Environmental Protection, Natural Resources and Forestry, and the State Inspectorate for Environmental Protection. This group has successfully integrated environmental issues into privatisation negotiations. There is no evidence that foreign direct investment (FDI) has been hindered by liability issues — however, this may reflect a lack of interest in the oldest and most polluted sites that remain in the hands of the government, which has limited resources to handle clean-up, by default — a problem in evidence throughout the region (Auer *et al.*, 2001). Furthermore, a 1996 audit showed that only 18 % of State industries that had undergone 'capital' privatisation (as opposed to liquidation) had shown significant environmental improvement.

⁽¹⁰³⁾ Source: Ministry of the Environment of France (www.environnement.gouv.fr/).

Candidate countries

Privatisation in Romania began more slowly: between 1993 and 1999, about a third of the companies designated for sale had been privatised. In that period, environmental liability was not considered. A relevant law was passed in 1997, and in 1999 the government elaborated steps for the inclusion of environmental procedures in all privatisation negotiations. In practice, this has included the provision of information through audits, which increase transparency about the level of any liability, and the requirement for any remediation plans to be included in the sale agreement, with investors responsible for any costs (Bluffstone and Panayotou, 2003).

The Balkans

Albania's first environmental laws came about in 1992 with help from the World Bank, and, while identification of problems has been enhanced, there has been little in the way of remediation. War in the 1990s has added environmental burdens to the Balkans even beyond the typical problems of most of central and eastern Europe. Of the 50 000 km² of land in Bosnia-Herzegovina, for example, some 12 000 km² were considered minefields in 2000. Slovenia has transferred liability to buyers, with reduced prices based on environmental audits; those areas found to be commercially unattractive due to excessive pollution have been earmarked for clean-up using a fund generated through taxes on air and water emissions — actual remediation measures have been slow in materialising, however (Andersen, 2000).

Eastern European countries

Serious environmental damage and a lack of environmental liability rules in Russia continue to leave potential investors with concerns about liability⁽¹⁰⁴⁾. Investors face a lack of clear environmental standards, but are generally held liable under privatisation rules — the lack of clarity about the responsibility investors are taking on leads to uncertainty that can have repercussions on the value placed on the investment (Andersen, 2000).

With a third of its industry involved in heavily polluting activities, and because of its many military bases and the Chernobyl disaster, Ukraine has a challenging environmental situation. Some 30 000 ha are considered contaminated, as are 133 of the 197 large potable water facilities (Andersen, 2000). Liability for military site clean-up rests with the

Military Defence Complex, a non-transparent government agency whose resources have been insufficient for the task. Private owners may access some government funds for assistance in some clean-up activities (Andersen, 2000).

Requirements for funds to be available for environmental liabilities

The requirement to make funds available for environmental liabilities is in place in a range of countries in Europe, including Belgium for marine impacts, as stated above, and in Ireland. There are also generally increasing demands for company reports and accounts to make explicit mention of environmental liabilities, which, in turn, de facto lead to requirements that there be funds or insurance policies available to cover eventualities.

The Irish EPA, under the Protection of the Environment (PoE) Act 2003 requires certain operators to maintain or guarantee the availability of funds for dealing with environmental liabilities, under a strict liability regime. The EPA requires certain operators to obtain a special licence for operating and this licence stipulates the responsibility of the operator to maintain or guarantee the availability of funds for dealing with environmental liabilities, including the consequences of accidents, plant decommissioning and the management of long-term 'residuals' such as contaminated land or waste-disposal facilities. The scale of necessary funds is judged by external specialist consultants whose findings, in the form of published reports, are assessed by the EPA. Prosecution costs are also recovered, where possible, as are special costs arising, for example, from action taken by the EPA to remedy environmental harm caused by any identifiable party⁽¹⁰⁵⁾.

6.1.2 The liability directive (Directive 2004/35/EC)

During the 1990s, an extensive process of knowledge collection on liability for damages to the environment took place on the initiative of the Environment DG. Issues such as existing legislation, insurance, preventive effect, and valuation and restoration techniques were explored, and there was public as well as corporate consultation. On 9 February 2000, the European Commission adopted a White Paper on environmental liability (COM(2000) 66) and on 23 January 2002 the Commission put forward a proposal for a directive with regard to the prevention and remedying of environmental

⁽¹⁰⁴⁾ As noted in the disclaimer for the Hermitage Capital Management Fund of the HSBC: 'The legislative framework for environmental liability and the extent of any exposure of business to the costs of pollution clean-up have not been established ... substantial liability for any business in which the Funds invest would have a significant adverse effect on the value of the Funds.'

⁽¹⁰⁵⁾ See http://europa.eu.int/comm/environment/impel/pdf/iri_report.pdf.

damage. The directive, following an intensive conciliation process, was finally approved by the Parliament and the Council in March 2004, and published in the Official Journal on 30 April 2004 and entered into force. Member States will have to comply by April 2007, adopting legislation meeting the requirements of the directive.

The first article of the directive invokes the 'polluter pays' principle (see Section 6.1.1), which is specified in conjunction with the precautionary principle and the principle of preventive action in Article 174(2) of the EC Treaty. The directive is a step towards integrating environmental costs in production costs and in the prices of goods and services across Europe. However, the regime in place (falling under the environmental liability ³ situation — see Figure 6.1) is a public law regime where compensation is decided by a 'competent authority'. As a consequence, the general public or non-governmental organisations (NGOs) will have to submit their complaints to this competent authority which will decide if measures are needed. Lack of appropriate reaction by the competent authority could lead to action against it.

The directive:

- evokes liability for damage to water, to land and to species and habitats under Natura 2000 (see Figure 6.2). Member States may also identify additional species and habitats not under the habitats directive when transposing the directive;
- covers concrete and quantifiable damage, including multi-source pollution, where a causal link can be established between the damage and the identified polluter(s);
- establishes that a damaged environment should, as a first priority, be restored to its (further specified) baseline condition. If this is not possible and/or if interim losses occur, complementary and compensatory remedial action is required. In the case of the latter, a resource-to-resource or service-to-service approach must be used;
- permits environmental valuation, as a last resort, to be used to determine the extent of necessary compensatory remedial measures;
- does not evoke any compulsory financing mechanisms such as insurance or central funds but encourages Member States to promote the development of appropriate systems.

There are a number of instances where the directive does not apply. Most noteworthy are exemptions for damage falling within the scope of a range of international conventions, for example on nuclear

liability and liability for accidents happening on water territory.

6.1.3 Approaches to remedying environmental damage

Environmental damage can be remedied in a number of ways. The EU directive specifies primary, complementary and compensatory remediation.

- Primary remediation restores the environment to the same type, quality and comparable value, i.e. full restoration of the damaged environment.
- Complementary remediation occurs when full restoration of the damaged environment is not possible. The polluter then has to make other environmental goods and services available, for example by improving conditions in an existing habitat or creating a new natural habitat (forest, wetland, etc.) not necessarily connected with the polluted environment.
- Compensatory remediation ensures that the polluter pays for measures to compensate for losses occurring before primary or complementary remediation has achieved its full effect (interim losses). For example, if a lake is polluted and fishing is not possible for 10 years, the polluter has to compensate by using a similar approach to that under complementary remediation.

There are various ways of quantifying the monetary values of environmental goods for remediation measures, for example to compare the costs and benefits or to set an appropriate level of costs for remediation through complementary and compensatory approaches (see Box 6.12 on environmental valuation techniques). The techniques generally applied for environmental valuation are 'stated' and 'revealed' preference. With stated preference techniques, a sample of the population is questioned about their preferences for marginal changes in an environmental attribute, including its monetary value to them. Revealed preference techniques do not question people directly, but rather examine surrogate markets, valuing, for example, the difference in property values between a polluted area and a similar but unpolluted area. These methods are, however, very expensive to carry out, and techniques are being explored for transferring values from (primary) study sites to other sites (value transfer techniques).

The most appropriate valuation technique for quantifying compensation levels depends on the data available and the level of accuracy needed. While value estimates for political decisions

generally need only be indicative, the level of accuracy needed increases where liability and hence restoration payment and monetary compensation are concerned (Navrud and Bergland, 2001). Unfortunately, current models for value transfers are generally either very simple or explore mainly methodological issues, and not the accuracy of value estimates. To reach more reliable estimates, a better understanding of the parameters that determine individual preferences is needed (Loomis and Shrestha, 2001). There is a need for new primary valuation studies that are carried out with benefit transfer as part of the objective, as well as a need to move towards a protocol for good practice for carrying out such studies (e.g. Brouwer, 2000; Garrod and Willis, 1999; OECD, 2001).

6.1.4 Financing mechanisms and insurance

The issues of insurance and financial guarantees were strongly debated ahead of the adoption of the EU liability directive. The directive encourages Member States to promote the development of financial security instruments and markets, and establishes that financial issues must be reviewed six years after the entry into force of the directive.

Some existing liability regulations establish compulsory insurance, for example soil contamination in Denmark and environmental damage in Finland⁽¹⁰⁶⁾, and compensatory funds have been established, particularly with a view to remedying environmental damage on orphan sites. These funds are generally financed through operators' payments and/or fiscal allocations. The longest experience with insurance and valuation

of environmental goods and services is under the US Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or 'Superfund'), set up by the USEPA in 1980 (see Box 6.13). Although CERCLA has an impressive record of clean-up activities, there are serious concerns as regards its cost-effectiveness. The USEPA has responded to some shortcomings by establishing cooperation with the business sector on various issues.

A number of insurance companies already offer insurance for environmental damage, both on a compulsory and on a voluntary basis, and studies are emerging from scientific researchers and insurance companies on the possibility of insuring environmental damage under the liability directive. The insurance sector does not, however, at present want to guarantee the availability of insurance as there are still many uncertainties connected with insurance of environmental damage (Swiss Re, 2003).

Another option is compulsory payments to a compensatory fund or financial guarantees, possibly coupled with obtaining an operator licence such as required by the Irish EPA. Compensatory funds, however, may encourage freeriding by some operators, for example those who see no incentive to invest in cleaner production methods since they will not be held fully liable for the environmental damage which they currently cause. Such a moral hazard also exists for areas where there is full insurance coverage that does not include incentives through franchise limits or no-claims bonuses.

