4.1. Integration of the economy and the environment

Main findings

A variety of policy instruments are deployed to integrate the environmental dimension in economic decision making:

- Environmental impact assessment (EIA) of major projects is now a well-established procedure, although the effectiveness of EIAs depends on their being undertaken sufficiently early in the project cycle to influence project design.

- Legislation (the EU has an estimated 315 environmentally related Directives), the effectiveness of which depends on implementation by Member States (and also by the accession countries).

- Environmental management and auditing (EMAS) covers more than 1 500 registered sites across the EU (over 75% of them in Germany); the EU EMAS scheme is challenged by the international management scheme ISO 14000 which in some respects is less demanding.

- Voluntary Agreements, of which there are more than 300 in the EU, mostly in the Netherlands and Germany. The major issue is to make them credible and transparent, with third-party verification of binding targets.

- Subsidies, which may be environmentally damaging (supporting intensive agriculture or the coal industry) or beneficial (for example agri-environmental support).

- Environmental taxation: the main issue now is to shift from piecemeal environmental taxation to a more thorough ecological tax reform where labour taxes are replaced by environmental taxes.

In addition there are several instruments which have hitherto been less widely used – examples include extended cost-benefit analysis, tradeable permits and green procurement.

The EU Fifth Environmental Action Programme (5EAP) identifies sectors of economic activity which have major environmental impacts:

- Agriculture: eco-efficiency has improved in terms of emissions per unit of agricultural production, and fertiliser and pesticide use per hectare. Organic agriculture still plays a limited role. Agri-environmental measures are being applied on a considerable scale, but subsidies with a possible negative influence on the environment (like a considerable part of price supports) are still common and specific environmental taxation almost non-existent.

- Industry: eco-efficiency has improved for air and water emissions, but not for solid and hazardous waste: there is considerable scope for environmental taxation and voluntary agreements aimed at reduction of the generation of wastes.

- Energy: eco-efficiency is improving as the emissions of most air pollutants per unit of power generated are declining while energy demand is stable. Only about 5% of EU energy comes from renewable sources, and this could be increased by increased funding of renewables and taxes to internalise the environmental damage of fossil fuels.

- Transport: environmental damage is increasing, as a result of growth in the number of cars, road freight and air passengers, and increased congestion, despite improved vehicle fuel efficiency and use of catalytic converters. Environmental taxation on vehicle fuels is now widespread (although aviation fuel remains untaxed), and road pricing may change travel behaviour.

- Households: the number of households in the EU is growing at 1.6% per year, as average household size declines. There is growth in energy use and waste generation, although waste recycling is increasing particularly in countries which have introduced comprehensive programmes with charges for household waste collection and a well-financed recycling network. There is still scope for (higher) charges for household energy and water use. Eco-labelling of products is still developing slowly and covers only a small share of available household appliances.

1. Why and how to integrate economy and environment in the EU

The importance of integrating environmental considerations into economic and sectoral decisions was officially recognised in Article 6 of the consolidated Amsterdam Treaty, which established an obligation to integrate environmental requirements into all EU policies and actions. Recent EU progress in the process of implementation is demonstrated by the outcomes of the Cardiff European Council (of EU Member States; European Commission, 1998a) and the Aarhus Conference (of Ministers of the Environment of UNECE countries), both held in June 1998 (see Chapter 1.1).

As analysed in the previous chapters, environmental problems arise from economic activities – for example air pollution from transport, industry and power generation, or water pollution from households, industry and agriculture (see EEA, 1998, Chapter 14 for a summary). While environmental regulators can make policies that influence these other sectors, it is much more efficient and effective if policy makers in each sector – transport, agriculture, industry etc. – directly consider environmental concerns when they formulate policy. This process is known as the 'integration' of economic or sectoral policy with environmental policy.

Integration is a central objective of the Fifth European Environmental Action Programme (5EAP), which was adopted in 1992. It states that 'the strategy of the Programme is to create a new interplay between the main groups of actors (government, enterprise and public) and the principal economic sectors (industry, energy, transport, agriculture, tourism) through the use of an extended and integrated range of instruments.'

The final purpose of integration is, of course, to reduce the environmental damage from sectoral activities. Evidence presented in this chapter will show a decrease in environmental damage associated with some economic sectors, notably industry, within the EU. This is known as 'decoupling', since there is no longer a fixed relationship between production and the associated negative environmental effects. Decoupling involves a reduction in the ratio of physical emissions or natural resource use per unit of economic output, either from increasing efficiency through technological changes or a shift to a less environmentally damaging products. However, in some sectors, the increased scale of economic activity – such as the growth in the number of cars and households – will lead to growing environmental damage. These so called 'scale' effects may be enough to overtake any gains in reduced damage per unit of output, so that total environmental damage caused by the sector will rise overall. The big question is whether technological growth and product shifts will be rapid enough to keep pace with EU-wide demands for a higher standard of living. The situation is summarised in Table 4.1.1.

Progress towards integration has been made in agriculture, with reduced fertiliser (and pesticide) use per hectare, and a growing area devoted to environmentally beneficial activities. The energy and industrial sectors are also showing some improvements with declining air pollution per unit of output. However, the available data suggests that solid waste and hazardous waste from industry are increasing. Two sectors, where damage is still growing, are transport and households, both because of scale effect and the lack of efficiency gains substantial enough to offset this.

While much of the policy discussion focuses on the environmental damage which is not taken into account (technically speaking, internalised) in economic decision-making, it is important to note that economic systems also fail to account fully for environmental benefits. The agricultural sector not only produces pollution and landscape destruction, but also creates living landscapes that

Overview of sectoral trends relevant to environmental damage in the EU Table 4.1.1.

Sector	Agriculture	Industry	Energy	Transport	Households
Scale of consumption/ production	Utilised agricultural area fell by 0.7% a year from 1990-94	Manufacturing production stable since 1990	Final energy consumption per capita has been stable since 1985	Stock of cars risen by 4% a year since 1986, Road freight has risen by 5% a year since 1980, Air traffic has increased by 7.8% a year since 1985	Number of households has increased by 1.2% a year from 1991 to 1995
Efficiency gains	Fertiliser consumption fell per ha by 1.6% a year from 1985-94	Air pollution per unit of production declining Industrial waste has increased 1.4% per capita per year since 1985 in selected countries	CO_2, SO_x and NO_x emissions per kWh have declined from 1980-1990	CO_2 emission per vehicle-km has remained constant, NO_x has slightly declined , and SO_x has significantly declined from 1990-1995	Waste per capita has been rising by 3% per year since 1980
Shift to less damaging products or services	Share of agricultural land devoted to organic agriculture is rising, though still relatively low at 1.6%; agri-environmental measures now account for 20% of agricultural land, exceeding the target of 17% set out in the 5EAP	-	Renewable energy was 5.3% of total domestic energy consumption in 1996 – the same as in 1985	Passenger rail use, and rail and inland waterway freight have remained static since 1970 and are now less than 20% of total journeys	-

Source: EEA, Eurostat

are widely appreciated by people at large. For example, after deducting environmental damages from the net product of UK agriculture, there is nonetheless an estimated 24% increase in the 'true' output of the agricultural sector because of its contribution to biodiversity conservation, amenity and the sequestration of carbon dioxide (Adger and Whitby, 1991, 1993; OECD, 1997a).

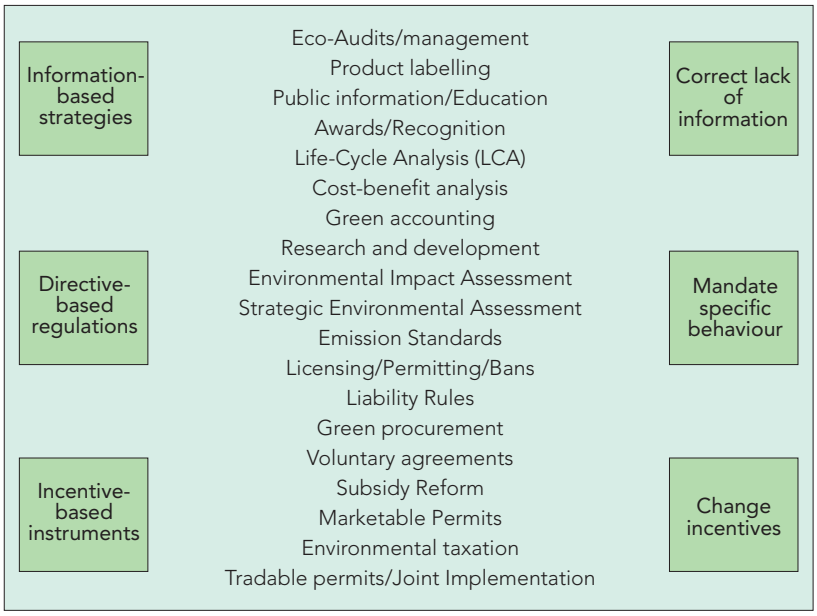
The process of integrating economic and environmental policy is complex, and several possible criteria for judging progress towards integration have been proposed (see Chapter 1.1) (EEA, 1998, Chapter 14; OECD, 1996a). The most effective approach is to examine the extent to which each sector has implemented key instruments for integration. These instruments can be subdivided into their target group (government, firms and public) or their aim (for example, information, regulation, incentives etc.). The 5EAP highlights four main sets of instrument: regulatory instruments, market-based instruments (including economic and fiscal instruments and voluntary agreements), horizontal supporting instruments (research, information, education etc.) and financial support mechanisms. These will be reviewed further in the next section.

2. Overview of key instruments for integrating economic and environmental policy

The main instruments for integration of the environmental dimension in economic decision-making are summarised in Figure 4.1.1. Some instruments, such as environmental taxation, are suitable for more than one sector while others, such as liability rules are targeted at a single sector, in this case, industry. This section will focus on the cross-sectoral instruments – in particular, environmental impact assessment (EIA), regulations, voluntary agreements, subsidy reform and environmental taxation – with sector-specific instruments covered in the sectoral reviews that follow.

While the comparison between information, regulatory and incentive approaches is complex, there is strong evidence that the economic approaches may reduce overall compliance costs for industry and house-

Figure 4.1.1 **Range of instruments for environmental policy**



Source: Adapted from EEA, 1997

holds. Additionally, some economic instruments raise financial revenues, which could be used to reduce other distorting taxes in the economy, particularly those taxes that give disincentives for employment. This is known as the *double dividend effect*, because taxation deters environmentally damaging activities (the first dividend) and other distortionary taxes are reduced (the second dividend). However, other research suggests that the reality is far more complex (Goulder, 1995). Due to these perceived benefits, this chapter reviews all the main instruments, but focuses on the incentive approach: subsidy removal, environmental taxation and voluntary agreements.

For each of the cross-sectoral instruments, there has been progress both at the EU level and Member State level (Table 4.1.2).

2.1. Information-based strategies

Information-based strategies work on the assumption that environmental policy, however devised, works better when besides policy makers, citizens are better informed. EU institutions have been taking an active role in co-ordinating and developing these instruments, both as environmental policy measures and to ensure that they do not lead to barriers to trade (see Chapter 4.2).

2.1.1. Environmental impact assessment

The EU has been active in promoting Environmental Impact Assessment (EIA), and Directive 85/337 has led to a major growth in EIA activity. EIA is widely used in all sectors to reduce environmental damage from major investment projects. There were an estimated 7000 EIAs per year within the EU in the early 1990s, with more than 70% in France. The main problem is to ensure that EIA is done sufficiently early in the project cycle to influence project design. A report for the Commission (European Commission, 1993a) found that: 'there is clear evidence that project modifications have been and are taking place, due to the influence of the EIA process. However, there is also evidence that as yet, its impact is not as widespread as intended and that modifications are mainly confined to those of a minor or non-radical nature'. The amended EIA Directive 97/11/EC aims to overcome some of these problems by broadening and clarifying the scope of projects which are EIA mandatory.

2.1.2. Strategic environmental assessment

One of the main shortcomings of project EIA is that it is applied at a very late planning stage. Therefore, Strategic Environmental Assessment (which applies the principles of environmental assessment to policies, plans and programmes) is also being taken forward by the EU. There is currently discussion on a proposed Directive (COM(96)511) which would require environmental assessment of certain plans and programmes which are part of the town and country planning decision-making processes. This would also include certain sectoral plans and programmes. However, the omission of SEA for policies leaves the Commission behind the forefront of international practice (Sadler and Baxter, 1997). Within Member States, Netherlands has taken the lead, with a statutory requirement for SEA of certain plans and programmes since 1987. Denmark and Finland are similarly advanced, requiring SEA for certain plans, programmes and policies.

2.1.3. Cost-benefit assessment

The importance of cost-benefit analysis was noted in the 5EAP which states the need for the 'development of meaningful cost-benefit analysis methodologies'. There has now been a growing willingness to use such approaches (Pearce, 1998). A number of attempts have been made to evaluate environmental externalities across the EU in sevral sectors, such as energy (European Commission, 1998b), transport (ECMT, 1998) and waste (Coopers and Lybrand *et al.*, 1997). On the operational side, the Structural Funds require that; 'all major project proposals are now required to include an

assessment of costs and benefits including those relating to the environment' (European Commission, 1996b). The European Investment Bank has also introduced procedures to evaluate environmental externalities in some sectors (IVM and EFTEC, 1998).

