

## VI. ENCOURAGING ENVIRONMENTALLY SUSTAINABLE GROWTH: EXPERIENCE IN OECD COUNTRIES

Environmental policies, and the environmental effects of economic activity and policies, attract increasing attention. Growing priority is being given to policies to ensure that decisions affecting economic activity take into account the associated effects on the environment, helping to make economic growth more environmentally sustainable. Equally, there is a need to ensure that environmental policies are designed to minimise the economic costs of meeting their objectives. This chapter reports findings from a series of country studies assessing the extent to which economic, sectoral, environment and natural resource policies succeed in combining these aims in a set of coherent and cost-effective measures.

*Policies have to address the interaction between economic and environmental developments*

Studies have been completed for eight countries and each was tailored to assess important or representative issues in the country in question.<sup>1</sup> They were thus not comprehensive in their coverage, but four common themes nevertheless emerged: a definite trend in recent years towards the use of market-based solutions for dealing with environmental problems; concerns that competitiveness and distributional issues constitute obstacles to policy implementation; certain sectors where current policies make environmental objectives harder or more costly to achieve; attempts to design institutions or processes to achieve co-ordination across relevant policies and sectors. These are discussed in turn in the following sections.

### Increased use of economic instruments in environmental policy

In most OECD countries the vast bulk of environmental legislation has been introduced in the decades since 1970. Initially legislation often took the form of controls on specific activities related to specific pollution problems, problems which were often so severe<sup>2</sup> that looking for quick solutions may have been more important than minimising costs over a longer period of time. The resulting policies frequently

*A “command and control” approach to environmental policy has been traditional...*

1. The studies were undertaken as part of the regular OECD reviews of economic policies and developments in member countries, published as special chapters in the series *OECD Economic Surveys*. Studies which were completed at the time of writing covered Belgium, Canada, Denmark, Finland, Germany, Norway, Sweden, and the United States. Studies on Australia, Austria, Ireland, Poland and France are forthcoming. An OECD working paper, O'Brien and Vourc'h (2001), presents common themes and lessons from the completed studies, and provides more detailed background to the present paper. Further background information, more particularly on the state of the environment and environmental policy in individual countries, can be found in the series *OECD Environmental Performance Reviews*. The first *OECD Environmental Outlook* (OECD, 2001a) provides an overview of the main challenges facing environmental policy in OECD member countries. See also OECD (2001b) for coverage of a wide range of related issues from the OECD programme on Sustainable Development.
2. An example was a river which caught fire as a result of pollutants habitually dumped in it.

either banned certain activities or discharges, specified particular process or cleanup technologies, or imposed limits on discharges from enterprises either in absolute amounts or in relation to their output. These are often known as “command and control” type policies and have produced many spectacular improvements in the environment. However, as environmental problems evolve and technologies or economic activity changes, rules and regulations need to be monitored and revised as necessary in order not to get out of tune with the situation. More generally, command and control policies often give rise to unnecessarily costly solutions to environmental problems and this has stimulated the search for ways of using market mechanisms to achieve environmental ends.

*... but “economic instruments”  
can make use of the price  
mechanism*

One way of looking at the relationship between the economy and the environment is to treat the impact of a particular activity on the environment as a cost similar to others, with the exception that it is not borne directly by the activity that causes it, that is, the cost is “external” to the activity.<sup>3</sup> For example, pollution of groundwater by some economic activity may impose additional costs of purifying water for household use. From an economic perspective, such external costs can be analysed in a similar way to other costs. If a price can be put on environmental damage that represents the value to society of avoiding that damage, then an efficient policy measure would be one that forces enterprises to treat these costs in the same way as internal costs, such as those associated with energy, labour and other inputs. And, if prices reflect these environmental costs, households will take into account the related environmental effects in their spending behaviour. If externalities are thus “internalised” in decisions (including those by public authorities), market forces can help in reducing environmental damage.