Box 6.12 Environmental valuation techniques

Stated preference: Methods where consumers are asked directly about their preferences and/or willingness to pay (WTP) or to accept compensation (WTA) for changes in an environmental good or environmental service. WTP is often used to assess affordability in studies on water supply infrastructure and charging. WTA compensation is used to explore specific losses, for example from increased noise near airports. There is usually a very large difference between WTA and WTP, reflecting affordability and limited budgets as well as moral issues or issues of principle.

Revealed preference: Methods where the price of a good is estimated on the basis of real or surrogate markets (e.g. park entrance fees, house prices, expenses incurred to avoid pollution).

Value transfers: Modification of estimates obtained through the above methods in order to fit data to another, but similar, environmental attribute, or transfer experience from one group or country to another.

For further introduction to the theory of measuring environmental values, see, for example, Freeman (1999) and Garrod and Willis (1999).

⁽¹⁰⁶⁾ The requirements in Finland stem from the Environmental Damage Insurance Act (No 81/1998) that came into force on 1 January 1999. See <http://www.ymparisto.fi/default.asp?node=8866&lan=en>.

6.2 What developments can one expect as regards liability and compensation?

6.2.1 Overview

Liability and compensation seem to be becoming more important tools and ones that should lead to a greater influence on behaviour. The introduction of liability for environmental damage points towards a stronger integration of the 'polluter pays' principle than previously seen in Europe (see Box 6.14 for possible outcomes of the growth in liability regimes). However, issues like the limited financial capacity of the polluter or the responsibility of public authorities (grant of permits, lack of preventive actions) may lead to significant deviations from the economic theory that supports the 'polluter pays' principle.

The liability directive, in calling for monetary compensation as a second priority after compensation in kind, requires the use of valuation techniques, which have known limitations. Further cooperation between ecologists and economists on these issues will be needed to assist the entry into force of the directive in 2007.

Other challenges and future developments include the following:

- Greater use of environmental management systems by companies, to help manage their

impact on the environment and avoid liability cases where possible.

- Regular withdrawal from the market of substances which are identified as dangerous, to respond to concerns of health and the environment and to avoid potential liabilities. Some chemicals will inevitably be the subject of these. The pace will depend on the future of the discussions on chemicals regulation, REACH ('Registration, evaluation and authorisation of chemicals'), and on national and company initiatives.
- More inclusion of provisions for eventual liabilities in company reports and accounts, and insurance or funds set up to cover these, and measures to reduce risk (whether double-hulled ships, or environmental management systems with special focus on risks).
- Stock market valuations, to reflect liabilities on a company's balance sheet. This is likely to lead to environmental issues being given greater prominence at the boardroom level across the EU.

6.2.2 Financing mechanisms and insurance

The financing mechanisms established by Member States when transposing the liability directive⁽¹⁰⁷⁾ are to be reviewed in 2010. Several environmental NGOs believe that insurance and central financial guarantees should not be made available, since they water-down the 'polluter pays' principle. Instead,

Box 6.13 Financing mechanisms under the US Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or 'Superfund')

- Covers historical facilities such as hazardous waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment.
- Evokes strict, joint and several liability, and is retroactive.
- Does not enforce compulsory insurance but establishes a tax on chemical and petroleum industries, supplemented by government funding, which goes into the Superfund and is used to finance clean-up of orphan sites.
- Since 1980, 7 399 clean-ups have been carried out at 5 253 sites.
- States must provide at least 10 % of the cost of clean-up if the Superfund trust fund is involved in financing the clean-up.
- Compensation for natural resource damage under CERCLA is capped at EUR 56 million and a fine of EUR 28 000 is applied when non-compliance with reporting requirements is determined.
- Future undiscounted Superfund clean-up costs have been estimated at USD 100 to USD 300 billion over 30 years (Garber and Hammit, 1998).

The Superfund has faced severe criticism as being a fund for lawyers rather than for clean-up, and is argued to have been very inefficient. For example, in a 1999 conference on the Superfund, it was noted that 'some experts estimate that 90 % of insurance expenditures and 20 % of corporate expenditures are legal fees or other transaction costs unrelated to clean-up activities'⁽¹⁰⁸⁾.

⁽¹⁰⁷⁾ At the time of writing of this report, there was little information on the financial mechanisms which Member States were going to implement.

⁽¹⁰⁸⁾ See <http://www.aei-brookings.org/events/page.php?id=28>.

the polluter should be made to pay all the costs associated with environmental damage. However, situations may exist where it would be impossible for the polluter to finance damage, for example in the case of insolvency or where identification of the polluter is not possible.

The main difficulty for market-based insurance for environmental damage is the current lack of statistical data for calculating the frequencies and severities of losses (Swiss Re, 2003). When considering compulsory insurance as an option for environmental damage, risk homogeneity, the ability of the insured to pay premiums, coverage, the level of premium requested and monitoring are elements that trouble the insurance sector as well as representatives of small and medium-sized enterprises in Europe, which fear that the directive will make it almost impossible for them to conduct business. As noted above, however, experience from the United States shows that SMEs may be perceived as posing smaller risks to the environment than large enterprises.

The insurance sector emphasises the need for Member States to introduce a mix of preventive measures, including permits with strict operating conditions, financial guarantees and monitoring by public authorities.

6.2.3 *Economic valuation of environmental goods and services*

Suggestions for appropriate techniques for the valuation of environmental goods and services put

forward in the Commission White Paper (European Commission, 2000) include reference to value transfers and the development of a value transfer database similar to the environmental valuation resource inventory compiled by Environment Canada in cooperation with the USEPA⁽¹⁰⁹⁾. Economic valuation has been kept as an option in the final text of the EU directive.

Given the limitations of valuation techniques, discussed in Section 6.1.3, further cooperation between ecologists and other scientists, psychologists and economists on these issues would greatly assist the entry into force of the liability directive in 2007.

6.2.4 *Sustainable economic growth and environmental technologies*

In order to reduce the risk of being liable for environmental damage, some operators will see an advantage in investing in environmental technologies and risk reduction strategies, plans, procedures and management systems. As liability regimes strengthen, greater investment in technologies and techniques (e.g. safety management systems and environmental management systems) that reduce potential impacts and liabilities can be expected. EU environmental policy, given that it builds on the principle of preventive action, argues in the same direction.

Furthermore, there is a synergy between liability concerns and the Lisbon agenda and the goal for the EU to become the most economically competitive region globally. Both argue, in practice, for a

Box 6.14 Possible outcomes of introducing liability regimes

Production decisions, including choice of technology, location of production and production components, will be weighed against the risk of having to compensate for environmental damage and/or premiums to be paid to insurance companies.

The currently very limited market for environmental insurance can be expected to develop further. Insurers may as a consequence exert greater influence on production decisions in order to reduce the risk of accidents.

Research into and development of environmental technologies can be expected to increase. One approach envisaged is that insurers/governments reward companies that spend resources on developing environmentally safer production, for example by reducing insurance fees or fees to central funds (in this respect, creating a mixed economic instrument).

Producers, in internalising the environmental costs of production, will pass on a proportion of any increase in costs to consumers. It can be argued that this is reasonable since consumers are the ultimate beneficiaries of the produced good and should also take part in covering the environmental costs of its production.

⁽¹⁰⁹⁾ www.evri.ca.

strong emphasis on research and development of environmental technologies.

6.3 What lessons can we learn?

The main experience with liability regimes is in the United States and with international conventions, for example those on damage to marine territories and nuclear damage. Experience from the United States shows that insurance and compensation systems/markets do evolve and that authorities as well as insurance companies, the business sector and the public have roles to play to make liability regimes operational and more effective over time. There are, however, some major risks, not least the risk that liability regimes become cost-inefficient given the possibility of exaggerated use of the law courts, increasing the administrative costs of this mechanism (as seen by experience with the Superfund). Key lessons from experience are as follows:

- The decision as to who takes the liability can result, de facto, in a subsidy, for example government acceptance of historical pollution of land and of accident risk in nuclear power.
- Liability schemes and complementary technical requirements to date have not been strong enough to avoid avoidable problems — notably oil pollution disasters.
- There are many examples in Europe where compensation for damage to health or loss of amenity has not been forthcoming. In addition, the structure of the insurance market options is not yet sufficiently sophisticated to offer appropriate signals to encourage operators to take appropriate action. There remains a moral hazard in full insurance coverage.

6.3.1 Avoiding risks

Experience from the United States suggests that caution is needed when liability is extended to entities other than the polluter, for example to purchasers of potentially contaminated land. The risk of being confronted with clean-up costs of unknown magnitude may discourage the sale or redevelopment of land with actual or potential contamination, such as previous industrial sites — so-called 'brownfields' (Boyd, 1999; Segerson and Dawson, 1999). As a consequence, developing pristine land may be preferred while potentially contaminated, developed land will be left idle. In order to avoid undesirable distortions in land development and purchase, the USEPA cooperates with prospective site purchasers who, in return for undertaking clean-up measures, are assured that

the EPA will not sue them in the future (Sigman, 2001).

Insurers wary of the risks of offering liability coverage have also found ways of avoiding exposure (see Box 6.15).

The EU liability directive does not include retrospective liability, but certain national liability schemes do. It would be useful to take into account the experience gained in the United States with regard to retrospective liability. The European regimes could thus avoid situations where the sale of industrial land decreases. On the other hand, a situation should be avoided where it would be attractive for a polluter to 'forward' a polluted property to a second party in order for government or insurance funds to cover clean-up costs. The issue is particularly relevant to the new free-market States in Europe, where private property rights have only recently been established and the credibility of contracts is an important element for the development of private property markets (Boyd, 1999).

Liability regulations may also impose financial risks on investors and thereby increase the cost of capital to firms. From 1988 to 1992, an average increase in the cost of capital for 23 larger firms was estimated at a social cost of USD 200 million to USD 800 million annually (Garber and Hammit, 1998). Smaller enterprises did not, however, experience significant cost of capital increases, which might indicate that the financial sector perceives little risk of liability claims related to SMEs. The potential social costs of the increasing cost of capital should be taken into account in overall economic assessments of liability regulations.