2.2. Regulatory approaches: environmental legislation

While information-based strategies can influence behaviour, they do not generally require compliance (except in the case of US 'right-to-know' type policies). Most environmental policy in the European Union and at Member State level is executed through regulations, or what is called 'command and control'.

With more than 315 pieces of Community environmental legislation, the EU has developed a fairly comprehensive set of environmental Directives. Most of the Directives relate to industry, agriculture and transport, but there are a growing number in the energy and household sector.

Improving implementation is an urgent priority since in 1995 Member States had notified implementing measures for only 91% of the Community's environmental Directives, leaving as many as 20 or 22 directives not transposed (transferred into national legislation) by some Member States. In the same year, 265 suspected breaches of Community environmental law were reported, which is 20% of all infringements registered by the Commission that year. In October 1996 over 600 environmental complaints and infringements were outstanding against Member States, with 85 awaiting determination by the Court of Justice (European Commission, 1996c). In 1998, the latest round of infringement proceedings announced showed that the majority of the EU Member States were still being targeted by the Commission for non-compliance with 12 environmental directives.

Future EU legislation will focus on follow-ups to existing legislation and updating. The greater regulatory challenges are twofold: first, to ensure the widespread implementation of EU legislation in existing Member States and second, to cope with enlargement of the Union, as the economic and financial constraints of the new countries will require complex transitional arrangements. Up to 1998 many Accession Countries were making slow progress in adoption of EU environmental standards (European Commission, 1998c). The main area of weakness was poor institutional capacity in environmental inspectorates. The longer term challenge of enlargement is that there may, in the future, be pressure to make new and even existing environmental legislation much more flexible, and indeed use means other than legislation to attain the goal of environmental improvement in order to take into account the economic and environmental diversity of Member States.

Progress at EU and Member State level in introducing key instruments — Table 4.1.2.

Instrument	EU level initiatives	Member State initiatives
Research and development	Funding in the 5th research framework programme will be EUR 2 billion for the environment	Support for clean technology in many Member States
Environmental Impact Assessment (EIA)	Directive on EIA in 1985 (revised in 1997)	About 7000 EIAs per annum conducted across EU
Environmental management systems	Eco-Management and Audit Scheme (EMAS) from 1993	About 1500 sites registered with EMAS by 1998
Regulations (emission standards, licensing/ permitting/bans)	About 315 environmental related Directives (including updated Directives)	About 90% of EU Directives had been transposed into national legislation, but still weaknesses in implementation
Voluntary agreements	Guidance to Member States (European Commission, 1996a) Agreements on energy efficiency in washing machines and TVs; and CO_2 emissions with auto industry	More than 300 voluntary agreements agreed from 1990-96, mostly for industry, with about 100 in Germany and 100 in the Netherlands
Subsidy reform	Reform of Common Agricultural Policy, Common Fishery Policy, Structural Funds, Cohesion Fund, European Investment Bank	Reform of domestic energy and industrial subsidies underway
Environmental taxation	Guidance to Member States (COM(97)9) Mineral Oils Directive (1992) Proposal for VAT on energy to be harmonised and discussion of pesticide tax	Growth in environmental taxation with Nordic countries leading the way. EUR 6 billion raised by pollution taxes in EU in 1996 – a 100% increase since 1990

Source: EEA

2.3. Incentive approaches

The use of economic and fiscal incentives was emphasised in the 5EAP: 'In order to get prices right and to create market-based incentives for environmentally friendly economic behaviour, the use of economic and fiscal incentives will have to constitute an increasingly important part of the overall approach. The fundamental aim of these instruments will be to internalise all external

environmental costs incurred during the whole life cycle of products – from source through production, distribution, use and final disposal – so that environmentally friendly products will not be at a competitive disadvantage in the market place vis-à-vis products which cause pollution and waste.'

2.3.1. Voluntary agreements

During the 1990s, voluntary agreements (VAs) have grown in popularity as a means of internalisation (Box 4.1.1), particularly in the industrial sector; 'Environmental agreements with industry have an important role to play within the mix of policy instruments sought by the Commission. [...] They can offer cost-effective solutions when implementing environmental objectives and can bring about effective measures in advance of and in supplement to legislation. In order to be effective, it is essential, however, to ensure their transparency and reliability.' (European Commission, 1996a).

Table 4.1.3 shows that all Member States have experimented with some form of voluntary agreements. In 1996 some 305 *national* agreements were recognised in the European Union but many more exist at sub-national level (European Commission, 1997a). They are focused on many different sectors but 20% of these were in chemicals;

Box 4.1.1. How do voluntary agreements work?

Voluntary agreements (also known as covenants or negotiated agreements, as they may not be strictly voluntary) involve a polluter negotiating with a regulatory authority to reduce pollution or modify resource depletion. VAs may take several forms. EEA (1997) distinguishes those which determine the target for reduced environmental impact, from those where the target is already established, with the VA focusing on the detailed implementation of action to achieve the target. The term 'voluntary agreement' covers a wide range of commitments, varying in terms of their legal characteristics, reporting mechanisms, monitoring arrangements, etc.

Voluntary agreements differ from conventional regulatory policy in several ways. First, the actual target of policy may be part of the VA. In other cases, however, the VA is simply substituted as the means of achieving a target that would have been implemented anyway. Second, formal legislation is generally avoided, although the threat of that legislation often remains. The VA effectively becomes a means of 'putting the polluter's house in order' in order to avoid the legislation. In other cases, the threat is of sanctions for not achieving the VA target, rather than the threat of legislation to mandate the target. The difference in effect here may be negligible and the extent to which such agreements are truly 'voluntary' has been questioned (Segerson and Miceli, 1996).

Voluntary agreements remain controversial as a policy mechanism for achieving environmental goals. On the positive side they impart considerable flexibility to the polluter as to how to meet an agreed target. In this respect they are likely to minimise compliance costs, an important feature of modern environmental regulation. From the polluter's point of view they may also have a benign public image: the industry is seen to be taking action on its own, even if there is a less well publicised threat of sanction behind the agreement. From the regulator's standpoint there is the advantage of avoiding costly legislation, although this may be offset by the need to monitor the agreement and put pressure on to achieve the environmental goals (European Commission, 1997c).

As to environmental effectiveness, there is contradictory evidence about the extent to which firms achieve the environmental targets in VAs. In the USA there is some evidence that firms in VAs over-comply (Schmelzer, 1996), whilst some European studies find that environmental goals are rarely met at all (Bizer, 1999). The EEA assessment of six cases (EEA, 1997) judged that agreements had been effective in a few cases but that insufficient information was available to assess the remainder. For those VAs where the target itself is negotiated, there are some suspicions that the resulting goal is less than would have been the case had legislation occurred. This perception tends to be reinforced if the VA excludes representation from environmental interests; i.e. is exclusively between polluter and regulator. Not all policy areas are suitable for conventional approaches, however, and VAs may be especially suited to contexts where highly technical and complex factors make conventional legislation difficult. This is a well-known issue in regulation, namely one where the information rests with the polluter and the costs of acquiring the information by the regulator are very high (so-called 'asymmetric information').

Finally, doubts have been cast about other aspects of VAs. Because of their potential for high publicity that benefits the industry, there is an incentive to 'free ride'; i.e. for a single firm to secure the benefits of the publicity without undertaking any aggressive measures. The extent of this free-riding is generally unknown (Storey, 1996). There are also concerns about the extent to which VAs can restrict competition and will affect trade within the EU, by forcing co-operation between competitors. At the moment there appears to be no evidence that this is the case, but some commentators perceive it as a real risk.

At the moment, experience is too new for the effectiveness of such agreements to be determined. The EEA survey (1997) suggests that they have been partly responsible for observed environmental improvements, and have been associated with the introduction of environmental management schemes in some firms. On the other hand, Bizer (1999) reviews eight voluntary agreements and finds that none of them can be regarded as cost effective – i.e. none produced a better environmental solution than alternative forms of regulation.

12% in food products, tobacco and beverages; 11% in transport, communications and storage; 11% in metals; 10% in non-metallic mineral products; 10% in electricity, gas and water supply; and 10% in rubber and plastic products. Sector definitions can overlap somewhat. The Netherlands and Germany account for some two-thirds of prevailing agreements. Voluntary agreements are unlikely to be suitable for all sectors; in particular, they are not easily applicable to heterogeneous sectors such as agriculture. Most agreements have been for waste management, followed by air pollution and climate change. Examples include agreements on producer responsibility for packaging in Sweden, Germany and the UK, and an agreement in Portugal between the Ministry of Environment and the paper industry.

To date most VAs have been concluded within Member States, but there is now a desire to initiate more EU level agreements. The first EU level agreement came in 1997 with a 20% improvement in energy efficiency by 2000 (from a 1994 baseline) agreed with the washing machine and television/video recorder industry. In October 1998, a landmark agreement was reached between European car manufacturers and the Commission that average CO_2 emissions from cars would be reduced by 25% from 1996 to 2008. The Commission is now discussing voluntary agreements with the EU airlines industry and the pulp and paper industry. In addition to actual agreement, the EU issued a Communication in 1996 to Member States (European Commission, 1996a) that presents guidelines for the use of voluntary agreements. The Communication stresses that while VAs have some advantages, they should be more credible and transparent with third-party verification of binding targets.

Environmental agreements by Member State and sector, 1996 — Table 4.1.3.

	5EAP Sector					
Member State	**Agriculture**	**Energy**	**Industry**	**Transport**	**Tourism**	**Total number**
Austria			✓			20
Belgium		✓	✓			6
Denmark	✓	✓	✓			16
Finland			✓			2
France		✓	✓			8
Germany		✓	✓			93
Greece		✓	✓		✓	7
Ireland			✓			1
Italy			✓			11
Luxembourg		✓	✓			5
Netherlands	✓	✓	✓			107
Portugal	✓		✓			10
Spain			✓			6
Sweden	✓	✓	✓			11
UK			✓			9
EU15						312

Source: EEA, 1997

2.3.2. Subsidy reform

Both at EU and Member State level, there are major subsidy programmes that affect environmentally important markets, such as energy, agriculture, transport, heavy industry and fisheries. Due to the existence of subsidies, product prices can be lower, even at a level that may not cover private costs. While such subsidies are often introduced for sound social and economic reasons, they sometimes have deleterious effects on the environment because they encourage wasteful production or the excessive use of damaging inputs (e.g. fertilisers, pesticides) (Table 4.1.4). Generally, subsidies are declining, although subsidies to agriculture through the Common Agriculture Policy (CAP) and to the coal industry in certain countries remain high, and may have considerable negative environmental impacts. There is widespread agreement that subsidies should, as far as possible, be reduced in an effort to reduce environmental damage. In undertaking subsidy reform, it is possible to introduce environmentally beneficial subsidies which are in effect payments for the provisions of external benefits. For example, as part of CAP reform, there has been an increase in payments to farmers for environmentally positive land use. These benefits include the provision of amenity and natural assets such as woodland, lakes and ponds, stone walls and traditional buildings. A fuller description of the sector specific subsidies is given in Sections 3-7 below.

2.3.3. Environmental taxation

Environmental taxation was stressed in the 5EAP and Member States have been active in increasing taxation, particularly in the

Table 4.1.4. **Potential environmental effects of sectoral subsidies**

Sector	Approximate size (EUR)	Type of subsidy	Potential environmental impacts
Agriculture	65 billion (1997)	Commodity price support. Subsidies on inputs (fertilisers, pesticides, capital, water).	Negative impacts: increased pollution from intensive agriculture and habitat destruction due to price guarantees.
		General support (R&D, extension).	Positive impacts: agri-environmental schemes, support for environmentally beneficial activities.
Energy	9.3 billion (1995)	Support to coal producers. General support to fossil fuels. Support to electricity sector.	More pollution from coal and fossil fuels in general. Reduced energy efficiency.
Transport	0.44 billion (1995) to road freight	Revenues collected from road users is less than expenditure on road maintenance etc.	More road transport and hence more air pollution, noise etc.
Industry	25.2 billion (1994) – excluding Germany (=17.4 billion, 1994)	Subsidies to encourage location in certain areas. Subsidies for certain industries (steel, ship-building and textiles).	Increased production in some environmentally damaging industries (e.g. steel).

Source: Steele, Hett & Pearce, 1999 based on data from OECD, 1998a; IEA, 1998; ECMT, 1998; European Commission, 1997b

Nordic countries. However, progress at the EU level remains slow up to now; the Commission's 1992 proposal for an EU-wide CO_2/energy tax was not adopted (see Section 2.2 in Chapter 3.1). The EU adopted in 1992 the Mineral Oils Directive, a fiscal harmonisation measure setting a minimum level of excise duty on motor fuels in all Member States. There are now a number of initiatives to increase activity in this area in line with the concerns raised in the 5EAP: 'As such charges become more widespread and have real environmental impact and in consequence, generate greater financial income, some intervention at Community level may be necessary to ensure that charging systems are designed in a transparent and comparable way, and to ensure that distortions of competition within the Community are avoided'. There are proposals to impose minimum rates of excise duties on energy across the EU and for a framework for pesticide taxes. In addition, the European Commission issued in 1997 a Communication on environmental taxes and charges in the Single Market (European Commission, 1997c) which concludes that there is considerable room for Member States to introduce fiscal instruments in keeping with the legal and competition rules of the Single European Market.