Taxes on pollutant emissions, or schemes for trading emission permits, are examples of economic instruments that allow environmental externalities to be internalised and are used in many countries already (Table VI.1). Although not easy to apply in all circumstances, they have important advantages over command and control measures (see Box VI.1); most countries are increasingly looking for ways to use such instruments to reduce the economic costs of environmental policy, or to increase the environmental benefits for given costs, although it remains the case that a more traditional regulatory approach is still in use in most areas.<sup>4</sup>

*Voluntary approaches are  
popular, but not always  
effective*

Increasing use is also being made of voluntary agreements. These come in a variety of forms, frequently as undertakings by trade or industry associations on behalf of their members, though they may also be agreements made between individual enterprises and governments.<sup>5</sup> Although voluntary agreements can be useful ways of disseminating information and increasing environmental awareness among both enterprises and the general public, in many cases they are not very effective in promoting environmental improvements in addition to what might have been expected in the absence of the agreement.

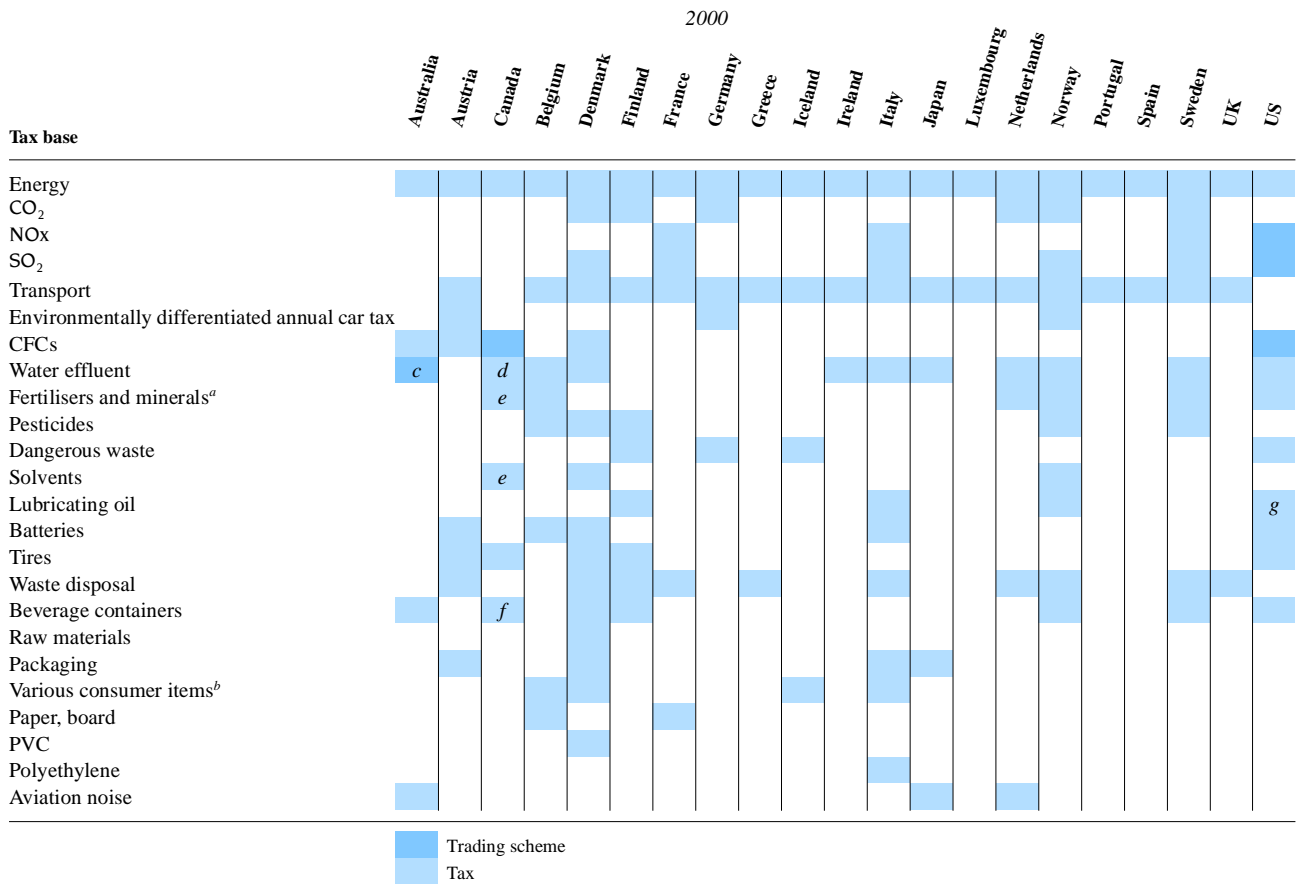
This lack of effectiveness is often due to the natural tendency of industry associations to design the targets and programmes such that they are not too difficult to meet, or defined in vague terms that are difficult to verify. Sometimes the main

3. See Pearce and Turner (1990) for extensive discussion of the economics of environment and natural resource policy.

4. Use of economic instruments implies the existence of a regulatory base, of course, for example to define the property rights in a tradable permit system.