Further empirical evidence regarding the effect of liability on cost of capital, land sales and redevelopment is being established in the United States and should be observed in Europe. When implementing environmental liability regulations in Europe, monitoring these effects from the beginning would be useful for adapting existing regulations and aid implementation of new legislation.

6.3.2 Behavioural changes

Experience from the United States (Anton *et al.*, 2004) suggests that the threat of liabilities combined with market-based pressures from consumers, investors and other firms are significant motivators for operators to adopt more comprehensive environmental management systems, which leads

Box 6.15 Insurance for extended liability

In 1994, Lloyds of London reported losses of GBP 2 billion, notably from increasing asbestosis and pollution claims in the United States. Insurers unwilling to risk such massive losses withdrew from covering clean-up related to retrospective liability. A counterproductive effect was that some operators managing hazardous waste had to close down because they could not obtain insurance (Wilde, 2002).

to integrated approaches to include environmental concerns in business management. They can also be expected to encourage the use of safety management systems. With appropriate support from authorities and consumer awareness, liability regulation could promote increased use of environmental management systems and safety management systems by operators in Europe. This would effectively strengthen not only the 'polluter pays' and precautionary principles, but also the global principles of environmentally sustainable economic growth and decoupling of economic growth from environmental degradation (see also Box 6.16 for links of instruments).

The scenario of operators substituting emissions from one medium to another in order to avoid liability has so far been rejected. With the implementation of stricter liability regulations in Europe, this possibility should, however, be kept in mind. Although this has not yet been the case, it would also be sensible to observe whether certain aspects of production are moved in order to escape liability regulations.

The economic effect of liability regimes is directly linked to the effectiveness of the threat of having to pay compensation for potential damage. Information, public participation and access to justice in environmental issues therefore play a key role in the integration of environmental considerations into the plans of economic operators. The legislative package of the Aarhus Convention ⁽¹¹⁰⁾ is a new step towards

ensuring a tighter implementation of environmental legislation through the empowerment of citizens.

As the levels of compensation available after the *Prestige* and *Erika* accidents show (see Boxes 6.4 and 6.5), liability for certain types of accident under the current regimes is far from ensuring full cost recovery through the potential polluter. A full integration of the principles mentioned at the beginning of this chapter would require a reconsideration of setting limits to liability and compensation measures.

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Box 6.16 Liability as part of an instrument mix

Introducing complementary elements to liability regulation may further increase the responsiveness of operators. Supporting instruments could be:

- entry/operating requirements (e.g. compulsory insurance, provided insurance is available);
- implementation of technical standards (e.g. double-hulled ships);
- incentives for investment in new technology;
- black lists and other consumer-awareness tools;
- encouragement of implementation of high-quality environmental management systems and safety management systems.

⁽¹¹⁰⁾ The Convention is a UNECE Convention signed in Aarhus on 25 June 1998 at the Fourth Ministerial Conference in the 'Environment for Europe' process. The Convention entered into force on 30 October 2001. It is currently implemented with Directive 2003/4/EC (public access to environmental information) and Directive 2003/35/EC (public participation in certain environmental decision-making). Access to justice is still under discussion.

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7 Summary and conclusions

Economic instruments are being increasingly and widely used throughout Europe, though with major variations across countries and regions as to which instruments or packages of instrument are applied, the ambitions for their use, and the results that can be seen. Their scope is widening, covering a broader range of environmental challenges. They can be effective in delivering changes that are positive from the environmental point of view and can have additional effects, such as strengthening institutional capacity and the availability of information, as well as positive economic consequences in terms of increased efficiency and technological change.

This chapter summarises the main conclusions ⁽¹¹¹⁾ regarding the application of market-based instruments — exploring their use both singly and in combination. It looks first at practice, then at the way forward and finally at some generic and specific lessons that can be learnt from their application.

7.1 The use of market-based instruments in environmental policy in Europe

Some instruments, such as taxes on transport fuel and vehicles, are applied in all countries, although not always with benefiting the environment as the original motivation. Similarly, all countries have some sort of subsidies in place, either environmentally motivated or motivated for economic reasons but having the potential to cause environmental harm.

Other instruments are applied in all the countries within a particular region — broadly speaking, a comprehensive system of pollution charges for air and water is in place in the new Member States and other transition economies of central and eastern Europe, though the charging rates tend to be low and not particularly influential, albeit with some notable exceptions.

Other instruments have been launched very much on a national basis, and it is difficult to identify

groupings, with the possible exception of the Scandinavian countries and the Netherlands, and the other 'northern' European countries — the United Kingdom and Germany. The former were the early starters in environmental tax reform, and generally more ambitious in the aim and design of their instruments and coverage of environmental themes (e.g. energy, water and waste); the latter in many ways became the new vanguard in the mid to late 1990s.

Examples of the objectives that market-based instruments have been launched to address or contribute to include:

- **addressing climate change/reducing CO₂ emissions** from industrial installations in a cost-effective manner — the UK CO₂ emissions trading (ET) scheme (linked to the climate change levy and climate change agreements), the Danish ET scheme and the EU emissions trading directive;
- **reducing street litter, resource use and hazard** from the use of plastic bags, for example the plastic bag tax in Ireland, or from cans and bottles, via deposit-refund schemes;
- **reducing the demand for waste-disposal services** and hence the demand for land — through taxes on landfill and incineration in many countries;
- **reducing congestion in cities** — congestion charging in London;
- **reducing emissions to air and water** — for example the NO_x charge in Sweden, NO_x emissions trading in the Netherlands, air and water pollution charges in many eastern European countries, and water pollution levies in Denmark, the Netherlands and Germany;
- **recovering the costs of providing environmental services** ⁽¹¹²⁾ such as water supply, wastewater treatment and waste collection — water and waste charges in most European countries, though with differing degrees of cost recovery;
- **reducing primary aggregates use** — for example, the United Kingdom aggregates tax;

⁽¹¹¹⁾ This chapter has been drafted for the EEA (contract reference 3223/B2003.EEA.51620) by Patrick ten Brink (IEEP), Stefan Speck, Frank Convery (UCD), and Dominic Hogg (Eunomia), with valuable inputs from Jason Anderson (IEEP) and Hans Vos (EEA). It has benefited from the comments of the expert group (see 'Foreword and acknowledgements') and comments of the EEA's national focal points (NFPs).

⁽¹¹²⁾ This type of economic instrument is not discussed in depth in this report.

- **raising revenue for public transport** — congestion charging in London, toll roads in Norway, road charging for heavy goods vehicles;
- **raising revenue for the exchequer** — fuel taxes in most countries;
- **raising revenues to finance environmental improvements** in transition economies — earmarking the proceeds of taxes and charges for environmental funds;
- historically, **supporting Europe's ability to feed itself** through subsidies — the common agricultural policy (CAP) — and the **viability of fishing sectors** — through the common fisheries policy (CFP);
- **encouraging the development and uptake of environmentally friendly technologies** such as low-CO₂-emission vehicles, photovoltaics and wind power;
- **raising the costs and risks of inaction or negligence** on environmental matters — through liability requirements;
- **ensuring** that parties affected by pollution are **compensated for losses** — through appropriate mechanisms.

A further major development has been the increased move during recent years towards integrated packages of instruments to achieve specific policy objectives. The revenues from environmental taxes are increasingly being used to offset revenues from labour and other economic taxes.

Instrument by instrument

The key developments over the past five years for the instruments covered in this report are summarised below, instrument by instrument.

Emissions trading

Particularly noteworthy developments are as follows:

- The emergence of an EU-wide scheme for CO₂ emissions trading. This is the first supra-national emissions trading scheme that has emerged anywhere in the world.
- The first real empirical evidence from national schemes regarding emissions trading. This is a relatively new instrument for European countries and results from experience in the United Kingdom and Denmark.
- The application of emissions trading to the issue of waste management. This experience, from the United Kingdom, is a novel application of emissions trading from the global as well as the European perspective.
- A more general finding — based on worldwide experience, including companies and

forerunners like BP and Shell — that even with low prices and high transaction costs, emissions trading can still have reasonably impressive results. This may be because of a greater responsiveness to these instruments than has frequently been suggested.

Emissions trading has become the instrument highest on the political agenda in the EU, with the adoption of the EU emissions trading (ET) directive, the transposition of the ET directive into national legislation, the development of national allocation plans, and the associated 'linking directive'. Following the lack of success during the 1990s of introducing environmental taxes for mitigating climate change at the EU level, attention shifted to emissions trading as an economic instrument for reducing greenhouse gases. The emissions trading system started operation on a pilot basis in January 2005. Other examples of trading systems include:

- domestic emissions trading schemes — in Denmark and the United Kingdom;
- green certificate trading — in Belgium. Since 2002 for Flanders and 2003 for Wallonia, electricity suppliers have had to buy a certain amount of green certificates (2 % in 2004 up to 6 % in 2010) from green electricity producers;
- packaging recovery notes (PRNs) in the United Kingdom, dealing with packaging waste;
- individual transferable quotas (ITQs) in fishery management in a range of European countries, including Denmark, Estonia, Iceland, Italy, the Netherlands, Portugal and also in Russia for some stocks.

A range of other schemes are either planned or under serious consideration, including an NO_x trading system for the Netherlands (due to be in operation from 2005) and more green certificate trading.

Taxes and charges

Particularly noteworthy recent developments include the following:

- Increasing use of novel forms of road charges, including the use of a congestion charge in London (UK) for all vehicles and charging on the basis of distance travelled for commercial vehicles, for example already in use in Switzerland and Austria, being implemented in Germany, under discussion in the United Kingdom and on the agenda in the Netherlands.
- The introduction of a tax on plastic bags in Ireland, which achieved fairly rapid change with limited costs to the actors affected.