At the Member State level, most states have taxes on motor fuels but significant differences remain in other areas, in particular agricultural inputs, air transport and water. Three major surveys by the OECD (1989, 1994, 1997b) show the use of economic instruments is on the increase, although progress has been modest. In 1987, European countries had around 137 examples of economic instruments; environmentally beneficial subsidies played a significant role, accounting for the vast majority of instruments in place in Germany and just under one-half of those in Finland. In 1992, the total number of instruments had increased to 157 and in 1997 the total number was 134, but subsidies were excluded from the survey and more countries were surveyed. Although overall progress has not been dramatic, substantial changes have taken place in some countries. Denmark effectively more than doubled its use of non-subsidy instruments in the five years between the two surveys, as did Germany. Since 1992 further changes occurred, with the Scandinavian countries substantially increasing the use of economic instruments, along with the Netherlands, Belgium and Austria (Figure 4.1.2). The number of taxes alone, however, has a limited value as an indicator of progress. Tax revenues from the UK, for instance, are higher than in many other countries.

The revenue from transport and pollution taxes represented only 1.8% of total EU tax revenue in 1996, although this proportion is larger for the Netherlands (5.5%) and Denmark (4.9%). By 1996, pollution taxes raised EUR 6.7 billion in the EU, while transport taxes raised EUR 45 billion. For pollution taxes this is a 100% increase in revenue since 1990. Transport taxes are very variable between Member States (see also Sections 6.5 and 6.6 below). Taxes classified as energy taxes, however, represented a larger proportion, at 5.3% of EU tax revenue on average, up to around 8% in Portugal and Luxembourg and around 7% for Italy and the UK. While the number and revenues of environmental taxes have been growing, their magnitude still remains low and they still make up a limited proportion of the total revenue from taxes and social contributions and a very small proportion of GDP (Figure 4.1.3).

The progress in adopting economic instruments in the economies in transition is not

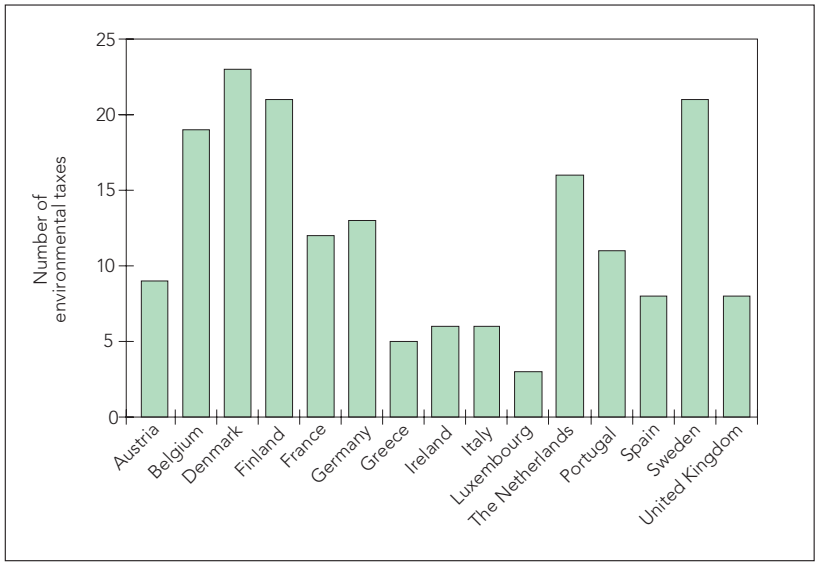
included in the OECD and EEA surveys. A UNEP Compendium of case studies of economic instruments in central eastern European Countries (UNEP, 1997) suggests that economic instruments are quite widespread, reflecting the fact that an environmental tax base existed in some countries before transition, although such taxes were generally ineffective (Box 4.1.2).

Further progress on economic instruments can take place in three areas (EEA, 1996): their extension to more countries, increasing harmonisation and capability at the EU level, and developing new tax bases. Extension to more countries requires that other countries follow the more radical steps taken by the Netherlands and Scandinavia. Increased harmonisation is often advocated because of fears that environmental taxes, especially energy taxes, will have effects on competitiveness within the Single Market, thus providing a justification for action at EU level in accordance with the subsidiarity principle. But many environmental taxes will tend to be modest fractions of industrial production costs, so that competitiveness effects will be small or non-existent. Additionally, environmental damages vary by Member State so that the economic rationale for harmonisation is not always present. Nonetheless, moves towards harmonisation clearly provide one way in which the scale and extent of economic instruments can be extended. Steps to develop new tax bases are already in progress with discussion of innovative charges on pesticides and air fuels, but could also include water resources and hazardous chemicals.

In the longer term, there may be a more radical shift away from taxing 'goods' like labour towards taxing 'bads' such as environmental damage. This was discussed in the Commission White Paper on Growth, Competitiveness and Employment (European Commission, 1993b) which concludes: 'Finally if the double challenge of unemployment/environmental pollution is to be addressed, a swap can be envisaged between reducing labour costs through increased pollution charges'. Some countries are already applying this. The tax reform in Denmark provided for marginal income taxes to be lowered by about 8-10% between 1994 and 1998, and for the phasing in of new green taxes worth EUR 1.6 billion (EEA, 1996). The total redistribution of the tax burden in Sweden was equivalent to 6% of GDP, while the tax shift between labour and energy accounted for 4%. The 1998 French budget included a new generalised pollution tax grouping taxes on water, air pollution and waste, which will be used to lower taxes on labour. Similar reforms have taken place in Norway and the Netherlands, whilst the UK has introduced a landfill tax with the revenues being used to reduce labour taxes and support environmental trusts. It is likely that in the future, this shift to taxing environmental damage to reduce labour taxes, known as 'ecological tax reform', will grow.

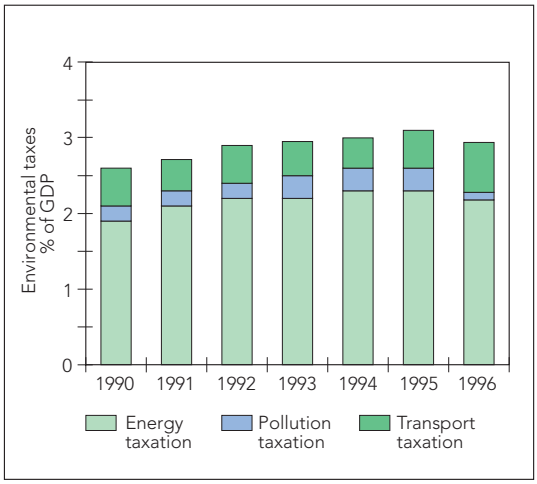
The result of this shift is that, when environmental taxes are combined with reductions in distortionary taxes, not only does the environment improve, but there may also be positive economic effects. This is known as

Number of environmental taxes in EU countries, 1996 Figure 4.1.2



Source: OECD, 1997b

Energy, pollution and transport taxes as % of GDP in the EU, 1990-96 Figure 4.1.3



Note: for comparison with other diagrams taxes are shown here as percentage of GDP and not, as is more common, as percentage of total revenues from taxes and social contributions.

Source: Eurostat

Box 4.1.2. Economic instruments in economies in transition (central and eastern Europe, Accession countries)

Pollution charges have traditionally been in place in the transition countries. Due to their levels being too low and the lack of institutional mechanisms for full collection, they had little effect in the 1980s. Currently, though, economic instruments are gaining importance in the 'new' environmental policy.

In Poland emitters of air pollutants must have a valid permit which in turn is contingent upon demonstrating the fate of emissions using dispersion models. All permitted polluters must then pay a charge on emissions and fines if emissions exceed the standard set. Fines are about 10 times the emission charges. The emission charge was US$2 per tonne of SO_2 emitted in 1990 increasing to US$96 in 1996. Revenues raised in 1994 totalled some US$105 million from the SO_2 tax alone. Revenues are hypothecated to various environmental funds at local, regional and national levels. To date the charge has probably not encouraged the introduction of abatement equipment beyond major enterprises since it is too low. Nonetheless, compliance appears to be improving, and environmental funds play a positive role.

Hungary introduced a packaging waste charge in 1996. Charges are paid according to the weight of the packaging material, with a discount for the degree of recycling beyond some obligatory target. The recycling may be undertaken by the payer of the charge or through a binding contract with a recycling organisation. Major packaging corporations and users of packaging have already instigated recycling measures. The charge rates are mainly based on the costs of treating packaging waste and are levied at the first point of sale to minimise the complexity of the charge system. Actual revenues are projected to be around US$13 million per annum.

In the Czech Republic large and medium-sized polluters have, since 1992, had nine years by which to comply with air emission standards comparable to those in the EU. Emission charges cover nearly 90 pollutants and are an integral part of the programme of compliance. Charges were set to be similar to average abatement costs, when these were known, with a discount for contexts where technologies are under development, and a surcharge of 50% for non-compliance. Other charges are based on effluent and waste. The revenues from the waste charge are recycled to the communities in the locations where the waste site is located – effectively a form of compensation. Natural resource charges on converted agricultural land, groundwater, surface water and mineral extraction are also in place.

Sources: Lehoczki and Sleszynski, 1997; Balogh and Lehoczki, 1997; Seják, 1997.

the 'double dividend' and has recently been estimated at an EU level (Jarass, 1997). Work by the Norwegian Tax Commission suggests that raising environmental taxes equal to 1% of GNP, and reducing labour taxes by an amount equal in revenue terms would raise employment by 0.7%, reduce the consumer price index by 1.2% and raise disposable incomes by 0.2% by the year 2010 (Moe, 1996). A recent study for the UK finds that seven new environmental taxes could help create 391 000 jobs (Cambridge Econometrics, 1997).

2.3.4. Tradable permits and joint implementation

The 5EAP highlights the possibility of more innovative economic incentives: 'It will be important to study also the extent to which possible options such as tradable permits could be utilised to control or reduce quantities (of pollution)'. With such programs a fixed total quantity of allowed pollution (emission budget) is set and allocated in the form of tradable permits to the regulated community. The polluters have the choice which policies or measures to use to comply with the overall target. Among the possible compliance options is the acquisition or transfer of tradable permits. Similar programs can be used to limit or control resource extraction (e.g. fish catch, water use). While this approach has yet to penetrate Europe, they are commonplace policy weapons for the control of air pollution in the US and for fisheries management in the US, Australia and New Zealand (OECD, forthcoming 1999). Germany is about to introduce a trading scheme for volatile organic compound emissions from small industry. The onset of further restrictions on sulphur and nitrogen emissions in Europe and the implementation of the Kyoto Protocol to the Framework Convention on Climate Change are likely to see more attention to tradable quota systems in Europe.

2.4. The use of policy instruments in the EU: a summary

The sectoral distribution in the use of the main policy instruments discussed above is summarised in Table 4.1.5. Due to the character of the various sectors, the applicability of the instruments varies, which is one of the reasons behind the distribution shown. In this respect it needs to be stressed that, as mentioned before, such a quantitative overview certainly is not intended for progress evaluation towards some targets.

3. Agriculture

The agricultural sector is still rich in market distortions which encourage harmful agricul-

tural practices. The Agenda 2000 reforms promise to further the current progress in this area. However, integration with a real and large-scale effect on the environment has yet to be realised. Overall, progress towards internalisation in agriculture is moving in the right direction by reducing environmentally damaging subsidies and introducing economic instruments, but at a slow pace.

3.1. Environmental assessment of the sector

The agricultural sector has shown declining air emissions and fertiliser use since the late 1980s (Figure 4.1.4). The decline in fertiliser use can be attributed to several factors, including increased use of manure, and technical change (see Chapters 2.2 and 3.5). This trend is likely to continue with stricter implementation of the Nitrate Directive and the CAP reforms. The decline in livestock numbers has helped to reduce methane and ammonia emissions, although livestock farming still contributes significantly to total methane emissions (42%) (see Chapter 3.1 and 3.4). The number of pigs is still rising, with high concentrations in certain parts of the EU and accompanying manure problems. The overall livestock density has not declined, which also points to the continuation of the nutrient load in areas with intensive farming systems. Pesticide use (in tonnes of active ingredient) has stabilised in the EU, although the newer pesticides are more biologically powerful and applied in smaller quantities. Energy use per unit of production continues to grow, although energy use in agriculture amounts to a very small proportion (less than 2.5%) of overall energy consumption. Agriculture is the largest consumer of water in southern Europe, and this is increasing. One positive trend is that the share of agricultural area in the EU devoted to organic agriculture has been steadily increasing, although at approximately 1.6% in 1997 the effect of this is probably insignificant. The social context of the agriculture-environmental debate cannot be ignored. In the 1980s, about three million people in the EU12 left agriculture, a decline of almost 40%, highlighting the importance of diversification of the rural economy (see Chapter 3.13).