5. See OECD (1999b) for a comprehensive survey of the use of voluntary agreements.

Table VI.1. Use of economic instruments in OECD countries



a) Minerals are phosphorus and nitrates.

b) Such as disposable razors, disposable cameras, bags, disposable tableware, light bulbs.

c) Hunter river salinity.

d) Quebec.

e) British Columbia.

f) New Brunswick and British Columbia.

g) Rhode Island.

Source: OECD (1999), European Environmental Agency (2000); Economic Instruments For Pollution Control And Natural Resources Management In OECD Countries: A Survey; OECD database on environmentally related taxes.

### Box VI.1. The advantages of economic instruments

Minimising the overall costs of achieving a given environmental goal means that all activities that affect the goal should pay, as far as possible, the same cost for improving their performance (or penalty for not doing so). Otherwise, the task of achieving the environmental goal could be redistributed across activities in a way that reduces the overall cost.

The use of economic instruments, such as pollution taxes, ensures that all sectors of the economy (provided the measures are applied to all relevant polluters) face the same incentive to reduce pollution, and thereby encourages least-cost solutions to be found. Enterprises who can abate their emissions most easily will contribute the most to the total reduction in pollution.

In addition, economic instruments promote “dynamic efficiency” by providing permanent incentives for reducing emissions through technological improvement. Command and control type regulations generally need to be updated as technology evolves, possibly quite frequently, depending on their design.

Finally, as economic instruments work through the price system, they more effectively co-ordinate economic and environmental policies: where prices of goods and services reflect the associated environmental costs, producers and consumers automatically take them into account in spending and production decisions in all sectors of the economy.

motivation on the – industry side is to avoid legislation making action compulsory. Against this background, voluntary agreements are likely to be more effective when they provide clear quantitative targets, all relevant enterprises are required to participate, and meaningful sanctions for non-compliance are provided for. Often it is only a clear threat of legislative action by the government that will generate “voluntary” agreements of this sort.<sup>6</sup>

*Where command and control measures are required they should be designed with cost-effectiveness in mind*

There are many instances where command and control measures are necessary, nevertheless. This is the case, for example, where technical or measurement problems make it difficult to continuously monitor the environmental damage attributable to individual agents, or where – as for some hazardous substances – it is desired to reduce emissions to zero. Where command and control measures remain necessary they should be designed so as to minimise the associated economic costs. One important element here is to focus on environmental quality objectives rather than imposing site-specific technology standards which determine how the environmental policy goals should be achieved. This maintains incentives among firms and households to find cheap ways of reaching the targets.

## Tax or trade?

*Emission taxes and cap-and-trade systems are two types of economic instruments*

A debate has opened up in recent years on the relative advantages of two kinds of policy instrument which are, on the face of it, rather different but which are in fact closely related: emission taxes and cap-and-trade systems. A tax sets the “price” of emitting a unit of a pollutant, leaving the total amount of emissions to emerge from market decisions that take the price into account. A cap-and-trade system sets a limit (the “cap”) for total annual emissions, issues a number of permits each year equal to the cap and requires emitters to purchase, on a free market, sufficient permits to cover their emissions. The tax sets the price with the quantity of emissions determined by the market, the cap-and-trade system sets the quantity and the market determines the price.

*Fix the price or fix the quantity?*

Once a market price has been established, and provided economic conditions, technology and the overall cap are broadly stable, a cap-and-trade system will appear to enterprises very similar to a tax: emissions have a well-defined price and production decisions have to take it into account. The choice between the two then depends on what is the most appropriate in a concrete situation.<sup>7</sup> If it is possible to value the environmental damage caused by particular emissions, then imposing a per-unit tax equal to that damage is the optimal approach. However, it can be difficult to quantify the damage caused by emissions and often even more difficult to put a monetary value on it. In this case a tax may still be a useful instrument to change behaviour in the right direction even if the “optimal” outcome is not achieved. Frequently, governments adopt quantitative targets for emissions and under these circumstances a cap-and-trade system can be a good solution. It can be thought of as automatically calculating the tax necessary to achieve the target.