- The fact that one of the few taxes based on an attempt to internalise externalities in a formal sense, the UK landfill tax, has departed from its initial rationale. The rationale has effectively been supplanted by its use to meet various targets, recognising (in part) that alternative waste management routes provide external benefits.
- The trend towards increasing differentiation of transport taxes to reflect environmental concerns, particularly CO₂ emissions from vehicles (e.g. the reform of the system of taxation of company cars in the Netherlands and the United Kingdom, and circulation tax reform in the United Kingdom and Denmark).
- The increasing move towards full cost recovery for the basic provision of environmental services — water supply, wastewater treatment and waste management — with prices rising and often leading to significant reductions in resource use. Affordability by consumers, however, limits the pace of movement towards full cost recovery — a further example of how genuine social concerns often overrule economic or environmental concerns. Affordability issues are critical in the eastern European countries and the Balkans, and are still very important in many regions of the new Member States.

Environmental taxes and charges are widely applied at the Member State level and in other European countries. These instruments address all environmental media — air, water, land — and are applied in all countries, though with very wide variations in the number of instruments applied, the level of taxes and charges, and their effect.

New taxes have been introduced, in particular in the waste area, either as waste deposit/waste taxes (Sweden and Catalonia/Spain) or as taxes levied on products, such as the plastic bag tax in Ireland. Taxes levied on greenhouse gases other than CO₂ have been introduced in Denmark and Norway. Several countries, such as Estonia, Germany, Slovenia and the United Kingdom, have implemented new energy/CO₂ taxes during the past five years. The deposit-refund scheme, which is a quite common economic instrument already implemented in central and eastern European countries, has become more widespread in the whole of Europe in recent years.

At the EU level, the new energy products taxation directive (Directive 2003/96/EC) increases the minimum tax rates on mineral oils beyond those agreed in 1992, with rates applying from 2004, and establishes for the first time minimum tax rates for

energy products, such as coal, electricity and natural gas. This repeals the 1992 mineral oil tax directive. The impact is mainly on new Member States.

Some EU directives are giving increasing scope and encouragement for the use of market-based instruments by Member States. For example, under the water framework directive, Member States shall ensure they have pricing policies in place by 2010 that allocate the costs according to the 'polluter pays' principle and differentiate between different user groups. In addition, the Council can adopt economic instruments to implement the objectives of the packaging directive. Until then, Member States can act unilaterally, but have to respect all regulations and obligations laid down in the EU Treaty when introducing new economic instruments.

Environmental tax reform/ecological fiscal reform

The most noteworthy recent developments in the area of environmental tax reform (ETR) and environmental fiscal reform (EFR) include the following:

- Implementation of the German ETR, and first steps towards an EFR by explicitly making the reduction of environmentally harmful subsidies an important part of finance policy.
- Continuing progress in Sweden in shifting the tax burden from 'goods' to 'bads'.
- Changes in the fiscal system, for example in a number of EU Member States and in Russia, amounting to de facto ETR, even though the links were not explicitly made in the policy development — the Russian measures involved a substantial reduction in taxes on income, with taxes on transport fuels being raised significantly at the same time.
- Some other countries appear to be starting to develop, or extend, broader tax reforms. Austria appears to be in the early stages, and the United Kingdom is also extending de facto ETR, though it has not always presented its approach as an official strategy.

Building on existing experience in the Nordic countries, **ecological tax reforms**, where there is a shift away from taxing 'goods' (such as employment) to taxing 'bads' (pollution or natural resource use), have begun to be implemented in other countries. These have done so by increasing existing tax rates (e.g. Germany, with a rise in energy taxes) or introducing new taxes (e.g. the United Kingdom, with the new climate change levy, aggregates tax and landfill tax). There is also a move, albeit slow, from 'tax reform' towards 'fiscal reform', where subsidy reform is included in the general reform

package. While some have been ambitious, given the political contexts and resistance, the reforms are still only one step in a more extensive EFR that is needed to achieve a more appropriate distribution of tax burdens within European economies. While there is no 'target' for an ideal balance of tax burdens, it is clear that the current balance leaves significant room for more constructive reform.

Subsidies, subsidy reform, support schemes and green purchasing

The study highlights the following key developments:

- Environmentally motivated subsidies and support schemes are being used to encourage the more rapid diffusion of new, cleaner technologies. This is typically in the absence of full internalisation of the externalities associated with the technologies with which they compete. Examples are low-emission vehicles (passenger cars, buses) and renewable energy.
- There has been some progress with the reform of some economic subsidy schemes that are harmful to the environment, through reducing them or transforming them into ones which have a 'more positive' environmental impact. The change in farm support measures under the CAP is an example.
- There are some examples of company car taxation being reformed (the United Kingdom) though elsewhere progress has been less encouraging (the Netherlands).
- EU State aid guidelines can condition the provision of financial assistance, for example by requiring that some compensating environmental measure is in place.
- Concrete environmental conditions — on NO_x emissions and noise levels — have been integrated into a public procurement tender for transport buses by the Helsinki municipal authority and a more expensive but better environmental offer was chosen. While this was challenged in the courts, the choice was upheld as fair. This early case of green procurement complements the growing green consumerism of individuals.

Subsidies can take several forms, such as direct payments, price support, (partial or full) exemptions from taxes/charges, and tax differentiation. Subsidies are closely looked at by the European Commission, and their use is constrained by the State aid control guidelines, which are due to be reviewed to better facilitate pro-environmental subsidies, for example to stimulate technological innovation, as announced in the environmental

technologies action plan (ETAP). Arguably, the non-internalisation of external costs could and indeed should be considered as an implicit subsidy and hence as a type of State aid. In practice, such implicit subsidies are regarded as inefficiencies or shortcomings of the functioning of the market and significantly less attention is paid to them than to existing subsidies. Some would argue that some pro-environmental subsidies are not subsidies at all, but rather a means of obtaining a level playing field and making prices more fair.

There have been many developments in the field of subsidies in recent years, including continuing interest and commitment to removing environmentally harmful subsidies, better understanding of the impact of subsidy programmes on the environment, and new initiatives to implement pro-environmental subsidies (e.g. low-emission vehicles) and support schemes (e.g. for renewables). Although the removal of environmentally damaging subsidies has been discussed in political circles for many years, steps to implement such reforms often lack the necessary political will.

Liability and compensation

A relatively new field of environmental policy deals with the issue of liability and compensation. Key developments are as follows:

- The adoption of the EU directive on liability — which combines compensation payments and requirements for primary and complementary remediation measures.
- Broadening of the oil spill fund, reflecting greater compensation needs following recent disasters.
- Linkage between liability and technical improvement, for example double-hulled ships.
- The inclusion of funds for aftercare in legislation, for example the EU landfill directive.
- Liabilities and privatisation — a range of approaches, with government, sellers or buyers assuming retrospective liabilities for contaminated land, varying by country. This was a critical issue in the new Member States in the early years of transition.
- Increased potential to resort to environmental evaluation as a means of assessing damages — moving valuation in Europe from a generally academic approach to one of concrete practical implication of some significant importance.

Liability issues as regards contaminated land have been around for a long time and became particularly important during the mass privatisation in the new Member States in the early 1990s. However, the issue

of liability has only recently started to gain more systematic coverage, and is beginning to include very important economic players — the insurance and reinsurance industries. Similarly, compensation has only rarely been applied and the economic threat of having to make major compensation payments is not yet real, with some very select exceptions.

7.2 Where are we going and what are the future perspectives and needs?

The key insights regarding future perspectives and needs identified in this report are summarised instrument by instrument below, followed by some generic observations. Some potential applications are already at the planning stage, some are more like expectations and some have only been identified as areas where action is needed. In some cases, the expected future actions build on lessons (see Section 7.3 for details) that have been understood by policy-makers and, where not politically difficult, these are clearly likely to be implemented.

7.2.1 Instrument by instrument

Emissions trading

The following points have particular relevance:

- Close monitoring of progress of the EUETS is to ensure that future schemes benefit from the experience gained. Evaluation of current experience is obviously desirable and to be expected.
- One can expect that those considering new national ET schemes will seriously explore whether a market wider than one country can be established, especially if that country is small. This builds on lessons from domestic CO₂ trading schemes and discussions of plans for schemes for NO_x trading at the national level that suggest a need for new systems to be designed with a view to linking to other countries.
- There are arguments in favour of a shift away from ET systems where the allocation mechanism is based mainly on grandfathering to hybrid systems which combine elements of grandfathering and auctioning of allowances.
- There is already a range of discussions, initiated by various parties, that the EUETS could usefully be extended, to include other gases, and perhaps linked to other sectors, which could be covered either by the same scheme or by separate linked schemes. Sectors of potential interest that have been suggested include

aviation and transport. These are sectors with a major potential contribution to reducing CO₂ emissions; the policy discussions remain open as to which approach to take to encourage CO₂ emission reductions. Trading is one of the options being seriously discussed.

Emissions trading is now regarded as a sensible, serious potential instrument for addressing environmental challenges, not only at both the national and EU levels but also at the regional level, with different countries pooling targets and achieving economies through a bigger bubble. The debate is strongly driven by interest in reducing the costs of meeting commitments, in the light of concerns about international competition and competitiveness.