The environmental impacts of agriculture in the Accession Countries are mixed. Intensification has occurred, but in areas outside the collective farms and following the declines in output since 1990 the use of inputs such as fertilisers and pesticides was relatively low in most countries and the associated pressures on nature and wildlife were less than in much of western Europe (European Commission, 1998d) (see Chapters 2.2 and 3.13).

There are many ways to reduce environmental damage from agriculture. The assessment will focus here on measures targeting both inputs (pesticides, fertilisers, and water) and outputs (agricultural area and livestock density).

3.2. Quantified environmental damage

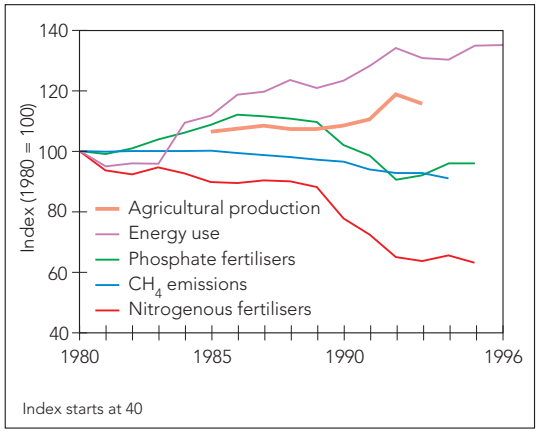
In comparison with other sectors such as energy and transport, the agricultural sector has not been the subject of attempts to measure environmental damages on a systematic basis. A recent investigation of UK agriculture (Pretty et al, 1999) estimates the external costs in 1996 to be almost EUR 2.3

Summary of use of instruments in each sector within the EU (in %) — Table 4.1.5.

	Agriculture	Industry	Energy	Transport	Households
EIAs per year (period 1989-1991: 7000 per year)	16	26	8	30	20 (waste)
Directives (315 in total)	30	40	5	14	9
Voluntary agreements (305)	3	88	5	4	-
Environmental taxation (134 taxes)	3	9	18	54	16
Environmental Management Systems (1714 registered EMAS sites)	-	88	4	8	-

Sources: EIA: derived from European Commission, 1993a; EC Directives: Haigh, 1998; Voluntary agreements: European Commission, 1996a; Environmental taxation: OECD, 1997b; EMAS: ERM (forthcoming).

Agricultural production and selected emissions to the environment — Figure 4.1.4



Source: EEA

billion, of which EUR 320m is from damages to water resources, EUR 700m is attributed to air emissions, EUR 140m is damage to wildlife, landscape and genetic diversity, and around EUR 1 billion is damage to human health from BSE ('mad cow disease') and related diseases.

3.3. Regulations

Several EU policy measures are beginning to exert a greater influence on the agricultural sector and its environmental impacts, including the Nitrate, Pesticides and Habitat Directives (see Chapters 2.2, 3.5 and 3.11). However, legislation has not always been successful, for example the widespread failure to implement the 1991 Nitrate Directive which has resulted in legal proceedings by the Commission against 13 of the Member States (ENDS, 21 October, 1998). The EU has also passed two Directives (EEC 2092/91 and EEC 2078/92) setting up a harmonised framework for organic production and organic livestock farming.

3.4. Subsidy reform and agri-environmental measures

The European Union subsidises agriculture on a substantial scale. The main forms of subsidy are (a) market price support whereby farmers are guaranteed prices that are often above world prices, and (b) direct payments to farmers. Other forms of support also exist. Direct payments have been growing since the 1992 CAP reforms, the aim being a gradual reduction in price support to be replaced by direct payments with targeted objectives, including payments to set aside land from agricultural use and programmes to promote environmental objectives (see Chapter 3.13). Whereas price support accounted for virtually all EU subsidy in the mid 1980s, currently direct payments are having account for over two-third of the agricultural budget. Most, but not all, switches from price support to direct payments have been environmentally beneficial (OECD, 1997a, c; OECD, 1998a,b).

In 1997 total agricultural subsidies (both environmentally beneficial and environmentally damaging) amounted to some EUR 65 billion, or some EUR 440 per household. By far the greater part of this sum (60%) is accounted for by milk and beef (Figure 4.1.5). The trend of subsidy is downwards from a peak of over EUR 90 billion in 1990, but the 1997 subsidy (for the EU15) is about the same as that in 1986 (for the EU12), so that the actual fall in the total subsidy is slightly larger than shown in the figures.

The general effect of the 1992 CAP subsidy reform has been beneficial to the environment, although in some cases policy changes have shifted input-intensive activity from one location or one activity to another. However, a Commission progress report on the 5EAP (European Commission, 1996d) argued that: 'the CAP reform did little to systematically integrate environmental concerns. Even if secondary positive effects can be expected from the reduction of price supports and from extensification, it should be avoided that these reductions will lead to the abandonment of agriculture in certain less favoured zones, which would have negative impacts on biodiversity and the landscape.'

In terms of introducing environmental beneficial subsidies the main EU instrument has been the so called agri-environmental measures (Regulation EEC No 2078/92) which provide 50% EU financing for schemes that improve the environment and contribute to rural development. Between 1993-1997 the EU budget for this was EUR 5 billion – about EUR 1 billion per year – but still only 1.5% of what is spent on CAP as a whole. Generally these schemes have been well subscribed, with agri-environment measures accounting for 20% of agricultural land and exceeding the target of 17% set in the 5EAP (see Box 3.13.7 in Chapter 3.13). However, research in the UK (National Audit Office, 1997) found that payments were sometimes set below levels to compensate farmers for average profit foregone. There are also concerns that the scheme requires only very modest environmental improvements from farmers, as has been the case in some German schemes. In addition, CAP provides an 'extensification premium' to producers whose stocking density is particularly low. There is also funding for environmentally sustainable farming, such as integrated pest management in the fruit and vegetable industry.

The CAP reform included in Agenda 2000, on which agreement was reached in March 1999, responds to the challenge of enlargement which will lead to 50% increase in agricultural land and a doubling of the farm labour force, so that maintaining the present CAP structure would be very expensive and lead to large EU surpluses in sugar, milk and meat. The political agreement reached on Agenda 2000 includes a 15% cut in the cereals intervention price in two steps starting in 2000/2001, a cut in beef price guarantees by 20% by 2002 and in the dairy sector a 15% cut in intervention prices in

three equal steps starting in 2005/2006. In all cases, lost income will be replaced by direct payments, with provision for Member States to define environmental conditions for farmers to receive the direct payments – an approach known as 'cross compliance'. There will also be a greater role given to the agri-environmental measures and increases in the extensification premium.

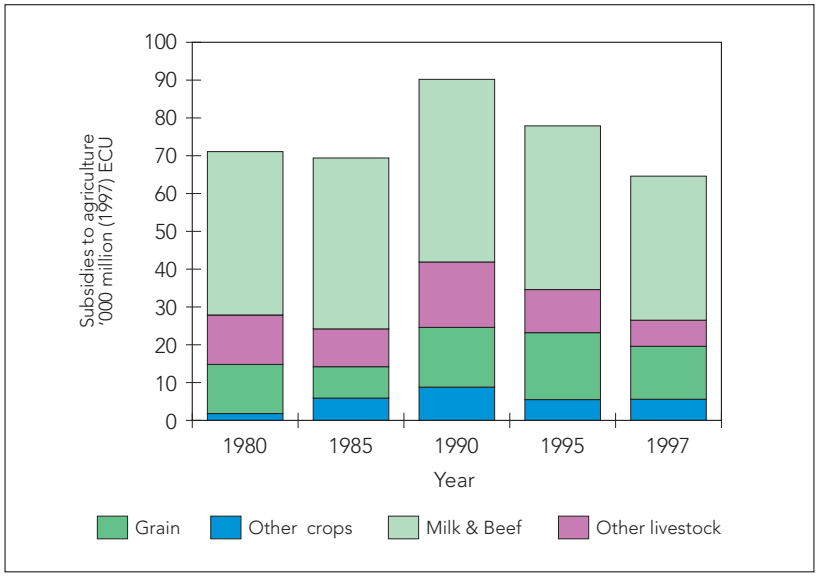
However, these proposals have been criticised as not going far enough: the total spending on rural development and the environment will only be 10% of the CAP budget; there is still no clear timetable for the phased removal of production support; and, it is left to the countries how to apply 'cross-compliance'.

At the national level, perhaps the most obvious subsidies with an environmental effect are to irrigated agriculture in southern Europe. Municipalities supplying water to agricultural units in the Po Basin in Italy are required to charge prices based on cost recovery but in practice numerous exemptions are granted. In Spain, agricultural abstraction is subject to a levy which is not related to volume of water used, but to area of land, and there is a shortfall between recovered costs and the costs of supply. In other countries, subsidies may take the form of exemption from taxes: this is so in Portugal where irrigation water is exempted from a new tax introduced in 1995 and in the Netherlands where farmers are exempt from the groundwater extraction tax (see Chapter 3.5).

3.5. Environmental taxation

Economic instruments that affect agriculture include taxes on pesticides and fertilisers and charges on excess manure. Compared to other sectors, experience with environmental taxation in the agricultural sector is very limited (Table 4.1.6). Pesticide taxes of 3% and 5% of retail price levels have been introduced in Denmark and Sweden and are under discussion in the UK and the Netherlands (European Commission, 1997c). In 1998, the Danish tax on insecticides was increased to 54% of the retail price and the tax on other pesticides to 33% of the retail price. The European Commission recently commissioned feasibility studies on the possibility of introducing EU-wide taxes on pesticides and fertilisers, and an EU-wide framework could be proposed if diverse action by Member States is perceived to threaten to distort the single market. There is yet little consensus about these taxes across the EU, but the consultations and discussions continue.

Agricultural subsidies in the EU, 1980-1997 Figure 4.1.5



Note: 1997 figures are estimates. Figures shown are for producer subsidy equivalent.

Source: OECD, 1998b

4. Industry

Attempts at integration in the industrial sector have been underway for at least the last two decades. During this period, air and water emissions have declined although waste generation has been stable or increasing. While traditionally regulations alone

Environmentally related taxes and charges in the agriculture sector, 1996 Table 4.1.6.

Environmental tax measures	A	B	D	DK	E	F	FIN	GR	I	IRL	L	NL	P	S	UK	CZE	HUN	POL	IS	N	CH
Fertilisers														*						*	
Pesticides				*			*							*						*	
Manure charges												*									

Note: List of country codes at the end of the chapter.

Source: OECD, 1997b

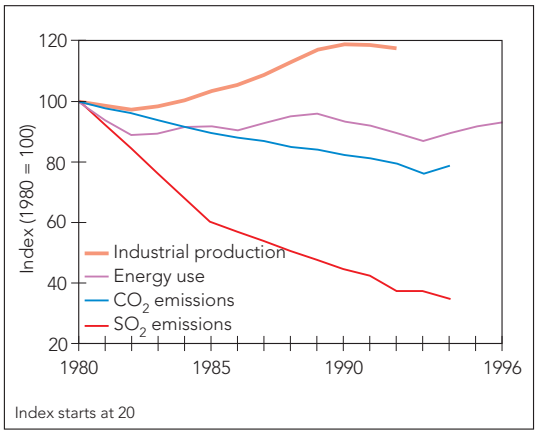
were used, there is now growing reliance on more innovative approaches such as voluntary agreements, environmental management, liability and green procurement and environmental taxation. These instruments are still only developing and there is scope for wider appliance across the EU.

4.1. Environmental assessment of the sector

The industrial sector was historically the first target of environmental concern and so the range of instruments to promote integration is most comprehensive in this sector. Despite increasing industrial production over the 1980s, emissions to air have significantly declined, especially emissions of SO_2 (Figure 4.1.6).

Figure 4.1.6 **Economic and environmental trends in the industrial sector, 1970-96**

Source: EEA



These developments can be partly linked to changes in legislation – the industrial sector was among the first to be targeted by EU environmental legislation, and several problems have been addressed through improved efficiency or end-of-pipe measures. The changing structure of the EU economies has also undoubtedly contributed to these changes (see Chapter 2.2).

Information from countries where data is available shows that the generation of industrial solid and hazardous waste has generally been stable or increasing. In most countries, industrial waste generated per capita exceeds the amount of municipal waste, except in Portugal and Denmark. As Chapter 3.5 shows industrial water abstraction in most European countries has been declining in the 1980s, primarily due to economic recession and technological improvements. Environmental damage from industry in the Accession Countries is lower in absolute magnitude compared to the EU15, but the intensity (e.g. waste generated per unit of GDP) is greater (OECD, 1998c). Liability for environmental damage (especially for soil contamination) is an important issue in these countries.

There are many strategies to reduce damage from the industrial sector. This section will focus on the key instruments available including regulations, environmental management, subsidy reform and environmental taxation. Eco-labelling and product standards are reviewed in Section 7.4 below. Voluntary agreements are not covered here as they have already been reviewed in Section 2.3.1 above.