6. In the Netherlands, many so-called voluntary agreements take the form of negotiated “covenants” between the government and enterprises or industry associations. Once signed, these covenants become legally binding.

7. See O’Brien and Vourc’h (2001) for a discussion of which circumstances favour which instrument.

A complication with permit trading is that a market infrastructure has to be set up. However, a certain amount of practical experience, largely in the United States (see Box VI.2), suggests that at least in the case of energy-related emissions, markets emerge spontaneously very quickly.

Another question is how to distribute permits under a cap-and-trade scheme. Giving emission permits away free to existing emitters (in proportion to their historical emissions), as in the US schemes, a method known as “grandfathering”, means that although enterprises are induced to make efforts to reduce their emissions, on average they pay no penalty beyond the actual cost of the emission reductions. An alternative is for the government to auction the permits; in principle the outcome for output and prices would be practically the same, but the government would receive the revenue.

*Permits: auctioned or “grandfathered”?*

This choice of how much revenue to collect, and from whom, is not in fact a distinguishing feature of cap-and-trade. The same issues arise for a tax, which can equally be designed to raise no net revenue. Thus, while the US sulphur dioxide trading scheme uses grandfathering, the Swedish charge on nitrogen oxides is refunded to emitters in aggregate (but in a manner independent of their actual individual emissions<sup>8</sup>) to achieve an essentially identical result, apart from the determination of the price of emissions. Other permutations are possible in both types of system.

### Box VI.2. Transactions and prices in US emission trading

Two major emission trading schemes are currently operating in the United States, the SO<sub>2</sub> trading scheme, part of the acid rain program, and the regional NO<sub>x</sub> trading scheme, aimed at reducing ground-level ozone.

The SO<sub>2</sub> emission cap was foreseen in revisions to the Clean Air Act in 1990, and was effective from 1995 onwards, with a significant tightening in 2000, through a reduction in the size of installations subject to the cap and a reduction in the overall limit. The NO<sub>x</sub> cap was effective as from 1999, with some trading beginning the previous year. A tightening similar to that for SO<sub>2</sub> is due in the NO<sub>x</sub> regime in 2003. The penalty for non-compliance is \$2 000 per ton for SO<sub>2</sub>, whereas for NO<sub>x</sub> the penalty is payable in permits, at a rate of three tons for each ton of overrun.

In both schemes, actual emissions have run below the level of the cap. SO<sub>2</sub> permit prices are significantly below levels expected before trading began (\$400-500 was thought to be a reasonable guess) (Figure VI.1). That they are not zero despite the cap being non-binding is due to the possibility of “banking”: the constraint may become tighter in the future, and emission permits not required for current emissions can be held over for future use. The rise in SO<sub>2</sub> permit prices in 1998 might have been due to anticipation that supply would be tighter in 2000.

Banking provisions – whereby unused permits can be carried forward for use in later periods – differ between the two