Taxes and charges

Looking to the future, the key issues include the following:

- Countries are likely to learn from one another's successful experiences with new taxes and charges and apply similar schemes. Several EU countries have been looking into congestion charging and plastic bag taxes following the successes of the UK and Irish schemes, given the obvious need for solutions to similar problems across Europe.
- There is greater scope for assessing the scale of environmental (and social) externalities for policy development, which may lead to additional arguments to implement taxes or charges. More countries are becoming comfortable with this type of analysis and more analysis of this type is expected to take place in the coming years. This does not necessarily mean that policy-makers should feel bound by some form of externality 'straitjacket'. It would seem, however, that such analysis can at least inform the need and design of taxes where the intention is to internalise environmental costs. There may be good reasons why taxes may stray from the assessment of externalities, for example:
 - where it seems unlikely that other externalities will be accounted for in the short to medium term (so the UK landfill tax's departure from its initial level may be justified by the lack of internalisation of impacts which would incentivise recycling);
 - where there are reasons for believing that stronger incentives may be required to overcome behavioural lock-in (possibly to stimulate the use of alternative transport modes);

- where there is reason to believe that, given the prevailing regulatory infrastructure, the externality tax might encourage illicit behaviour which could outweigh any benefits from the tax;
 - where (as in a number of cases) the science underpinning such valuations is still imprecise (not least, for example, in respect of climate change);
 - where perceptions of impacts on competitiveness lead to the acceptance by policy-makers that (proposed) taxes and charges are too high, even if merited on a polluter pays or environmental concern basis.
 - There is a clear need in some sectors for the application of taxes where this has been rather limited in the past, for example with regard to aviation, maritime transport, land-use, tourism, agrochemicals and industrial chemicals. The potential for positive experiences increases as the technology required to implement taxes which target the externalities concerned more accurately evolves and improves.
 - There is continuing legislative support for a move towards the use of full cost recovery for the provision of environmental goods and services — water supply, wastewater treatment, waste services — as well as for the provision of heating and also, perhaps more controversially, mining and forestry. The greater use of full cost recovery in other areas — environmental permits, infrastructures, water abstraction, etc. — can also be expected as countries move to greater fiscal prudence and can do so given affordability issues and equity concerns.
- this area and the Danes have already responded to the issue by reducing the CO₂ tax to zero for installations under the emissions trading scheme.
- Efforts to reduce subsidies that do not have defensible social, economic or environmental aspects are expected to continue, and, where successful, result in budget savings that contribute to reducing the overall tax burden.
 - Interest in reducing the current burden of levies on employment and business competitiveness, combined with environmental concerns, would suggest a much broader role for and application of ETR.
 - The scope for applying ETR/EFR could be extended to other countries — one could expect serious consideration to be paid to such reforms in countries other than those which have already supported and implemented them. The cooperation between Germany and the Czech Republic, most recently including Poland, is a good example. It aims at information exchange and network building in the new Member States to facilitate political processes and possibly introduce ETR/EFR. Care would need to be taken to ensure that the nature and extent of the ETR are relevant to the particular national circumstances, both in respect of the degree to which such instruments could be safely implemented at the levels sought (given prevailing institutional constraints) and in the way in which the existing fiscal system is altered in response to the revenues from environmental taxes, ET and subsidy removal.
 - The greater public acceptability of environmental taxes where the burdens are balanced by the reduction of other taxes — whether employment or corporate taxes — suggests that de facto ETR/EFR is more likely than not to take place. This may not, of course, be an indicator of a policy commitment to such reforms, but from the point of view of price effects this amounts to the same thing. Interestingly, there may be greater scope for ETR/EFR if and where countries are interested in reducing corporate tax rates or social security contributions to address competitiveness concerns across Europe and internationally, and at the same time are not willing or able to reduce general tax burdens, and are therefore increasing taxes on fuels or the environment. Polls very often show that acceptability could increase substantially if the revenues were used for the environment. Public acceptability also comes from the link with reducing taxes on labour. It is quite likely that had the critical public discussions on increasing fuel prices in Germany

Environmental tax and fiscal reform

Looking forward, some observations are as follows:

- If emissions trading increases in popularity and is applied instead of taxation schemes, then in order to avoid revenue losses, trading systems would need to be based more on auctioning than on grandfathering as a way of allocating allowances. This would imply that the balance in the source of revenues in ETR/EFR may shift from taxes alone to taxes plus revenues from auctioned allowances. This could be particularly relevant in relation to transport if the intention to include this in ET schemes is followed through.
- Given that the EU emissions trading scheme enters into force in 2005, it is very likely that countries may wish to enhance the compatibility of trading issues with taxes. The European Commission is preparing a draft directive in

in 2000 not been made against a knowledge of the reducing labour taxes, the ETR process there would have been stopped. Given the high level of public concern for fighting unemployment, the link was invaluable for the German reforms.

- Finally, ETR/EFR is a government decision and public support for it is a type of trust in government. At the same time, the process of applying environmental taxes and charges is a type of government support for the economic decision of individual economic actors — as these should respond to the price signals and make informed decisions away from pollution or polluting products. There is therefore a type of mutual trust and increase in responsibility that does not occur with pure command and control.

Subsidies, subsidy reform, support schemes and green purchasing

The future expectations in these areas are as follows:

- The reform of economically motivated but environmentally harmful subsidies is likely to continue.
- In the transformation of agricultural subsidies, there may be potential to make greater use of market-based instruments, such as tendering schemes, in which providers of public goods offer particular outcomes for particular prices. This may enhance the efficiency of the use of revenue employed for these purposes.
- The scope for more environmentally sensitive public procurement is likely to expand considerably. This may be an approach which can drive innovation since the buying power of public bodies can be used to develop challenging specifications for suppliers of goods and services. Procurement specifications could be linked to eco-labelling schemes.
- There may be scope for a broader application of pro-environmental subsidies in EU and non-EU European countries (e.g. low-emission vehicles and biodiversity conservation in central and eastern European countries). More pro-environmental subsidies can be expected.

Liability and compensation

Liability and compensation are becoming more important tools, leading to a greater influence on behaviour. The introduction of liability for environmental damage points towards a stronger integration of the 'polluter pays' principle than previously seen in Europe.

The liability directive, in explicitly calling for monetary compensation to be paid where

appropriate, requires the use of valuation techniques, which have known limitations. Further cooperation between ecologists and economists on these issues will be needed and are expected to assist the entry into force of the directive in 2007.

Other challenges and future developments include the following:

- Greater use of environmental management systems by companies can be expected to help manage their impact on the environment and avoid liability cases where possible.
- Regular withdrawal from the market of substances which are identified as dangerous, in response to concerns about health and the environment and to avoid potential liabilities, to which some chemicals will inevitably be subject. The pace will depend on the future of the discussions on chemicals regulation, REACH ('Registration, evaluation and authorisation of chemicals'), and on national and company initiatives.
- More inclusion of provisions for eventual liabilities in company reports and accounts, more use of insurance or setting-up of funds to cover these, and measures to reduce risk (e.g. double-hulled ships, environmental management systems with special focus on risks).
- Stock market valuations can be expected to reflect the liabilities on company balance sheets. This is likely to lead to environmental issues being given greater prominence at the boardroom level across the EU.

7.2.2 General prospects and need for instruments

While it is impossible to predict which instrument will be launched where and for what purpose, it is possible to note key areas where environmental challenges are such that we can expect serious consideration of whether economic instruments may be appropriate. These include the following:

- **Climate change:** This is a major challenge which will require a portfolio of instruments, both market-based and not. We can expect more emissions trading schemes to be set up internationally, more efforts made at linking to the EU-25 scheme, and extension of the trading scheme (other installations, other sectors, other gases) in the second period. Similarly, we can expect more taxes and charges (for the economic sectors not covered by the EUETS, for example transport and households), linked exemptions for industry that are sensitive to energy prices,

and possibly (depending on country experience) more negotiated environmental agreements. We can expect complex portfolios of instruments to continue to be developed and can probably also expect pressure to remove 'double' instruments (e.g. replace emissions trading and energy/CO₂ taxes with just one instrument).

- For transport, the level and impacts of **road traffic** represent a range of challenges: addressing congestion, balancing consumer choice issues, competitiveness, CO₂, health concerns, and ensuring appropriate cost-recovery mechanisms for infrastructure development and use to avoid making road transport, whether private or for road haulage, a de facto subsidised mode of transport. Similarly, ensuring appropriate modal shift is a major challenge in which economic instruments can be only one component of the complex package needed to encourage the availability and adoption of appropriate alternative modes of transport.
- **Aviation:** Emissions of CO₂ and water vapour make significant contributions to global warming — increasingly so given the high growth rate of this sector, the fastest-growing source of CO₂ emissions. There are some discussions exploring whether aviation could be linked to the EUETS, and national interest in exploring taxation of domestic flights and flights between any two Member States, mainly for the moment looking at VAT on domestic flights. Action is needed here, and some is expected. The Netherlands is preparing to introduce a kerosene tax on national flights in 2005. Noise is also a problem, and one that will grow with increased aviation activity. One can expect more compensation solutions to be applied.
- **Shipping:** This is a source of emissions of acid and greenhouse gases and of oil spills. This is another sector/activity with a very strong need for action and historical reasons for inaction. Serious discussions can be expected as regards the use of different instruments to address the challenges — earmarked charges are being discussed, as is trading and self-negotiated commitments.
- **Chemicals:** These are one of the major challenges facing European policy-makers and industry. There is a very strong need to encourage the use of substitute chemicals in a number of areas. Some have raised the prospect of economic instruments to address this. Liability issues will clearly be key, although their importance depends on 'duty of care' provisions (in other words, whether liability is constrained through agreements that proof of appropriate duty of care makes companies exempt from liability). The use of taxes and charges may be constructive for non-critical substances.
- **Agriculture:** Pollution from agriculture (nitrates, run-off, pesticides, herbicides and fungicides), combined with international trade pressure and budget concerns, is leading to increased pressure to move away from the current subsidy regime. One can expect more government support for organic farming and reduced intensification. There remains evidence that a number of pesticides in use in Europe lead to damage to the environment, some of which has important economic repercussions for niche industries (e.g. beekeeping). Efforts can be expected to address these diffuse pollution problems, using taxes/charges or negotiated agreements. In the latter case, if negotiated agreements prove unable to offer the sought-after changes, one can expect pressure for these to be replaced with taxes and charges in due course. Outright restrictions will, of course, be appropriate if and where proof of serious hazards is uncovered. The general reform of the CAP provides a good framework for further market incentives to be introduced.
- **Resource availability and quality of non-renewable resources:** The continued availability and quality of non-renewable resources, such as gravel, sand, aggregates and indeed also oil, are becoming increasingly important. In some cases (notably in gravel, sand and aggregates), the use of economic instruments is expected to increase. If scarcity and environmental costs are properly included in the price of a resource (e.g. with market-based instruments), the market will promote optimal use of the resource, and stimulate development of alternative sources when prices go up.
- **Renewable energy:** A wide range of instruments is being applied to encourage the use of renewable energies, from direct subsidies to schemes set up by governments whereby households pay increased rates to support renewables, green purchasing schemes with consumer opt-in, and tradable renewable energy certificates linked to purchase obligations. Expectations are that we will continue to see instruments put in place to encourage the diffusion of renewables.
- **Renewable resources — fisheries, forestry** — run the increasingly evident risk of mismanagement from inappropriate fishing or felling. Additional interest in the use of ITQs (individual tradable quotas) can be expected for fishing as well as changes to the subsidy regimes. In the case of forestry, increased labelling and green procurement (i.e. from sustainable forestry) are likely.