4.2. Environmental expenditure

Quantitative estimation of the aggregate environmental damage from industry is exceedingly difficult. However, there is some information available on identified annual expenditure by industry on compliance with environmental regulations. The current expenditure for maintaining and operating environmental protection facilities, including payments to others for waste and waste water treatment, is in the order of 0.1 to 0.5% of GDP. Investments each year are in the same order of magnitude (Figure 4.1.7).

4.3. Regulations

In the past, the main instrument in the industrial sector has been regulation at the Member State level, harmonised by EU Directives. At the EU level the key Directives relate to hazardous waste, air emissions from industrial plants, chemicals and integrated pollution control through Integrated Pollution Prevention and Control (IPPC). IPPC has dramatically changed the way industrial pollution is regulated in many countries. The most important industrial Directive currently under discussion is an overhaul of EU controls on dangerous chemicals.

4.4. Environmental management systems

Environmental management (also known as eco-audit) is a voluntary scheme for producers designed to alert both producers and consumers on the need to use natural resources responsibly and minimise pollution and waste. The EU Eco-Management and Audit Scheme (EMAS) was adopted in 1993 and became operational in 1995 with the first awards made by accredited environmental verifiers appointed in each Member State. Companies wishing to register their sites with EMAS must adopt a company environmental policy, conduct an environmental review of all environmental issues and impacts, and in

light of this review establish an environmental management system at their site. This management system must be audited at least every three years and the results of the audit and the initial environmental review must be used to prepare an environmental statement which is disseminated 'as appropriate' to the public (Haigh, 1998).

By 1998 there have been 1500 sites registered with EMAS, with about 75% in Germany. Interestingly, while most sites are industrial, there are also a number of transport and energy related sites. While the numbers applying for EMAS is growing, it is a tiny proportion of the estimated 1.7 million industrial enterprises in the EU. A study by the Commission to review EMAS (Hillary, 1998a) found various shortcomings. One of the problems is the overlap between the EU EMAS and its international equivalent ISO 14000, although attempts were made to register for ISO 14000 even after having received EMAS. The main reason is that for many global enterprises the ISO 14000 is more attractive as its marketing potential is not limited to Europe as in the case of EMAS (Hillary, 1998b). It is also argued that ISO 14000 is less demanding than EMAS since it does not require the publication of a validated environmental statement or continuous improvement in environmental performance (only in the system). Some fear that this may lead to pressure to ease some of the EMAS requirements (Haigh, 1998). In November 1998, the Commission published its proposals to revise EMAS to increase take-up and credibility, proposing to extend the scheme to sectors other than manufacturing.

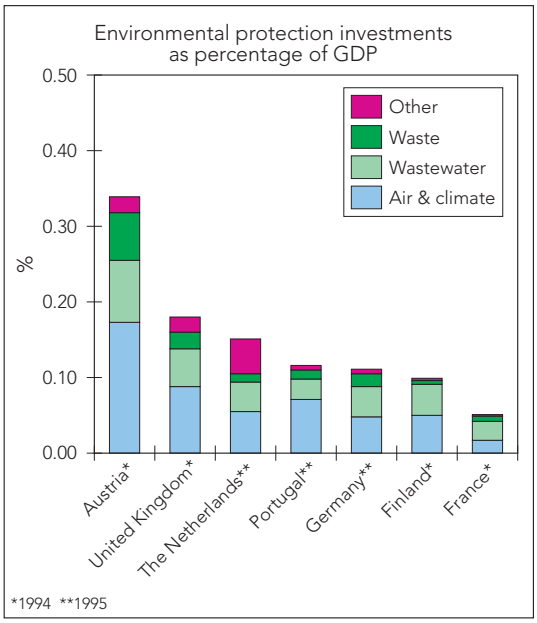
There has been only very limited quantitative attempts to evaluate EMAS. An Austrian study found that firms undergoing EMAS registration earn their investment in less than 14 months on average, through reduced production costs (Austrian Economic Chamber, 1996). In March 1996, Deutsche Bank announced favourable rates of interest for EMAS registered sites because it regards EMAS validation as a clear sign of reduced environmental risks. In addition, a number of German insurance companies view the existence of EMAS as a favourable factor when assessing company premium levels (Taschner, 1998).

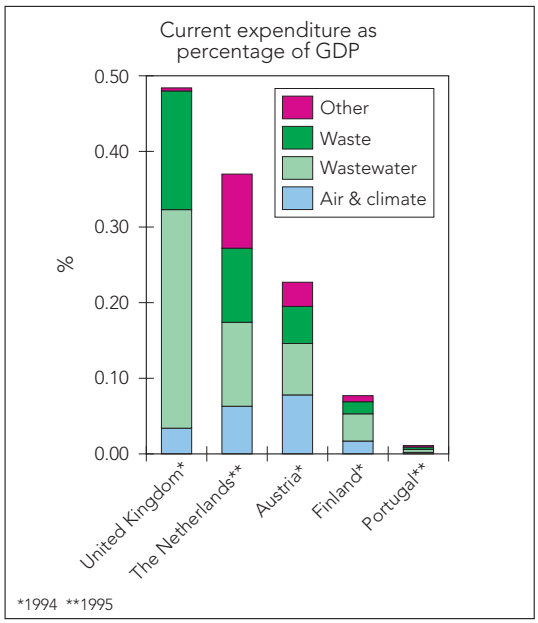
4.5. Environmental liability

In January 1998, the Commission published a Working Paper on an EU environmental liability regime, and a White Paper was expected in May 1999. The liability would apply to 'operators' and 'any waste operator (including the waste producer)'. It would not be applied retroactively, but it would allow public interest groups to have legal rights to take cases and the burden of proof would be on industry. Although it will probably take up to 2002-3 for the liability regime to come into force, opposition to the White Paper by the industry has already started with claims that this will mean significant costs to the industry.

At the Member State level, Finland has already introduced liability legislation. About

Environmental protection investments and current expenditure for environmental protection by industry Figure 4.1.7





Notes: The category 'other' includes soil and groundwater, noise and vibration, biodiversity and landscape, radiation, research and development and other activities. For many countries data is available for a few of these categories only. Totals can thus not be compared. Comparison is further limited by the varying structure of the economies. For instance, the high expenditure on waste water treatment in the UK is due to the privatisation of waste water collection and treatment in that country. Due to the nature of the activity the amount of investment can vary considerably from year to year. For Austria only 1994 figures are available.

Source: Eurostat

2000 Finnish industrial firms have been legally obliged to purchase environmental liability insurance from January 1, 1999. The new insurance requirement covers the situation where a firm that has caused environmental damage cannot be found or is bankrupt, or where the source of damage cannot be agreed. The law is not applied retrospectively and therefore does not apply to cases of soil contamination caused before 1999.

4.6. Subsidy reform

In general, industrial subsidies in the EU declined considerably between 1992 and 1994, (Germany was the exception, as subsidies increased during the unification process). In 1994 subsidies amounted to EUR 42.6 billion (European Commission, 1997b). There was a substantial decline in those types of aid most likely to go to mobile investment projects (e.g. regional aid, R&D, and general aid programmes). There has also been an increase in the use of more transparent forms of aid in virtually every Member State (e.g. grants and tax reductions) versus a decrease in less transparent types of aid (e.g. loan guarantees and equity participation). In the OECD, more than 50% of sectoral programmes designed to benefit a single industry go to the shipbuilding, textile or steel industries, which together represent approximately only 9% of manufacturing GDP in OECD countries (OECD, 1996b). The environmental impacts of subsidy reform are unclear, although they should be beneficial in energy-intensive industries such as iron and steel.

In terms of environmentally beneficial subsidies, Austria, Denmark, Greece and the Netherlands operate subsidies for industrial pollution control. A number of schemes (Denmark, Greece and the Netherlands) are aimed at the development and demonstration of clean technology, e.g. up to 40% of the costs to the industry. In Austria, enterprises can claim up to 30% of the costs of wastewater treatment plants. In the Netherlands, there is a subsidy to promote clean processing of waste from the fishing industry with the budget of DFL 0.18 million in 1997. In addition, Austria, Denmark, France, Finland, the Netherlands and Portugal apply more relaxed accountancy rules, i.e. accelerated depreciation, for environmental investments.

4.7. Environmental taxes and charges

The main environmental levies affecting industry seems to be charges on (hazardous) waste generation followed by charges on water effluent (Table 4.1.7). Effluent charges are well established and were imposed in France since the 1960s and since the 1970s in the Netherlands. In both countries the charge was related to oxygen-demanding materials and heavy metals and helped stimulate a reduction (Tuddenham, 1995; Hotte *et al.*, 1995). Industry is also affected by general energy/CO_2 taxes. Charges on environmentally damaging inputs to the industrial production process such as oils and solvents are not as widespread.

5. Energy

Economic instruments are in common use in the energy sector. However, to reach targets of 12% of energy from renewables and 18% of electricity from co-generation in the context of more liberalised energy markets and falling oil prices will require tough policy measures, which might include increased subsidies to renewables and co-generation, greater use of voluntary agreements with electricity companies and higher taxes on fossil fuels.

5.1. Environmental assessment of the sector

Atmospheric emissions from power generation, have declined since the 1980s (Figure 4.1.8). These declines have been most marked for sulphur dioxide (50% decline from 1980 to 1994) and nitrogen dioxide (23% decline from 1980 to 1994). This has been the result of fuel shifts and technical improvements, such as increased generation efficiency, and pollution abatement, such as the installation of 'scrubbers' to reduce acidifying and summersmog related emissions. However, it is likely that the potential for such efficiency improvements and pollution control is now declining as, for instance, fuel shifts can be applied only once. Future reductions in atmospheric emissions, such as the 8% cut in greenhouse gas emissions required by the Kyoto Protocol (see Chapter 3.1), will need to come from greater use of renewables. Whilst there is considerable variation across Member States, on average only 5% of the EU energy supply in 1995 was from renewables, mostly hydro and biomass. There is thus clearly considerable potential to expand renewables particularly in countries where their use is low, such as Belgium, Ireland, the Netherlands and the UK. On average 9% of EU electricity comes from co-generation (also known as combined heat and power), but this percentage is much lower in Greece, France and

Environmentally related taxes and charges in industry, 1996 — Table 4.1.7.

Environmental tax measures	A	B	D	DK	E	F	FIN	GR	I	IRL	L	NL	P	S	UK	CZE	HUN	POL	IS	N	CH
Lubricant oil charge							*													*	
Oil pollution charge							*														
Solvents				*																	
Water effluent charges			*	*		*						*	*			*	*	*			
Tax on ground water extraction			*									*									
Hazardous waste charge	*	*	*			*	*						*			*	*	*	*	*	
Land fill tax or charge									*			*			*						

Source: OECD, 1997b

Ireland. In the Accession Countries the environmental effects of energy generation are smaller in absolute magnitude, but the intensity (as measured by energy supply per unit of GDP) is greater compared to those of the EU15 (IEA, 1998) (See Chapter 2.2).

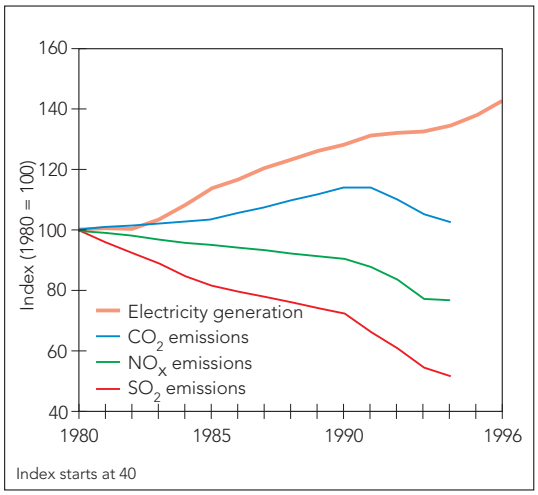
The main strategies to reduce environmental damages from the energy sector are to reduce energy demand (through energy efficiency), lower environmental damage from fossil fuel sources, switch to natural gas and renewables and increase co-generation. The issue of energy efficiency is reviewed in detail in the sections on households and industry, so here the focus is on fuel shifts, increased use of renewables and co-generation.

5.2. Environmental damage

The most developed sectoral study of environmental damage, the ExternE programme of DGXII, is for energy production (European Commission, 1998e). It presents estimates of mainly air pollution damage in units of EUR/kWh or EUR/tonne of pollutant, which can readily be compared with costs of pollution abatement. Damage categories include human health (morbidity and premature mortality), corrosion and soiling of buildings and materials, crop losses, global warming and freshwater pollution.

The most significant damages are those caused by emissions of particulate matter, due to its impacts on human health (morbidity and mortality) (see Chapter 3.10). This is followed by nitrogen dioxide, which in combination with volatile organic compounds contributes to the formation of ozone, which impacts on morbidity and mortality and also damages crops. The role of carbon dioxide in total damage, through its contribution to global warming, is also significant. In this case, it is the sheer volume of carbon dioxide emissions which result in such high total damage estimates: amongst the various pollutants, carbon causes the lowest damage per tonne.