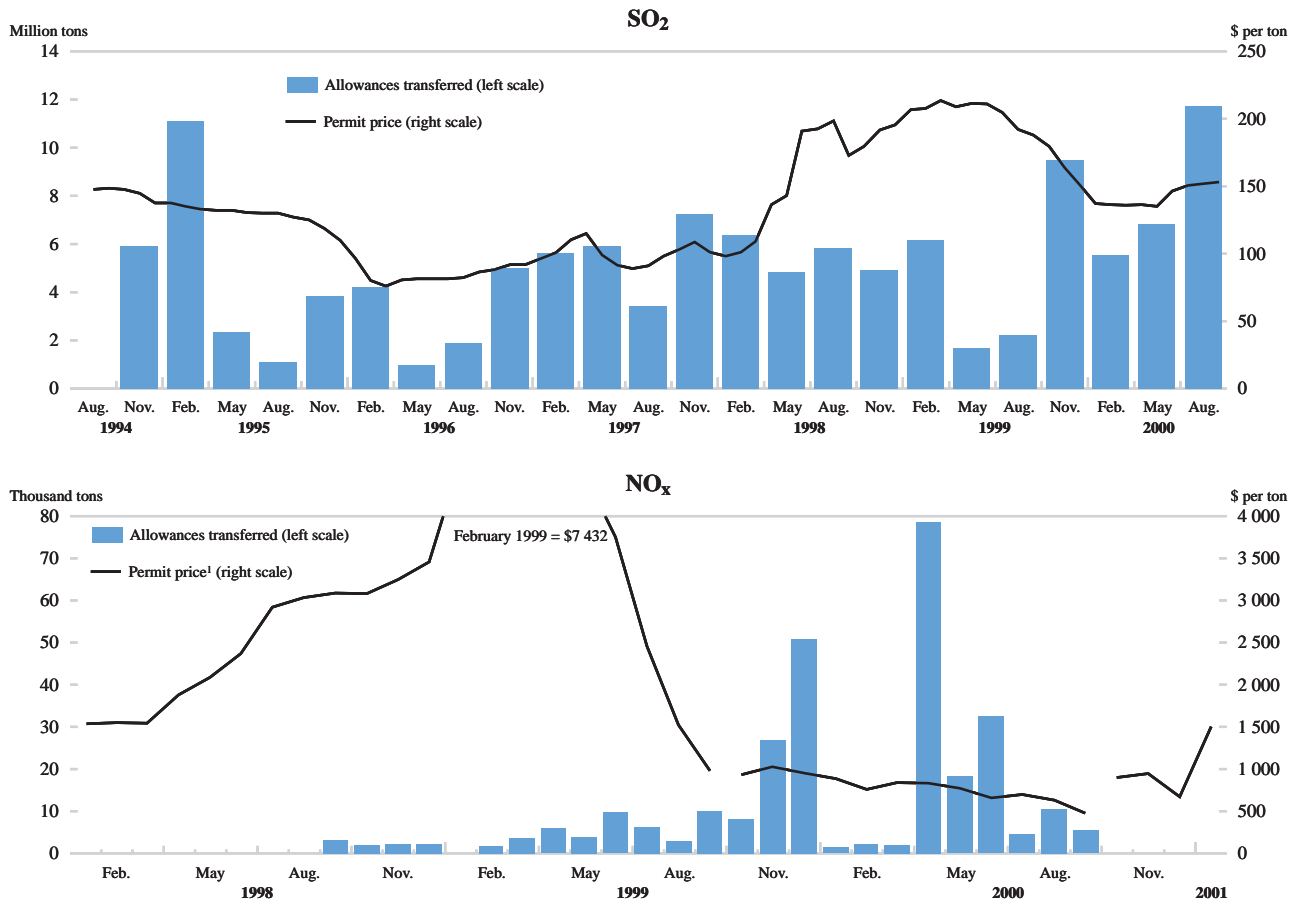
programmes; in the NO<sub>x</sub> scheme banked permits are discounted to avoid emissions exceeding the overall target in any one year by more than 10 per cent. Hence permits of a different “vintage” trade at different prices; prices in the NO<sub>x</sub> market seem generally to be more volatile than for SO<sub>2</sub>. In the SO<sub>2</sub> scheme, there are no restrictions on banking.

Much of the early SO<sub>2</sub> trading occurred within enterprises – transfers between generating units owned by the same firm. These remain in the majority, but the share of trades between distinct organisations has tended to grow. Brokerage transactions are a minority of the total – perhaps 20 per cent of those in NO<sub>x</sub> and 10 per cent in SO<sub>2</sub> – but are a higher proportion of those that occur between distinct organisations; price data is from transactions through brokers, there is no statutory requirement to report prices.

Two facts may have been important in the success of these programmes. First, the targets appear to have relatively easy to meet so far. Second, the absence of any charge for issuing the permits has prevented any serious profitability problems. Further tightening of the constraints (either through economic growth or absolute reductions in allowable emissions) and a shift to charging for permits when they are issued (desirable as a means of capturing the economic rent which otherwise accrues to emitters, but not currently planned) will provide a more severe test of this approach.

8. The charge, applied to large electricity generators, is levied on NO<sub>x</sub> emissions at a rate of 40 SKr per kilogram. The revenue is returned to emitters in proportion to energy produced. See Roseveare (2001).

Figure VI.1. Emissions permit trading in the United States



Note: In 2000 the SO<sub>2</sub> cap was 8.95 million tons, the NO<sub>x</sub> cap was 219 000 tons.

1. 1998 to September 1999: price of 1999 "vintage". October 1999 to September 2000: price of 2000 "vintage". October 2000 to January 2001: price of 2001 "vintage".