Which instrument or instrument mix will be launched and what form it will take will depend on a range of factors, including the structure and health of the economy and the particular sector concerned, the legal, policy and institutional framework, the existing instrument mix in place, stakeholder preferences, and, of course, the nature of the environmental challenge and the ways in which it can be met (e.g. new technologies or techniques, existence of substitute products, and changes in consumer behaviour) and hence what instrument can most effectively and efficiently encourage the appropriate developments. While most instrument choices are based on national decisions, a few are EU-wide. Progress at the national level is, however, within the European context, with some limitations (e.g. State aids), and other limitations in place de facto (e.g. concerns about impacts on competitiveness). There are also opportunities, in the informal process of 'learning from others', that can lead to a type of soft harmonisation, or the potentially more formal process of the open method of coordination (OMC), where more coordination on progress can be had for instruments across Europe. This process is being considered for use with regard to subsidies to support clean technologies, and the general reform of subsidies and taxes, given the unanimity voting requirements and national interests in not changing this.

7.3 Lessons from experience

There are instrument-specific, case-specific and general lessons for the use of market-based instruments for environmental policy in Europe. Section 7.3.1 looks at the instrument/case-specific lessons and Section 7.3.2 at general lessons.

7.3.1 Specific lessons

Emissions trading

- At the EU level, there should be an attempt to maintain a forward look to ensure that policies are not created which inhibit the potential for ET. Likewise, the potential economic benefits of ET argue for an assessment of existing policies to understand where they may not be compatible with ET systems, particularly where ET is being actively considered (e.g. for NO_x) and where useful forward-looking measures could be taken that do not compromise the environmental objectives.
- At the national level, States should not be too hasty in designing new schemes, or should design them with a view to their future development, as there may be important lessons

to be learnt from existing schemes and those still to be implemented. It will be desirable to bear the international context in mind, as there are benefits to be gained, especially for smaller countries, from ensuring that schemes can be made 'transnational' to enable deepening of the market. States should also be mindful of the possibility of locking themselves out of any developing schemes through the application of instruments that are too 'State-specific'. This argues for compatible national approaches; whether this requires communication and coordination, guidelines, templates, or legal requirements for harmonised approaches has yet to be decided.

- The costs to stakeholders of meeting targets through ET are unlikely to be prohibitive. Depending on initial allocations, some participants stand to be financial beneficiaries, whilst the potential of instruments to stimulate more rapid diffusion of cleaner technologies, as well as innovation, may generate dynamic benefits (which are not always foreseen by those engaging in *ex ante* analysis). In short, costs are not going to be high, and there could be some benefits.
- Grandfathering of allocations results in windfall gains to some participants. If, in the EU scheme for CO₂ trading, the existing approach to allocation were maintained, this would likely restrict its potential expansion, making it difficult to include transport and aviation, as well as other gases, in the scheme.
- Furthermore, the choice of sector caps in the national allocation plans can lead to imbalances of burdens across sectors within a country and different burdens on the same sectors of industry across countries, raising concerns about 'unfair' treatment.
- ET schemes require a level of data availability, monitoring, and verification that goes beyond much past practice. This inevitably requires considerable effort to ensure that there are high-quality management systems in place, that practical monitoring protocols are developed and adhered to, and that verification, enforcement and penalty schemes are in place and up to the task.

Taxes and charges

- At the European level, few attempts have been made to guide the application of environmental taxes through measuring externalities. This remains the case despite ongoing research on external effects (such as the EU research programme ExternE and its successors) and

increased familiarity with the term among policy-makers.

- Over time, States have become more confident in designing taxes which more closely reflect the environmental issue that is being addressed. One can see this in the evolution of taxes on energy products (petrol tax differentiation with regard to sulphur content), vehicles (the United Kingdom and Germany), pesticides (Norway), and charging for waste at the household level (where schemes that include charges based on combinations of bin size, frequency and weight are now used). This evolution may reflect, in some cases, changes in technology, which allow such taxes or charges to be levied. This suggests that tax design may improve the accuracy of its targeting as technology develops and the lesson is to build on new and proven technologies to make realisable advances in tax design.
- There is limited evidence of taxes damaging competitiveness. In some cases, this reflects good design, in others the fact that exemptions from taxes are widespread. One way of gaining greater acceptability for levy-based instruments is to recycle revenues in ways that encourage positive behaviour among the actors affected by the levy (making the instrument 'revenue neutral' across the targeted actors, for example the Swedish NO_x levy). This can enhance stakeholder acceptability, whilst also allowing for the application of higher tax rates, with consequent increases in effectiveness. In some countries such as Germany, ETR has enhanced the competitiveness of the business sector by reducing tax rates, but it has also benefited from half of the reductions in the social security contributions.

Environmental tax reform/ecological fiscal reform

Relevant insights from experience are as follows:

- The German ETR has made use of a public information campaign to generate public support for the shift in taxation from 'goods' to environmental 'bads'. Arguably, the changes that have been set in motion would have been more difficult to implement without the support generated by the campaign. At the same time, the UK has been less public in displaying the motivations for its use of new fiscal instruments. The lesson to be learnt from examining different experiences is that effective communication can earn support for ETR and strengthen positive results.
- Extensive use of environmental taxes has not proved to be detrimental to economies, at least

where these taxes are used to reduce the revenue take from existing taxes such as those on income and labour.

- Most ETRs began with a focus on energy/fuel taxes, but have subsequently been extended to cover other sources of negative externalities such as waste and pesticides, although the contribution of such taxes to total environmental tax revenues, currently around 6 %, will remain limited.

Subsidies, subsidy reform, support schemes and green purchasing

- Subsidies should be applied with care since they use scarce public resources. They should be structured to avoid dependency on them, for example, by being time limited, or related to some level of market penetration or technological maturity. They should, however, be made relevant to the purpose for which they are designed, implying that support schemes based on market-determined prices may not be suitable for technologies with long payback periods, since these may not be bankable from a financial point of view. They should also be well targeted and their performance monitored to avoid unintended results such as the creation and involvement of interest groups which seek to profit from subsidies and waste the resource, leading to lower value for money.
- It is now acceptable for public procurement to take environmental criteria into account so that broader-based measures of value can inform the selection of tenders for public goods and services. In other words, the criterion of lowest price can be complemented by environmental considerations without being regarded as unfair selection.
- Subsidies have been extremely important in accelerating the commercialisation of new technologies, for example, for photovoltaics in the domestic sector and the development and use of wind turbines. The development and uptake of new technologies also, however, depend on other factors (attitudes of households, municipal authorities and commercial organisations) and initiatives (e.g. ensuring appropriate facilitating planning rules, and ensuring access to markets and infrastructures).

Liability and compensation

- The decision as to who takes the liability can result, de facto, in a subsidy, for example implicit government acceptance of historical pollution of land and of accident risk in nuclear power.

- Liability schemes and complementary technical requirements to date have not been strong enough to avoid avoidable problems, some of which — notably oil pollution disasters — have been of catastrophic proportions.
- There are many cases in Europe where compensation for damage to health or loss of amenity has not been forthcoming. In addition, the structure of the insurance market is not yet sufficiently sophisticated to offer appropriate signals to encourage operators to take appropriate action. There remains a moral hazard in full insurance coverage: full coverage can reduce the incentive to implement risk-minimisation and problem-avoidance measures.
- Understanding the policy needs and priorities and '**picking the winners**' — focusing on issues for which there is agreement and pressure to have them addressed, such as litter, plastic bags, and congestion problems.
- **Keep it simple and understandable:** If it cannot be understood, political masters will not implement it. Simplicity can be in terms of design. In some cases, **transparency** and the use of information technology can make less simple schemes (e.g. complicated formulae for charge rates) acceptable, for example, if the charges are easily understood and clearly communicated, even if the formulae used to calculate them are not.

7.3.2 General lessons

Experience shows that the question of 'which instrument is best' has changed to 'which instrument mix is best'. Pros and cons are very much affected by the particularity of the environmental challenge, the legal context of the country, the state of institutions and their capacity, the structure and health of the industry/economy, and social and cultural issues.

Environmental effectiveness: There are proven cases of key environmental benefits for each type of instrument. Taxes/charges have proved effective as shown by congestion charging, NO_x taxes and plastic bag levies. Tax differentials were of major importance for encouraging unleaded fuel (complemented by subsidies for catalytic converters and the availability of substitutes), and are now effective in encouraging the use of low-sulphur fuels. ET has proved itself in the United States in its application to the problem of acid rain, and ITQs have proved invaluable for fisheries in Iceland. Subsidies have been critical in putting wind, photovoltaics and other renewables on the market and accelerating their marketability.

The effectiveness of an instrument has been shown to depend on a number of factors, including the following:

- Having an **instrument champion** who can make it work, often taking personal risks. For example, had the London congestion charge proved a failure, then the mayor's standing would have been seriously weakened. Real leadership was also required in Ireland in opting for the plastic bag tax rather than a negotiated agreement that was promoted by industry, and in the development of the EU emissions trading scheme by the European Commission.
- **Keep it realistic:** There is no point in having charge rates higher than what is affordable, and there is no point in having taxes and charges based on monitored results if monitoring cannot or does not take place.
- **Give advance notice of the imposition of a new instrument:** If people have time to study how to respond to a planned instrument then there is time to develop a response, making the process less costly. Phasing-in schemes, for example by means of a pilot phase, gives people time to adapt and also time to fine-tune the working of the system. Also, no matter how bad it is, it will be seen as 'a lessons to be learnt period' rather than 'an early failure'. This can be critical in managing expectations and reactions.
- **Stick to what has been announced and do not change it too often:** Experience shows that regulators (given the need to develop capacity) and industry (given investment cycles) benefit from stability in the regulatory environment, and time is needed for the lessons of the first instrument (or mix of instruments) to be learnt before unavoidable changes are made. This argument has been used for some countries as regards new trading schemes that require amendments to the IPPC directive, which is still far from fully implemented in most EU countries.
- Understand the potential **trade-offs** (e.g. across the three pillars of sustainable development and for different stakeholders), and work out which trade-offs are unacceptable and can be avoided and which are acceptable. This requires good research to understand the likely impacts on different parties and the likely responses.
- **Public and private acceptability and keeping stakeholders on board:** Early **consultation/public participation** as well as understanding their positions are critical. Furthermore, a transparent use of revenues can defuse potential opposition to a tax charge — in the case of ETR/

EFR, making use of (at least some) revenues for something visible and useful to the public, for example environmental projects, has been shown to facilitate acceptance.