Economic and environmental trends in the energy sector, 1980-96 — Figure 4.1.8



Source: EEA

5.3. EU policy

EU energy policy was most recently set out in the 1996 White Paper which gives three main objectives: security of supply, improved competition and protection of the environment. While the Commission argues that

market liberalisation will help renewables, others disagree arguing that they may be undermined by their higher price (IEA, 1999). In 1996 the Commission published a Green paper on renewables and this was followed up with a White Paper in 1997 (European Commission, 1997d) which stated that: 'Renewable sources still make an unacceptably modest contribution to the Community's energy balance.' The document proposed a target of 12% penetration of renewables by 2010 in the EU. However, the target was not approved by the Energy Council and a proposed Directive will only call for 5% share in electricity production for each country. To achieve this objective, the recent Directive on the Internal Market in Electricity allows Member States to give preference to renewables. The Commission also proposed that 18% of EU electricity should be produced by co-generation by 2020 – a doubling from the current figure – and this was welcomed by the Energy Council.

5.4. Subsidy reform

Energy subsidies targeted to fossil fuels are one of the largest subsidies with possible environmental effects (Figure 4.1.9). The UK systematically reduced subsidies to coal production to below EUR 0.2 billion by 1995. However, German subsidies remain high, at EUR 4.7 billion in 1998, and Spanish subsidies were over EUR 1 billion in 1996 (IEA, 1998). Germany expects to have reduced its coal subsidies to EUR 2.8 billion in 2005.

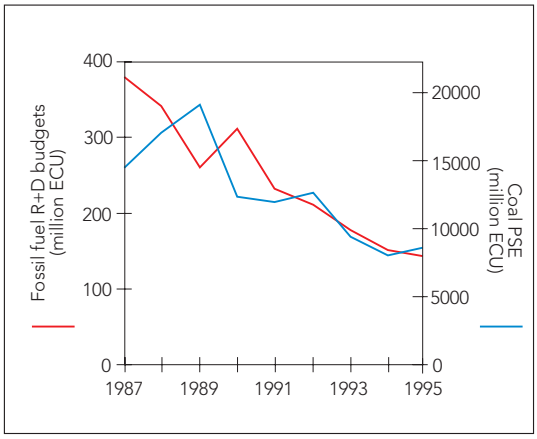
Reduced subsidies to coal production will most probably lower emissions of conventional air pollutants and carbon dioxide. The extent of this environmental effect depends on what is used as a substitute for subsidised coal. In some cases, for example, it is likely to be imported coal, whereby the extra demand for imported coal will likely have the effect of raising world market prices since the EU is a major coal consumer. The rise in world-market prices would in turn encourage worldwide reductions in coal usage, reducing carbon dioxide emissions (Anderson and McKibbin, 1997). In other cases the substitute would be natural gas which has a lower environmental impact per unit of energy than coal: the environment impact is therefore directly beneficial.

However, subsidisation has other effects, for example by encouraging energy-intensive industries to locate in subsidised areas. There is some evidence that aluminium smelters, for example, have been encouraged by subsidies. Since aluminium is an energy-intensive industry, the subsidy also has the effect of discriminating against the use of recycled secondary aluminium which is far less energy intensive (Koplow, 1996). Various studies have shown that there are triple-dividends from reducing subsidies: energy costs fall because substitute sources are encouraged, environmental impacts are reduced and government finances improve (OECD, 1997d). Individual case studies suggest, however, that environmental benefits could be quite small: the gains from removing subsidies range from around 1% of the sector's contribution to carbon dioxide emissions in a selection of EU countries, to 5% in Norway. For comparison, significant effects of up to 16% of emissions would be secured in Russia (OECD, 1998d). More substantial environmental impacts arise if the analysis is extended to worldwide impacts through the effects on the world market price of coal.

The main focus of EU energy subsidies is on the production side. By contrast, subsidies in eastern Europe focus on keeping consumer prices down. Since 1990 supplies from the Russian Federation have dropped and the effect has been a substantial reduction in subsidies. The scope for further reductions, especially in the coal sector, appears large but there are clear trade-offs between subsidy reduction and employment concerns (World Bank, 1997).

In terms of environmentally beneficial subsidies, many countries have introduced subsidies for renewable energy and this was welcomed in the recent Commission White Paper on Renewables. In Denmark, wind

Figure 4.1.9 **Subsidies to coal and to fossil fuel research and development, 1987-1995**



Note: Total subsidies for coal are shown in producer subsidy equivalents (PSE) for Germany, Spain plus the UK. Fossil fuel Research and Development budgets are for EU15.

Source: IEA, 1998

energy has been promoted by an investment subsidy and electricity tax repayment. In Germany, generous subsidies through a minimum tariff are provided making Germany the second largest wind generator in the world (after the US). In the UK, subsidies through competitive tendering for a renewable quota have led to a substantial decline in the costs of generation, although the UK remains the country with the lowest reliance on renewables in the EU at only 0.7% of total energy consumption. The competitive tendering approach is also used in France and Ireland, and it seems that this more cost-effective approach will be included in the forthcoming Directive prepared by the Commission. At the EU level, subsidies are provided by the ALTENER programme which has now been extended.

5.5. Environmental taxation

Environmental taxation on the use of fossil fuels was welcomed by the European Commission, as a means to increase the competitiveness of energy from renewable sources (European Commission, 1997d). This is especially important given the decline in world oil prices and the ongoing liberalisation of electricity markets. Recent taxes focus on CO_2, as well as nitrogen and sulphur oxides (Table 4.1.8). The Netherlands, Austria, Belgium and the Scandinavian countries have introduced CO_2 taxes. More recently, in January 1999, Italy became the first southern European country to introduce a CO_2 tax, which will be used to fund a wage subsidy to employers. While efforts to introduce an EU-wide CO_2 tax have not – thus far – met with success, progress is being made on a Directive that would for the first time impose EU-wide minimum rates of excise duty on most energy products. However, the proposal requires unanimity to be passed and a decision has been delayed to May 1999. Sweden introduced in 1992 a NO_x charge on large combustion plants which led to a fall in NO_x emissions per unit of input energy from 159mg/MJ to 103mg/MJ by 1993 (OECD, 1997d).

5.6. Joint implementation

One of the most innovative instruments is *joint implementation* (JI) under the Framework Convention on Climate Change. JI in general involves an agreement between two countries whereby one country (the investor) reduces pollution in the second country (the host) and counts the reduction in pollution as a credit against some national target. JI exists under the Montreal Protocol (see Chapter 3.2) with 'trades' in CFC emissions and is enabled under the Second Sulphur Protocol under the UNECE Convention of Long Range Transboundary Air Pollution (see Chapter 3.4). A specific application based on the JI notion is the 'Activities Implemented Jointly (AIJ)' phase of the Climate Change agreement (see Chapter 3.1). This was initiated in 1995 and will terminate in 2000. Under AIJ investor countries fund or undertake emission reduction or sequestration projects in host countries. In the pilot phase, no credits are constituted or counted against national emission targets. The Kyoto Protocol opens the way for project-based JI between Annex I countries (OECD plus the economies in transition) and the developing countries. Since the source or location of greenhouse gas emissions is irrelevant to the effect on global climate change, JI projects offer mutual gains: the investor undertakes emission reductions at lower cost; the host benefits through the transfer of improved technology, e.g. power station technology or a sequestration project (afforestation, reduced deforestation), which may stimulate economic development and improve the environment. Currently about 100 official AIJ projects are implemented. Numerous AIJ

Environmentally related taxes and charges in the energy sector, 1996 Table 4.1.8.

Environmental tax measures	A	B	D	DK	E	F	FIN	GR	I	IRL	L	NL	P	S	UK	CZE	HUN	POL	IS	N	CH
CO_2/ Energy taxation	*	*		*			*					*		*				*		*	*
Sulphur tax	*			*		*								*				*		*	
NO_x charge						*								*		*		*			
Other excise taxes			*	*	*	*	*	*	*	*	*	*		*	*		*			*	

Source: OECD, 1997b

projects with the involvement of European countries as the host exist, especially in Russia, the Czech Republic, the Baltic States, Poland, Hungary, Romania, Bulgaria and Croatia. European investor countries include Sweden, the Netherlands, Norway, Germany, France and Belgium.

6. Transport sector

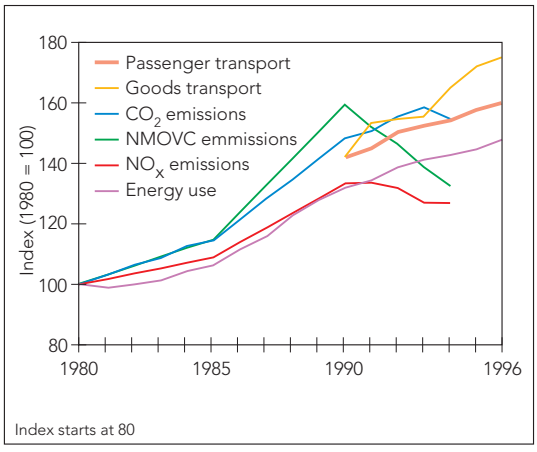
While many instruments are being applied to reduced transport damage, these are being overwhelmed by the rapid rise in demand for transport. There remain implicit subsidies to commercial freight and the airline industry through untaxed kerosene. While environmental taxes on fuel have been successful in increasing demand for unleaded petrol, they have not had much effect on reducing driving. Serious consideration needs to be given to comprehensive urban road-pricing schemes which no EU country has implemented yet.

6.1. Environmental assessment of the sector

Transport is the fastest growing sector relevant to the environment (Figure 4.1.10; see Chapter 2.2). Passenger vehicle-kilometres and freight tonne-kilometres grew by 1.8% and 3.2% respectively in 1995, while passenger-air miles grew at 11 %. Emissions from motor vehicles have significantly increased as car ownership has risen (and the number of people per car has declined in the EU from about 2 in the early 1970s to about 1.6 in the early 1990s). Environmental damage per vehicle-km has remained fairly constant as measured by carbon dioxide and nitrogen dioxide emissions per vehicle-km, although sulphur dioxide emissions per vehicle-km have significantly declined. This lack of progress, despite pressure on car manufacturers to improve fuel efficiency, arises from the gap between actual and test values for fuel efficiency due to poor driving behaviour and urban congestion which prevents the fuel efficiency being achieved (IEA, 1997).

Figure 4.1.10 **Economic and environmental trends in the transport sector, 1970-96**

Source: EEA



Cars now make up about 80% of passenger-kilometre journeys, while heavy good vehicles make up about 76% of freight tonne-kilometres, and there are limited possibilities for switching to more environmentally friendly alternatives such as clean vehicles, public transport, cycling or even walking. The development of low emission cars powered by electricity, gas or biofuels has been slow in most countries. There is some penetration of gas cars in the Netherlands and Italy, biofuel cars in Sweden and electric cars in Italy, but they still make up a small share of the fleet. It is projected that the share of passenger transport by car in the Accession Countries will increase from 45% of the total in 1994 to 80% in 2030.

Growth in the use of motor vehicles also causes environmental effects in an indirect way. Investments in road infrastructure, which lengthened Europe's roads by 3% in 1996, have effects on nature and biodiversity. Similarly, the production of vehicles is a polluting process. The stock of vehicles is growing at 4% a year.

Attempts to integrate environmental concerns into the transport sector were recently outlined in a report by the Transport Council presented at the Vienna European Council in December 1998. This report highlighted the need for measures that: enhance fuel efficiency and reduce emissions and noise; make the best use of available infrastructure; and, achieve a shift to less environmentally damaging modes of transport. As a first step the report argued that progress is required in transport pricing and environmental costs, the revitalisation of rail transport and the promotion of inland waterways, maritime transport and combined transport. The way these measures have been introduced in the past years is reviewed below, focusing on the different instruments available, including regulations, voluntary agreements, subsidy reform and environmental taxation.

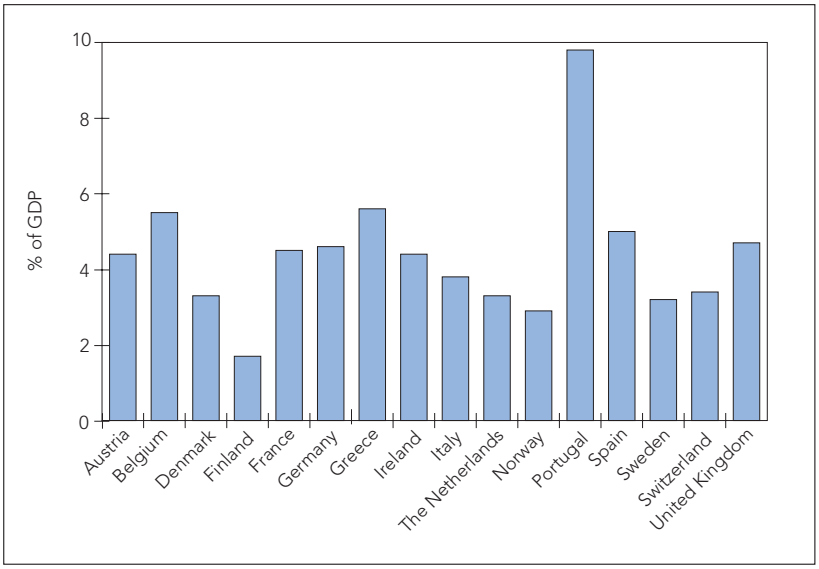
6.2. Quantified environmental damage

Externalities from road transport comprise: noise nuisance; local, regional and global air

pollution; water pollution from road runoff; risk of accidents and congestion, although the last two categories are disputed in a number of studies. Figure 4.1.11 shows the estimates of the monetary costs of environmental damage from road transport as percentage of GDP for each country.