Source: Environmental Protection Agency, United States.

### Full grandfathering may lead to over-compensation

Grandfathering is an attractive way to ease the burden on industry when new restrictions are being introduced. While preserving marginal incentives for pollution abatement, it limits the cost to polluters – who have sunk costs in the form of investments made when pollution damage was not recognised in legislation – and can therefore reduce their opposition to such measures. However, under some circumstances grandfathering can actually make polluters in aggregate better off: consumers pay higher prices, corresponding to the price of permits or the tax, but all the revenue accrues to the polluting industry. This revenue may exceed the costs of reducing pollution, particularly if higher output prices have only a limited impact on demand.<sup>9</sup> Thus, full compensation for the average enterprise may require only part of emissions to be grandfathered. In the longer run, when sunk costs and transition problems are no longer relevant, it would make sense to phase out all such compensation.

9. A recent paper argues that it might be sufficient to grandfather only a small proportion of historical emissions, auctioning the rest. See Bovenberg and Goulder (2000).

## A double dividend?

In practice, new environmental taxes are often introduced as part of more general tax packages. Green tax reforms implemented in a number of European countries have combined new environmental taxes with reduced taxes on labour, as in Denmark, Finland, Germany and the Netherlands, for example; the revenue can also be used to reduce other taxes (in Norway and the Netherlands, income taxes were reduced). The availability of such revenue is sometimes thought to represent a bonus – “double dividend” – from environmental taxation or auctioning of tradable permits, but the extent to which this is justified is debatable.

On one side of the debate, it can be argued that, if the tax system is optimal, there are no efficiency gains from raising any existing taxes and reducing any others (or increasing expenditure), so the same goes for any new revenue-raising taxes. It would follow that the only benefit from a new environmental tax would be the resulting change in behaviour (a “single dividend”); the revenue itself will be redistributed, but that redistribution in itself does not improve welfare, and thus does not amount to a double dividend.

However, tax systems are not optimal. Reforming them to improve efficiency is difficult and often politically costly. Under these circumstances, it is very likely that uses can be found for revenue from environmental taxes where the benefits exceed those from redistributing the revenue from environmental taxes either to polluters or to those suffering from pollution. This is even more the case where popular opinion supports such moves. Environmental taxation can thus ease tax reforms that probably should be undertaken anyway, but which might not be politically feasible. This double dividend – a “muted” double dividend – is perhaps a political rather than an economic one.

In some countries energy taxes are partly recycled to households or enterprises in the form of subsidies for energy-saving investment, perhaps in response to a public conception that earmarking of environmental tax revenues is a good thing. While such earmarking can be an effective way of gathering popular support, and therefore make sense from a political perspective, it is not justified on environmental or economic grounds. If such subsidy expenditure is desirable (which it may not be if energy use is appropriately taxed) there is no reason to tie it to revenue from one particular tax, nor to prevent such revenue being used for other desirable expenditure or to reduce other taxes.

## Economic instruments in use

Economic instruments, whether tax or permit trading (the former being far more common) are used in a number of policy areas (see Table VI.1). In clean air policy, a number of European countries have taxes on emissions to the air of sulphur or nitrogen oxide, which are implicated in acid rain and health problems, while the United States has cap-and-trade schemes. Regulations, for example on allowed emissions per unit of electricity generated, often remain in place however, even where economic instruments are used. Some European countries have also introduced a tax on carbon dioxide, the most important “greenhouse gas”. Many countries also have taxes or charges on water effluent, generally concerned with recovering the costs of treatment rather than targeted at the external costs of pollution.

As part of waste policy a number of countries tax certain individual products. Examples of countries where this form of policy was expanded in tax reforms of the

*Combining environmental taxes with other measures should not be necessary...*

*... but can be a useful practical approach*

*Economic incentives are used in a range of environmental policies...*

*... including waste...*

1990s include Belgium and Denmark (the latter has the widest range of such taxes among all OECD countries). Products concerned include batteries, drinks containers and plastic bags. Such taxes are often part of schemes to encourage recycling and re-use, rather than being based on calculations of the environmental costs of the products – which are likely to depend on the way in which they are disposed of. Taxes are also imposed on waste disposal in many countries, with some practising differential taxation to discourage landfill and to encourage recycling.