- **Need for equity** in implementation, making sure that the poorest are not unduly affected.
- **Make sure that people can respond:** This requires **elasticity of demand**, which, in turn, relates to the **availability of substitutes** and issues of lock-in of technologies and network compatibility. The fuel duty escalator in the UK and Germany was partly successful, and would have been considerably more so had there been appropriate substitutes — price alone is not enough. The Dutch tax on harbour sludge dumping was withdrawn mainly because of affordable alternative treatment options.
- **Indexation** of tax/charge rates to inflation to avoid the erosion of value over time, as has happened with many environmental taxes, for example the Russian pollution taxes; or **escalation** beyond inflation as a slow but sure way of making instruments more demanding and effective, such as the UK fuel duty escalator, and water pricing with escalation in Athens and Copenhagen.
- **Need for consistency:** Trading was not possible between the UK and the Danish CO₂ trading schemes given the different structures, and there was also a lack of compatibility with the EUETS. This has led to some calls for other trading schemes to avoid repetition of the problem by planning compatibility — for example, when potentially using trading to implement the national emissions ceiling (NEC) directive for substances such as NO_x or SO₂.
- **Avoid being hostage to interest groups:** This applies to all instruments and indeed to legislation in general. It has often been stated that it is important when designing a subsidy scheme to ensure that it is time limited and that eligibility criteria help avoid those that do not need the subsidy having access to the funds — and to restrict the say of interest groups in the design of the scheme to avoid 'rent-seeking behaviour'. Similarly, it is difficult to raise fuel taxes when road transport lobbies oppose them, even if there is an increase in efficiency or the benefit of shifting from road to rail.

Competitiveness: There is as yet no evidence of economic instruments having a major adverse impact on competitiveness, for example a sector in a European country losing competitive position and market share vis-à-vis an international competitor as a result of the burden of economic instruments.

This is due partly to the design of the instruments (using low rates), partly to the fact that there is a wide range of exemptions to avoid cost impacts (argued as offering equivalent action), and partly because of compensatory measures such as the recycling of revenues (e.g. for a particular tax such as that on NO_x in Sweden but also reductions in social security contributions). At the national level, revenue neutrality helps to address this.

This does not mean that there are no differences in impacts on individual companies, as some companies will be more able or willing to respond to the signals from taxes and charges and subsidies, or the opportunities of emissions trading schemes. This is not, however, a 'competitiveness' issue in the sense of 'unfair loss of competitiveness'. Indeed, this type of impact is appropriate given the need to encourage changes in behaviour (increasing willingness to respond). If and where polluting industries cannot adapt and have had to close, it has usually been a sign of underlying economic non-sustainability.

In the case of renewable energy generation, increasing support has created a more level playing field vis-à-vis conventional fuels and technologies.

Competitiveness concerns have often been given a greater weight than is justifiable, when selecting or designing instruments or when granting or designing subsidies. There are many subsidies that apply for too long. Some of this is based on an industry exaggerating the cost of measures and underestimating its ability to react, made possible by the asymmetries in information between the industry and the regulator. In some cases, this reflects arguments that were based on the industry only being able to have static responses to the instrument rather than dynamic ones, and hence overestimating the costs and underestimating the potential to adapt. This has led to lower charge/tax rates than arguably possible and necessary, more generous allocations of allowances (e.g. in NAPs), and excessive allocation of exemptions, in terms of eligibility, size and duration.

There has also been a move towards more 'evidence-based policies' — i.e. policies where there needs to be more information on the type, nature and details of the environmental problem than was needed in the past, in places misusing the concept of scientific uncertainty. This is itself driven partly by the competitiveness arguments noted above and partly by vested interests seeking to delay new policies. The climate change debate is a good example of one where lack of clear proof for the link between man-made emissions and climate change was initially misused to delay action; the lack of certainty as to

the precise effects of climate change is now being misused in the same way, despite the costs of inaction becoming increasingly higher, as demonstrated by calculations of the costs of reinsurance. The call for evidence can be a tool for delaying the implementation of instruments. It is critical that information is obtained early so as to avoid undue delays to solutions. It is also critical to balance this precondition of information availability with calls for support for the precautionary principle.

Innovation and diffusion: It has proved difficult, at this stage, to draw conclusions as regards the use of instruments to encourage the development and uptake of new technologies or techniques. It is clear that market-based instruments represent a dynamic incentive to innovate, and hence at least in principle should be better than command and control approaches using ELVs (emission limit values) which offer only a static incentive (meet the ELV and thereafter no further incentive), but statistical proof is hard to come by. Indeed, some argue that at least the ELVs will get innovation up to the point where the technology meets the ELVs and not beyond (which is not always guaranteed by market-based instruments) and then new ELVs can be set/negotiated, hence having the dynamic incentive as part of the overall process. The question of innovation will become increasingly important over the coming years, not just to support the Lisbon declaration and help implement the sustainable development strategy and environmental technologies action plan, but also because of the general need for economies to be dynamic and innovative in an increasingly competitive global marketplace. It is also important to distinguish between innovation and diffusion, which is simply an issue of ensuring a broader uptake of existing technologies. The evidence available on innovation and diffusion shows that:

- subsidies, support schemes and green purchasing have proved invaluable for the development and uptake/diffusion of clean technologies — photovoltaics, wind, catalytic converters, low-CO₂ vehicles — with the lessons of early applications leading to further technological developments;
- subsidies have helped in the diffusion of environmental infrastructure — water supply, wastewater treatment and waste services — through the Cohesion and ISPA Funds;
- legislative requirements have been the prime mover for the diffusion of existing technologies in the fields of air pollution control and wastewater treatment (e.g. tertiary treatment);

- monitoring requirements and liability concerns have led to greater innovation and diffusion of environmental management systems.

Equity/distributional impacts: Concerns about unfair (or unrealistic) burdens on households have been a key influence in pricing schemes for the provision of water, energy and heating and for wastewater and waste services in many countries, notably in central and eastern Europe. Such concerns have also led to different approaches to taxation (notably VAT) on household fuels across Europe. In the case of emissions trading, the national allocation plans submitted are leading to different burdens on different parts of the economy/country — it seems that households and transport and not the intense electricity users will face the greater burdens. If the public do not see a tax or charge as fair, the life of the instrument will be curtailed. This has been proved with VAT on household fuels in the UK and transport fuels in several countries.

Capacity needs and development: The use of economic instruments can help to create further information and support the development of capacity, but may require additional information and, in particular, regulatory capacity to work. Taxes, charges and ET can help provide information on the real costs to industry and other sectors of the improvements and the associated measures they adopt to respond to the market-based instrument. This can be very useful for the future development of policies and the selection of instruments. Similarly, certain instruments are not feasible without suitable monitoring or administrative capacity — pollution charges on substances that cannot or are not in practice measured simply create a situation of non-compliance (a problem often seen with the complicated charging schemes in Russia and other eastern European countries), and emissions trading that is not backed by rigorous monitoring, verification and non-compliance enforcement mechanisms would undermine the system. This also underlines the fact that certain instruments are more 'administratively cost-intensive' than others. Emissions trading is one of the instruments that requires considerable investment here given the need to designate competent authorities, develop monitoring protocols and have a solid system of verification in place. As a rule of thumb, the administrative costs of an ET scheme should not be more than 5 % of turnover from trades, otherwise the burden of the system will be too high for the market to function efficiently. Furthermore, adding further instruments to an instrument mix needs careful consideration, as each new instrument brings administrative capacity needs.

Effects on the economy: From an arguably simplistic classical economics point of view, all subsidies lead to inefficiencies and should be avoided. Furthermore, all goods and services should be properly priced with externalities and resource scarcity issues fully integrated into the price; only then will the market work efficiently. Social, environmental and economic concerns (e.g. local economic development) may, however, argue that subsidies are required to help fulfil social, environmental or development goals, and that economic inefficiencies through distortions of allocations of goods and services are outweighed by the benefits of other objectives. Technology developers and innovators and market diffusion experts would argue that for a new technology to be developed to a stage where it can compete in the market, and where that technology is of benefit to the country, a period of support is appropriate — initially R & D support from the government and subsequently price incentives to get the technology onto the market, tested, adapted, and then diffused, while leading to cost reductions. Moreover, as noted in Chapter 5, there are a number of existing subsidies that already distort the market, and, as noted in Chapter 4, the balance of the tax burden in economies is itself often far from ideal and needs reform. It is therefore difficult to assess — in a market economy with a range of inefficiencies and distortions — which changes will lead to what effects on the market and which are good or bad. Having said that, there are some clear cases where the effects on the economy can be identified and assessed.

- Subsidies, where they respond to interest groups and not to requirements of the economy or the well-being of the country, do more harm than good and need reforming. This has been recognised for the CAP and CFP, and, for example, coal mining, and efforts to address this are under way.
- Economic instruments should encourage efficiency by allowing the activities to which they apply to choose how to respond rather than by prescribing a response. This 'own allocation of efforts' should help move towards a lower-cost approach to responding to the incentive or meeting the target. Emissions trading should lead to meeting the targets at an often significantly lower cost to industry than with installation-specific targets — though in practice the overall costs to the country depends on the choice of allocation approaches and burden sharing. There are positive arguments for emissions trading provided that there are no overriding local effects, the administrative and implementation capacities are in place, and it is

feasible to have appropriate allocation, ideally through at least partial auctioning.