Figure 4.1.11 suggests that road transport may generate damage equal to some 2-5% of GNP. These estimates are consistent with the EU-wide damage estimates reported in ECMT (1998) of some 4.1% of GNP (see Section 3 in Chapter 3.12). However, methodologies and data sources vary and it is difficult to be precise about the exact contribution of the different types of externality. Moreover, treating all accident costs as externalities is controversial. As long as individuals are aware of risks when they make their decision to travel, that risk is 'internalised' and does not constitute a genuine externality. The overall scale of transport externalities is therefore open to some debate. ECMT (1998) reports minimum damage costs of 2% of GNP for Poland and estimates of 4-5% for the Czech Republic, which is comparable with the EU countries.

Environmental damage from road transport as % of GDP, 1991 — Figure 4.1.11



Source: Maddison *et al.* (1995) plus modifications.

6.3. Regulations

Regulations have traditionally been the main instrument for reducing vehicles emissions, often in the form of EU Directives, although this is now being complemented by the use of voluntary agreements. The latest new standards on car and light van emissions and fuel quality agreed in 1998 under the Auto/Oil measures are expected to make new vehicles in the EU about 70% less polluting in 2010. The new Directives will also require new vehicles to be fitted with on board diagnostics to monitor emissions, petrol- engined vehicles by 2000 and diesel-engined vehicles by 2005 (see also Chapters 3.4 and 3.12, Section 4.1).

6.4. Voluntary agreements

Voluntary agreements have been used on the Member State level to make the car industry financially responsible for scrapping old cars in an approved manner. Many countries, including Germany, Austria, the Netherlands, UK, France and Italy have voluntary agreements in place. At the EU level, a landmark voluntary agreement was drawn up with the EU car industry to agree a 25% reduction in average carbon dioxide emissions from new cars between 1998 and 2008.

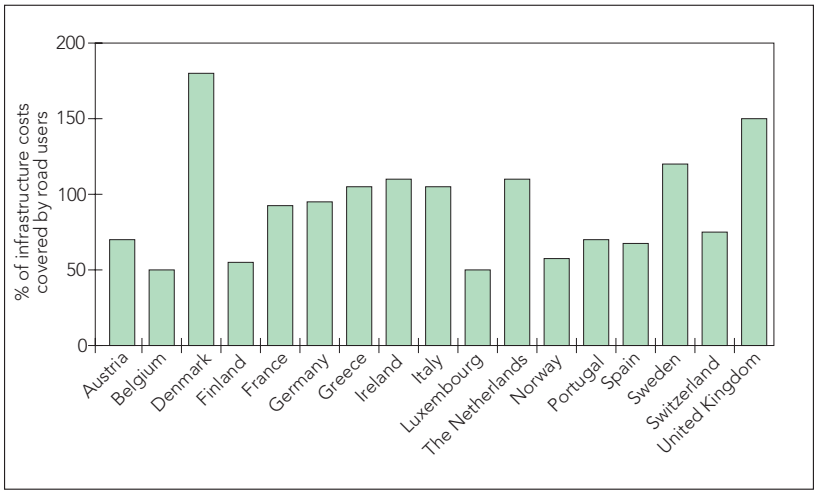
6.5. Subsidy reform

Subsidies to the transport sector primarily comprise non-recovery of the full costs of providing infrastructure, e.g. roads provision and damage repair, policing and emergency services, road lighting and safety barriers. Other costs may include the provision of free parking space, often encouraged by local zoning regulations (e.g. a given amount of parking space per building). These subsidy elements need to be distinguished from the failure to charge for *external costs* such as noise, air pollution and social severance effects (see next Section). Failure to recover infrastructure costs results in an effective subsidy and hence a distortion of competition between modes of travel.

Nearly all (95%) of the relevant subsidy is to rail, not roads – which is the result of public service obligations or the positive intention to support a more environmentally benign mode of transport. Only freight transport by road 'receives' a subsidy as about 82.5% of infrastructure costs are covered by relevant taxes. The results show that the subsidy to road and rail for EU plus Norway and Liechtenstein is EUR 8.93 billion, which amounts to some 0.15% of GDP of (ECMT, 1998).

However, within these European numbers there is very high variation (Figure 4.1.12). Road users in Denmark, Sweden, the Netherlands, Ireland, and the UK pay considerably more than the infrastructure costs, while road users in Belgium, Finland, France Luxembourg, Norway, Spain and Switzerland are subsidised by more than 15% of total costs. For rail, the variation is much less

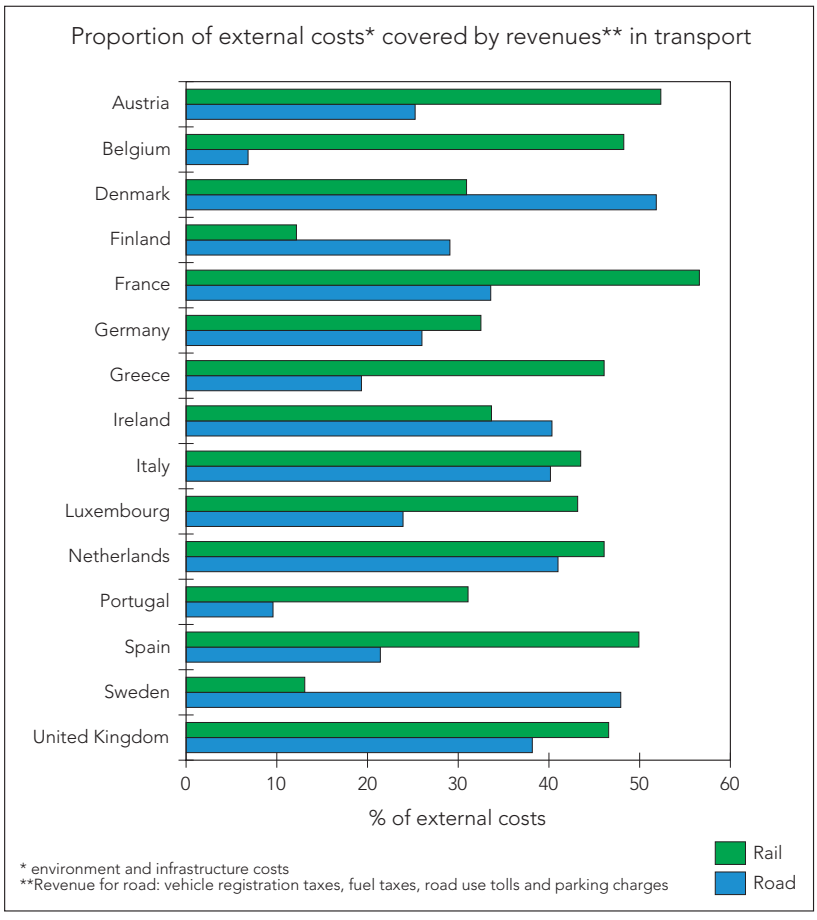
Figure 4.1.12 **Percentage of infrastructure costs covered by road users, 1995**



Source: ECMT, 1998

marked, with a fairly uniform subsidy of about 45% of total costs except in Finland and Sweden with very subsidised rail services (ECMT, 1998).

Figure 4.1.13 **How much of the external costs and infrastructure costs of freight transport are covered by taxes and charges?**



Note: Data is lacking for Air and Maritime transport.

Source: IWW/INFRAS, 1995; ECMT, 1998

Subsidies can also include tax exemptions. Transport subsidies in Germany may amount to some EUR 10.7 billion (Federal Environmental Agency, 1997). Nearly half of this sum is accounted for by the differential tax rate between diesel and gasoline (EUR 4.6 billion) and a third by oil tax exemption for aviation and inland navigation. The remainder comprises cost-deductions for commuting to work, and various exemptions from vehicle excise duty, depreciation allowances etc.

The most significant environmental impact of transport subsidies are to the airline sector, in particular the exemption of kerosene from excise duties, and the absence of VAT on ticket sales. A negative environmental effect arises due to the substitution effects (travel by air rather than other modes) and the volume effects (increased air travel). The own price elasticity for flying is relatively high, estimated at between -0.8 and -2, so that a 1% increase in prices leads to a 0.8% to 2% decrease in demand for flying (European Commission, 1997c). Some countries have been pressing the International Civil Aviation Organisation (ICAO) to accept aviation fuel taxation by 2001, and there is discussion of imposing either a tax on internal EU flights – more than half all flights from EU airports – or a charge based on km flown in EU aerospace (a feasibility report is due in 1999). In January 1999, Norway unilaterally imposed a tax on kerosene which would raise prices by about 25%. However, the tax is revenue neutral as Norway also reduced its existing environmental levy on air passengers.

The European Commission has been active in trying to encourage a reduction in transport subsidies and a switch to marginal cost pricing. The 1995 Commission Green paper 'Towards fair and efficient pricing in transport' stressed the importance of marginal cost pricing and this was followed up in 1998 with a White Paper on Fair Payment for Infrastructure Use (European Commission, 1998f). This gives concrete proposals for increased charges on commercial road use.

In terms of environmentally beneficial subsidies, many countries support public transport. At the EU level there has been funding for the Trans-European Transport Networks (TENs, see Box 2.2.9 in Chapter 2.2) which now benefits the railways following pressure by the European Parliament. In relation to the future TENs budget line, the European Council in June 1995 decided that 75% of the total allocation of EUR 1 800

million on transport projects should be spent on 14 TEN priority projects, among which rail and combined transport amount to 90%.

There are also a number of environmentally friendly subsidies for cleaner transport technologies such as the 'car stock modernisation subsidy' granted by the French government to all new car purchasers. Similarly, since 1990, Greece has been applying tax exemption for new cars fitted with a catalytic converters provided the buyer has already scrapped his/her old car. Around 300 000 old cars were scrapped and pollution considerably reduced already in the early stages of the policy.

6.6. Environmental taxation

An EU expert group appointed to advise the European Commission on transport pricing has recommended an EU-wide charge on external costs, stating 'Costs that are already incurred somewhere in the economy will be borne directly by those causing them: this will encourage a decrease in the overall level of these 'external' costs'. This approach was accepted by the Transport Council of Ministers in their report on sectoral integration to the Vienna Council of Ministers: 'The Transport Council will carry forward work on the issue of the integration of quantified environmental costs into transport pricing in the Community'.

Figure 4.1.13 shows the extent to which relevant taxes and charges on road and rail freight transport cover the estimated environmental damages ('externalities') and infrastructure costs.

A first step towards full coverage of environmental costs was taken in December 1998 under the 'Eurovignette' Directive, which aims to harmonise road charging of heavy lorries through the EU single market. From July 2000, annual charges will range from a maximum of EUR 1 550 for the heaviest and most polluting lorries to EUR 750 for the lightest and cleanest lorries. A similar approach will be implemented in Switzerland which will charge all Heavy Goods

Environmentally related taxes and charges in the transport sector, 1996 Table 4.1.9.

Environmental tax measures	A	B	D	DK	E	F	FIN	GR	I	IRL	L	NL	P	S	UK	CZE	HUN	POL	IS	N	CH
Motor Fuels:																					
Leaded / unleaded (differential)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*
Diesel				*			*							*			*	*		*	
CO_2/Energy taxation				*			*							*						*	
Sulphur tax														*						*	
Other excise taxes (other then VAT)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				*	*	
Gasoline (quality differential)							*							*		*	*				*
Vehicle-related taxation:																					
Sales/Excise/ Regist. tax diff (cars)	*	*		*			*	*	*	*		*	*	*			*		*	*	*
Road/ Registration/ tax diff (cars)	*	*	*	*	*				*	*		*		*		*	*		*	*	*
Employer-paid commuting expenses taxed	*		*	*	*		*						*	*	*	*	*	*			
Air Transport:																					
Noise charges		*	*			*						*					*	*		*	*
Other charges													*	*						*	

Source: OECD, 1997d, e

Vehicles per transit, with heavier and more polluting vehicles paying a higher charge. Table 4.1.9 shows that indirect taxes on vehicles are widespread as are fuel taxes which are more closely linked with the amount of travel. The importance of transport taxes in terms of revenues varies considerably between the countries. In 1996 for France, Ireland and Luxembourg transport taxes were around 1% of total revenues from taxes and social contributions, while in Denmark, Ireland, Spain and the Netherlands they amounted to 4%.