However, even where waste policy makes use of economic instruments, these are usually not sufficient to meet the authorities' objectives; the latter, which do not appear to be defined only with respect to environmental externalities, are supported by other regulations and specific targets for shares of recycling, for example. Increasing use is being made of producer responsibility legislation, requiring producers to take responsibility for the waste generated from their products. This can be an effective way of forcing producers to internalise the costs that their products will eventually generate, though if producers are subject to regulations over and above those that apply to other forms of waste, excessive costs may be imposed.

*... and energy,...*

Almost all revenue from environmentally related taxes comes from those on energy. Other environmental taxes generate little revenue, partly because they are few, and that is not their primary purpose in any case. Many energy taxes, particularly those on motor fuels, have existed for a long time as important revenue raising measures. They have only relatively recently been used for explicitly environmental objectives, as in the case of differential taxation on unleaded petrol or on low-sulphur fuels. However, the current structure of fuel taxation (and of taxation and charging in transport more generally) is far from consistent with environmental damage (see below).

*... a range which could usefully be extended*

There are many areas where there is potential for extending the use of economic instruments. In natural resource policy, an example is in management of water supply or of fish stocks through the use of such instruments as tradable extraction rights or fishing quotas. The latter have been successfully used in Iceland for some time and are also in use in Canada, the Netherlands and New Zealand. In water quality policy, much more use of economic instruments could be made, for example in tackling leaching of nitrates and phosphates from fertiliser or animal manure into water courses.<sup>10</sup>

An area where the use of economic instruments could be better co-ordinated is renewable energy policy. In most countries targets for renewable energy supply, generally selected for their own sake rather than as a result of any calculation of an optimal share of renewables, are being pursued using a mixture of subsidies to production and to research and development. However, the main environmental problems (such as those related to emissions of sulphur and nitrogen oxides, and carbon dioxide) that renewable energy avoids are well-defined and a more integrated policy would seek to tax those externalities systematically, wherever they occur, providing incentives both for the development of alternative energy sources and also for economising energy use (whereas energy use is, in effect, encouraged by subsidies to renewables).<sup>11</sup>

10. A number of countries have taxes on fertilisers, but these are usually set at very low levels or even exempt agricultural uses altogether.

11. While arbitrary targets may not be optimal, they are a popular practical approach. A good way of minimising the cost of achieving them is to use tradable "green" certificates, already planned for introduction in Denmark and Australia. These policies allow producers of renewable energy to issue certificates and force energy suppliers to purchase them in proportion to their total energy supply. Such a system can work in parallel with taxes on the identifiable externalities of non-renewable energy.

## Policy implementation: competitiveness and distributional obstacles

Environmental policies that are effective must alter the structure of production; they may well also change the level and distribution of income. Economic instruments achieve these changes by shifting relative costs and prices so that market forces move resources into less environmentally-damaging uses. These cost and price changes obviously affect the competitiveness of certain industries, and their effects may well be felt more strongly by some income groups or regions than others.

*Concessions granted on competitiveness grounds...*

Resistance to such losses of competitiveness and (perhaps less frequently) to changes in income distribution, frequently results in calls for some industries – in recent examples usually energy-intensive industries – to be exempted or at least receive special treatment, mainly in the form of reduced tax rates.<sup>12</sup> Competitiveness losses are particularly sensitive in industries with a strong export orientation. The economy-wide use of an economic instrument sometimes generates substantial and visible costs for a few industries or enterprises, with much more diffuse and less visible costs for a broad range of other industries. Exemptions reduce the incentive to abate emissions in the affected sectors, and thereby throw onto others the burden of meeting any given target, increasing the overall economic cost. Cost increases can be large if, as is invariably the case, the favoured sectors are precisely those that have the highest emissions per unit of output – those are the sectors where the least costly reductions can generally be made.

*... are frequently unjustified and impose real costs*

Of course, regulatory instruments also have effects on competitiveness and income distribution. Meeting technological or performance standards has costs and therefore affects firms' competitive positions. These effects from regulations are perhaps less obvious than those from economic instruments, which may explain part of the policy bias in favour of regulation. Moreover, regulation may also be more prone to capture – as narrow interest groups exert pressure to shape rules that favour their interests.