- Any move to internalise costs and hence get the prices right, or at least better, should also lead to greater economic efficiency — hence, taxes and charges that redress the imbalance of prices should be beneficial to the economy as a whole. When done on a macro-scale, such as part of ETR/EFR, this may lead to employment benefits.
- Where there are taxes and charges but these are not collected, this leads to a double negative effect on the economy — firstly, the revenues are lost to the authorities or the government (depending on national practice with earmarking revenues) and, secondly, those supposedly taxed or fined will see non-collection as a statement of reduced need to comply and hence lead to inefficient polluting activity — where the costs of pollution outweigh the benefits of the economic activity. This is not just an issue of health and amenity values, but also concerns contaminated land, water, and abandoned hazardous waste sites for which there is considerable evidence of an unfortunate legacy in many transition economies, and which create a liability for current and often future generations.
- Subsidies, where used judiciously, can lead to the development of domestic eco-industries — such as the Danish or German wind turbine or German solar industries — and can lead to benefits for the economies concerned in terms of trade and employment.
- Finally, the use of taxes and charges on fuels, and subsidies for non-fossil fuels, can lead to a reduced dependency on imports and hence less exposure to risks of price fluctuations and lower import risks and costs, greater macroeconomic stability and also greater energy security, which has obvious benefits. Note, however, that there is no inherent problem with import dependency if the macroeconomic health of the importing country is robust and if the price fluctuations are acceptable.

Links to legislation: The use of market-based instruments is encouraged by certain pieces of legislation — such as the water framework directive. However, legislation may constrain the use of instruments — for example, the IPPC directive limits the scope for domestic trading of NEC substances (NO_x and SO_2), and the national targets within the NEC directive constrain cross-border trading. Some constraints may be useful (e.g. to ensure that local environmental concerns are not compromised), though in other cases they may merit consideration. Note that the emissions trading directive amends the IPPC directive to avoid restricting options under the trading system cap.

Instrument mixes: There is a move towards searching for optimal mixes of instruments. The decision must balance effectiveness, feasibility, administrative costs, transparency and understandability, which relates to complexity. There may also be conflicts between instruments, and it is critical to understand the respective roles of each instrument in the mix. Examples of sensible instrument mixes include:

- subsidies and labelling schemes for low-CO₂ vehicles, combined with fuel tax differentials to encourage zero-sulphur fuel (which facilitates more efficient engines), revision of company car schemes, revisions of registration fee or annual circulation taxes to become more CO₂ reflective, and congestion charging;
- the British and Danish models of combining taxes with negotiated agreements which allow tax reductions that have been regarded as successful and are being studied by others for potential application;
- the combination of targets and subsidies is a well-used method and is now being used to encourage renewable energies in many European countries.

It remains to be seen what instrument mixes will be launched for which current and future challenges. It is clear, however, that there is a need for instrument mixes, and market-based instruments will often play a constructive role. Two broad immediate challenges that will have a major influence on the selection of instruments are competitiveness concerns and interests in promoting sustainable development, which concern not just issues of looking for 'win-win-wins' across the three pillars, or looking for acceptable trade-offs across the pillars, but also more concretely issues such as equity and fairness.

Competitiveness and the need for more evidence for new policies and instruments: The Lisbon strategy enshrines the EU ambition of becoming the most competitive knowledge-based economy in the world by 2010. This not only lays a foundation for action in Europe, but it also underlines the recognition that competition will continue to increase in the coming years, especially with the ascendancy of China and India and, of course, with competitive policies from other trading partners such as the United States and Japan. This will maintain the arguments for exemptions from taxes and charges from industry, and make it difficult to

truly realise the ambition of addressing harmful subsidies. This has also arguably influenced some national allocation plans under the EUETS, current NAPs being quite 'lax' in some countries, which can lead to more stringent reduction targets for non-trading sectors when an overall environmental reduction target has to be achieved. In addition, more information (evidence of the nature and scale of problems, assessment of the benefits of policies and measures) will be required before new instruments are launched. In the absence of sufficiently convincing evidence, a two-step approach may be adopted — first, the use of low-risk/low-commitment instruments such as self-commitments or negotiated agreements, followed by taxes and charges if and when better information on the problem is obtained and if the first instruments prove unable to deliver.

Sustainable development: A key challenge in the coming years is for Europe to be innovative and ensure sufficient employment creation; without this, there is arguably less real possibility for robust sustainable development. One can expect major efforts to encourage the development of domestic markets for environmental technologies and the development of efforts to take advantage of growing international markets. Subsidies and green procurement initiatives as well as subsidy reform can be expected to support this process throughout Europe. Finally, one can expect that any proposals for new or substantial changes to policies and instruments will go through an impact assessment and that the issues of who are the winners and losers, the distributional impacts, equity and fairness, competitiveness, effect and cost-effectiveness, administrative costs and feasibility will all be reflected in the final decision. The issue of equity and fairness is growing in importance as concerns are being raised about equal treatment across sectors, and the size of installations, and emphasis is being put on differential impacts across different parts of society and the issues of regressive impacts (stronger relative impacts on poorer households). Social exclusion issues are becoming more prominent in environmental decision-making. This should lead to the next generation of economic instruments being selected, designed and combined with other instruments in a manner that offers more 'win-wins' and fewer inappropriate trade-offs — not only across the pillars of sustainable development, but also within the pillars themselves — and hence real progress towards sustainable development.

Annexes

Annex 1 – Abbreviations and acronyms used in the report

ABT	averaging banking and trading (scheme)
ALARA	as low as reasonably achievable
BAT	best available technique
BMW	biodegradable municipal waste
BMU	Bundes Ministerium für Umwelt (DE)
BREF	best available technique reference (note)
CAFE	'Clean Air for Europe'
CAP	common agricultural policy
CCA	climate change agreement
CCL	climate change levy
CDM	clean development mechanism
CERs	certified emission reductions
Cercla	Comprehensive Environmental Response, Compensation, and Liability Act
CFCs	chlorofluorocarbons
CFP	common fisheries policy
CNG	compressed natural gas
CO ₂	carbon dioxide
DG	Directorate-General (European Commission)
DSD	Duales System Deutschland
EA	Environment Agency (UK)
EAGGF	European Agricultural Guidance and Guarantee Fund
EAP	environment action programme
EEA	European Environment Agency
EEB	European Environment Bureau
EECCA	eastern Europe, Caucasus and central Asia

EFR	environmental fiscal reform
EIA	environmental impact assessment
ELV	emission limit value
EMAS	environmental management and audit scheme
EMECs	equal maximum emissions concentrations
EMS	environmental management system
ENAP	exploring new approaches in regulating industrial installations
EP OPRA	environmental protection, operator pollution risk appraisal
EPA	environmental protection agency
EPER	European pollutant emission register
EQS	environmental quality standard
ERDF	European Regional Development Fund
ERU	emission reduction unit
ESF	European Social Fund
ET	emissions trading
ETAP	environmental technologies action plan
ETR	environmental tax reform
EU	European Union
EUETS	EU emissions trading scheme
FDI	foreign direct investment
FIELD	Foundation for International Environmental Law and Development
FIFG	Financial Instrument for Fisheries Guidance
GFTs	government financial transfers
GHG	greenhouse gas
GJ	giga joule
GM	genetically modified
GMO	genetically modified organism
HGVs	heavy goods vehicles
IEEP	Institute for European Environmental Policy
IMPEL	European Union network for the implementation and enforcement of environmental law

IOPC	International Oil Pollution Compensation (Fund)
IPC	integrated pollution control (UK scheme)
IPPC	integrated pollution prevention and control
ISO	International Standards Office
ISO 14001	International Organisation for Standardisation — environmental management standard
ISPA	instrument for structural policies for pre-accession
ITQ	individual transferable/tradable quota
JI	joint implementation
LATS	landfill allowance trading scheme
LCPs	large combustion plants
LCPD	large combustion plant directive
LFAs	less favoured areas
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MAC	maximum allowable concentration
MBIs	market-based instruments
MPLs	maximum permissible levels of pollution
NAP	national allocation plan
NEA	negotiated environmental agreement
NEC	national emissions ceiling
NERAs	national economic research associates
NGO	non-governmental organisation
NICs	national insurance contributions
NO _x	nitrogen oxides
OMC	open method of coordination
PA	priority action
PM	particulate matter
PPP	'polluter pays' principle
PRN	packaging recovery note
PRTRs	pollutant release and transfer registers

PSR	performance standard rate
Reclaim	regional clean air incentives market
SD	sustainable development
SDR	special drawing right
SEA	strategic environmental assessment
Seveso	control of major-accident hazards involving dangerous substances
SME	small and medium-sized enterprise
SMS	safety management system
SO ₂	sulphur dioxide
TAC	total allowable catch
TCLs	temporary compliance levels
TELVs	temporary emission limit values
TENs	trans-European networks
TEN-Ts	trans-European transport networks
TRECs	tradable renewable energy certificates
UCD	University College, Dublin
UKEA	United Kingdom Environment Agency
UNFCCC	United Nations Framework Convention on Climate Change
VA	voluntary agreement
VAMIL	accelerated depreciation of environmental investments measure
VOCs	volatile organic compounds
VROM	Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu (Dutch Ministry of Housing, Spatial Planning and the Environment)
WDAs	waste-disposal authorities
WFD	water framework directive
WHO	World Health Organisation
WTA	willingness to accept (compensation)
WTO	World Trade Organisation
WTP	willingness to pay

Annex 2 – Country abbreviations

Countries included in the report

EU MEMBER STATES prior to May 2004	EU MEMBER STATES from May 2004	OTHER EEA COUNTRIES
Austria AT	Cyprus CY	Iceland IS
Belgium BE	Czech Republic CZ	Liechtenstein LI
Denmark DK	Estonia EE	Norway NO
Finland FI	Hungary HU	
France FR	Latvia LV	OTHER EFTA
Germany DE	Lithuania LT	Switzerland CH
Greece EL	Malta MT	
Ireland IE	Poland PL	BALKAN COUNTRIES
Italy IT	Slovenia SI	Albania AL
Luxembourg LU	Slovakia SK	Bosnia and Herzegovina BA
The Netherlands NL		Former Yugoslav Republic of Macedonia (FYROM) MK
Portugal PT	CANDIDATE COUNTRIES	Serbia and Montenegro CS
Spain ES	Bulgaria BG	
Sweden SE	Croatia HR	EASTERN EUROPEAN COUNTRIES
United Kingdom UK	Romania RO	Belarus BY
	Turkey TR	Moldova MD
		Russia RU
		Ukraine UA

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