While fuel taxation is an important first step, road pricing is sometimes considered as a more effective restraint on vehicle use. For example, in the Netherlands a 30% fuel price increase would reduce urban traffic by 4.8% and overall national traffic by 7.1% (NOVEM, 1992). However, in the UK road pricing through a toll in urban areas would have a much larger effect (due to the higher price elasticity of demand) so a 1% increase in tolls leads to a 1% fall in traffic demand (Goodwin, 1992). So far, no EU Member State has introduced urban road pricing, although legislation is underway in the UK. Norway has introduced tolls in Bergen and other cities, leading to a 6-7% decline in traffic in the first year and rising car occupancy (Larson, 1988).

7. Households

Overall, evidence on the environmental influence of the household sector is lacking. However, trends in consumption patterns dominate improvements in packaging, energy-efficiency and resource use, and this emphasises the importance of trying to influence or restrict demand. It is difficult to evaluate the effectiveness of many policies to this end, either because they have been in place for too short a time to allow for a thorough investigation, because they are not operating in isolation but affected by other wider changes in a country's economy, or because they seek to influence behaviour which is not easily observable, e.g. households' energy-saving measures. Preliminary evidence (OECD, 1998e) demonstrates that packages of measures, addressing several aspects of sustainable consumption, are particularly successful.

7.1. Environmental assessment of the sector

This section focuses on three main environmental impacts from households: air emissions, solid waste and water use. Figure 4.1.14 gives an overview of relative performance in these areas.

Generally, the patterns are linked to per capita income levels of the countries: increased income levels spur demand for consumer goods, and therefore richer countries tend to produce more emissions and waste. Conversely, higher income countries are more likely to provide the infrastructure for households to be connected to water treatment networks. The contribution of households to environmental stresses can be significant (Table 4.1.10): the share of household CO_2 emissions as a percentage of total emissions is over 20% on average, reaching almost 40% in France, due to the structure of electricity production (with a high share of nuclear energy) in this country.

Trends in consumption patterns have, to date, overwhelmed improvements in the efficiency of energy and resource use (OECD, 1998e) (see Chapter 2.2). Growth in household energy consumption, the number of households, ownership of durable household goods and private cars have been driving forces for energy consumption and emissions. Influencing households' consumption patterns is therefore a potentially powerful means of addressing environmental problems.

Serious efforts to change consumption patterns are underway across EU Member States, due to increased recognition that current patterns are unsustainable and concrete evidence that changes in practices can deliver significant environmental improvements without major negative effects on living standards (OECD, 1998e). There is considerable scope for governments to curb the impacts of the household sector, and a growing array of policy instruments available to affect consumer behaviour. Strategies for reducing damage from the household sector generally focus on energy efficiency, waste reduction and recycling (including packaging) and lowered water pollution through a range of instruments, including regulations, subsidy reform, environmental taxes, consumer information and eco-labelling.

7.2. Quantified environmental damage

The only attempt to quantify environmental damage in the household sector relates to waste. While there are several studies on the economic value of environmental damage from waste disposal, the wide variety of methods used for disposal in the European

Union makes generalisation difficult (see Chapter 3.7). One wide-ranging study suggests that environmental damages from landfill average some 2-20 euros per tonne of waste, and from incineration 11-23 euros/tonne (Coopers and Lybrand *et al.*, 1997). Since some 100 million tonnes of municipal waste goes to landfill in the European Union, external costs from this aspect of landfill alone could amount to EUR 200 million to 2 000 million. For incineration the figure would be about 30 million tonnes and EUR 330 million to 690 million. The figures are speculative because of the limited nature of the physical data and the absence of detailed country-by-country estimates of environmental costs.

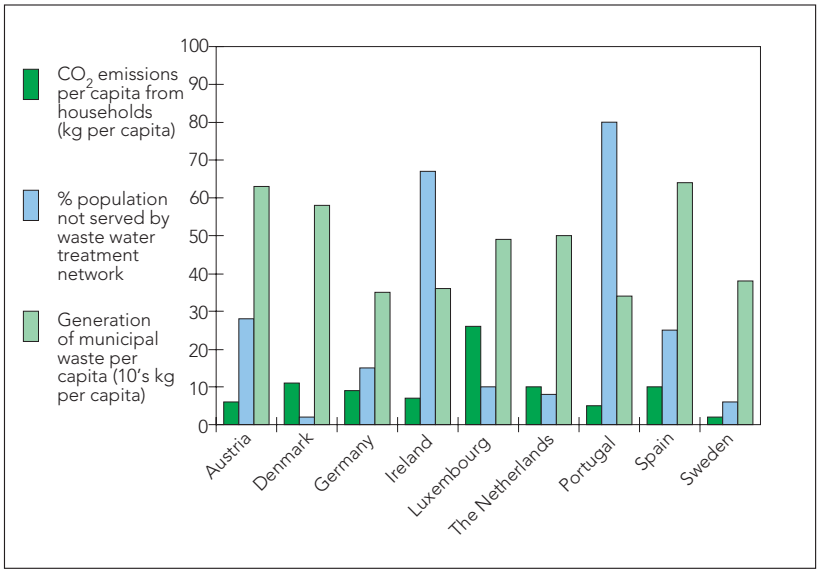
Little information is available on household contributions to atmospheric emissions. Nevertheless, the data on CO_2 emissions in Table 4.1.10 suggests that household energy use in the EU causes environmental damage of over EUR 1 billion per year.

7.3. Regulations

As analysed in Chapter 3.5, Member States are on track to comply with the Directive on urban wastewater treatment (European Commission, 1997e). The law will eventually require collection and secondary treatment of wastewater from all urban centres in the EU. The EU is currently developing minimum energy efficiency standards for household equipment such as refrigerators, which could be used to constrain household demand for energy. Energy efficiency improvements have contributed significantly to constraining household demand for energy to date: Table 4.1.11 shows the reduction in energy intensity of new appliances in Germany from 1978 to 1985 and Denmark from 1970 to 1994. The table gives the ratio of tested new appliance electricity use in the recent year to that of the earlier base.

A number of other regulatory measures have been taken by individual Member States, which will have the effect of reducing the impacts of households on the environment. Water consumption in Austria has been significantly reduced by the mandatory installation of 3/6 litre dual-flush toilets in new and replacement buildings; in France, standards for insulation of new buildings require the use of double glazing, which should allow for a 10% reduction in heating; in the UK, water companies have the power to restrict the use of hose-pipes in regions suffering from water shortage.

Environmental pressures from households (selected EU countries) — Figure 4.1.14



Notes: percentage of population not served by waste water treatment, all data for 1990; generation of municipal waste: all from 1992 except Austria, Germany, Sweden: 1990; CO_2 emissions: Portugal: 1990; Denmark 1991; Germany, Luxembourg: 1993; Austria, Ireland: 1994; Netherlands, Sweden: 1995.

Source: EEA, Eurostat

Percentage of CO_2 emissions attributable to households, selected European countries, latest available year — Table 4.1.10.

Country	DK	D	F	IRL	NL	A	P	FIN	S	UK	N
% total emissions CO_2	18	16	39	20	21	28	12	17	23	34	14

Source: Eurostat

Reduction in energy intensity of new appliances — Table 4.1.11.

	refrigerator	freezer	washer	dishwasher	oven
Germany	21	37	18	29	16
Denmark	29	40	35	55	13

Source: IEA (1997)

In the area of waste, regulations in the form of waste reduction and recycling targets have been important in bringing about impressive increases in recycling. For example, 20% of beverage cartons were recycled in 1997 in the EU with Germany leading the way at 69% with France, Italy, Spain and the UK at less than 2%. By 1997, over half of all steel packaging was recycled in 8 Member States.

7.4. Consumer information and eco-labelling

Provision of information is a potentially potent way of influencing household demand by allowing consumers to make

informed choices about the environmental impacts of their consumption decisions (see Chapter 4.2). Many Member States have developed effective eco-labelling schemes, such as the German Blue Angel scheme, and the EU has sought to develop an EU wide eco-label with a flower logo. By the end of 1997, there had been 183 EU eco-labels issued to products. However, the implementation of the scheme is still seen as too slow and in 1997 Denmark decided to follow the much more advanced Nordic Swan scheme rather than the EU eco-label. Revising the EU label has been under discussion since 1996 and in 1998 the Commission accepted that Member State schemes should operate alongside the EU scheme, and that the scheme will remain a simple pass or fail rather than a graded scheme which was seen as too complicated for consumers. Some countries have also taken a more dramatic approach with an Integrated Product Policy, which addresses the whole lifecycle of a product. This is now being discussed at the EU level (European Commission, 1998g).

Measuring the success of eco-labelling schemes is difficult (see Chapter 4.2, Section 3.2). Eco-labelled products have captured significant market share only in the Swedish market, where for example, eco-labelled detergents have 90% market share (Eiderstrom, 1998). The OECD (1997f) found that eco-labelling programmes were in general more successful in areas which had already benefited from high consumer environmental awareness.

The importance of providing consumer information is illustrated by the penetration of compact fluorescent lights (CFLs) which are 60% more energy efficient than incandescent light bulbs. Only 30% of households in the EU have more than one CFL, but Denmark and the Netherlands have the highest use of CFLs due to extensive public promotional campaigns. The sales of CFLs doubled in Sweden following a public information campaign at the start of 1998.

The balance of evidence suggests that household concern about the environment is increasing (see Chapter 4.2), although investigations of actual changes in behaviour is more limited.

7.5. Subsidy reform

In the water sector, efforts to encourage reduced water subsidies for households were made in the draft Water Framework Directive, but some Member States objected to an explicit reference to 'full cost recovery'.

Table 4.1.12. **Environmentally related taxes and charges for households, 1996**

Environmental tax measures	A	B	D	DK	E	F	FIN	GR	I	IRL	L	NL	P	S	UK	CZE	HUN	POL	IS	N	CH
Batteries		*		*										*			*				*
Plastic Carrier Bags																	*	*	*		
Disposable Containers		*		*			*										*	*	*	*	
Tyres				*													*				
CFCs and/ or halons																*	*	*			
Disposable razors				*																	
Disposable cameras				*																	
Water charges			*	*		*	*							*	*	*	*	*		*	*
Sewage charges			*	*	*		*					*	*	*	*	*	*	*	*	*	*
Municipal waste charges			*	*	*	*	*					*	*	*		*	*	*	*	*	*
Waste disposal charges	*	*	*	*	*	*	*		*	*		*	*		*	*	*	*		*	*

Source: OECD, 1997b

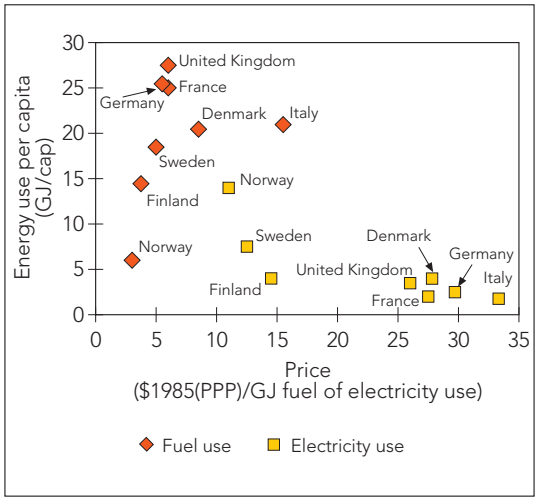
Household consumption is increasingly being charged to cover operating costs, but the capital costs of water supply are often still subsidised. Metering is widespread in Europe, but some households still lack meters, particularly in Norway, UK and Ireland. In Ireland, domestic water consumption is completely subsidised following a decision in 1996, and new water supply is financed solely by central government, often with the use of Structural and Cohesion Funds. Similarly, Italian domestic water supply continues to be subsidised, although charges have increased substantially in the last twenty years. It is thought that 70% of capital expenditure is financed from local and central government. In Spain, an estimated 50% of water supply infrastructure costs are met from public sources, and there is an unknown subsidy to municipal operational costs. The effect of removing consumer subsidies can be dramatic. In the former East Germany, subsidy removal and metering led to a 30% decline in water use (OECD, 1997g).

7.6. Environmental taxation

Table 4.1.12 provides an overview of progress on environmental taxes applicable to households in the EU, EFTA and Accession Countries at the end of 1996. Most countries have introduced some sort of environmental taxes or charges which fall on households, but progress in some, particularly Denmark and Hungary, is far more advanced than average.

The case for use of economic instruments as a means of altering household behaviour is compelling. Figure 4.1.15 demonstrates that prices have a clear influence on households' behaviour. Household fuel use, relative to income, tends to be higher in low price countries, a result that holds especially true for electricity.

Household Energy Use and Prices, 1993 Figure 4.1.15



Note: Data on energy use is adjusted to a common winter climate.

Source: IEA, 1997

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Country codes used in the tables in this chapter:

A:	Austria
B:	Belgium
D:	Germany
DK:	Denmark
E:	Spain
F:	France
FIN:	Finland
Gr:	Greece
I:	Italy
IRL:	Ireland
L:	Luxembourg
NL:	The Netherlands
P:	Portugal
S:	Sweden
UK:	United Kingdom
CZE:	Czech Republic
HUN:	Hungary
POL:	Poland
IS:	Iceland
N:	Norway
Ch:	Switzerland