Serious arguments have however been advanced to justify exemptions or reduced tax rates for exposed sectors and need to be considered. These arguments revolve mainly around two issues – “leakage” and the problems of being a “first mover” in environmental taxation. Nevertheless, it is not clear that even these arguments are sufficiently strong to motivate a deviation from the uniform use of economic instruments. This is so also because favourable treatment of some sectors is likely to stimulate attempts by others to achieve similar advantages.

### Leakage

“Leakage” refers to the effect of emissions-reduction policies in one country that work partly by causing production in certain sectors – notably those in internationally competitive markets – to move abroad, where emissions may consequently *increase*. This issue is most obvious where national pollution contributes to an environmental problem with a global character such as climate change. The essence of the argument, used for example by countries which have introduced a CO<sub>2</sub> tax, is that the effect of reduction in domestic emissions on the environmental outcome is offset

*“Leakage”...*

12. The CO<sub>2</sub> related taxes in Denmark, Finland, the Netherlands, Norway and the United Kingdom all have such provisions.

by leakage; some of the costs incurred by the taxing country, in the form of lost production, give no environmental benefit. That is, the marginal benefit – in terms of global emission reduction – is lower than the tax rate in the taxing country; to minimise the *domestic* cost of a given *global* emission abatement, tax rates differentiated by the degree of openness of the sector may be appropriate.

In the case of climate change, however, most OECD countries are parties to the Kyoto Protocol which, if implemented, will impose restrictions on all countries' emissions; "leakage" to another "capped" country should not then be a concern.<sup>13</sup> However, the problem may arise when some countries are *not* participating in such an agreement. In the Kyoto Protocol, for example, the issue arises vis-à-vis non-Annex B countries, as only Annex B countries are subject to emission caps.<sup>14</sup> The costs of moving production to non-Annex B countries, however, may often be particularly high, and a shift may be impractical. Empirical analysis on carbon leakage effects provides estimates of "leakage rates" ranging from around 20 per cent to as little as 2 per cent; in fact, the loss of competitiveness of energy-intensive industry is often found to be much less influential than what happens on international energy markets.<sup>15</sup>

... is less of a problem than often thought

Where policy is targeting a *local* or *regional* environmental problem, the case for exemptions is difficult to make, since leakage does not undermine the effectiveness of the tax or cap-and-trade scheme in addressing the domestic problem. It is nevertheless sometimes argued that leakage amounts to *imposing* pollution on receiving countries, generally in the developing world. These arguments, which are also used to justify barriers to trade based on environmental factors, assume that it is appropriate for OECD countries to attach an importance to pollution in other countries that those countries, implicitly, do not (since they could, if they wished, introduce appropriate policies themselves). Among the justifications for this approach are that political conditions in other countries may not allow populations' preferences to be adequately reflected in environmental policy. Affected domestic industry interest groups have an obvious interest in also emphasising this aspect in their lobbying.

## First movers

Measures taken in environmentally leading countries...

Countries that have introduced environmental taxes or cap-and-trade schemes may see themselves as acting on faith that others will follow in implementing appropriate policies. As first movers, they may have some grounds for not imposing heavy penalties on certain sectors and perhaps forcing them to move some of their production to other countries, a move that might not be necessary if all countries introduced measures at roughly the same time. It may also be justified to have a transition period in which industries have time to make adjustments to reduce their emissions before

13. Indeed, the Danish authorities, for example, have stated that they would revise their system of reduced CO<sub>2</sub> tax rates if the Kyoto Protocol comes into force. The other countries with CO<sub>2</sub> taxes are Finland, Norway, Sweden and the Netherlands. Recent statements by policymakers in the United States make it increasingly unlikely that the Kyoto Protocol will be ratified in anything like its existing form, however.

14. Annex B countries consist of most OECD Members and transition countries.

15. See OECD (1999c) and Burniaux and Oliveira Martins (2000), which provide empirical evidence using a general equilibrium model. The logic of the result mentioned in the text can be seen from the extreme case of completely inelastic energy supply: in this case, any action to reduce carbon emissions in Annex B countries will be accompanied by 100 per cent leakage, independently of any tax or permit scheme exemptions.

being hit with the full tax. This avoids what might be thought of as retrospective taxation on investments in plant and processes that were made when no such tax was in prospect. In practice, however, it will be difficult to verify whether a country acts as a leader or just follows idiosyncratic policy objectives, except in the rare cases where international agreement forces more countries to take action at some point in time.

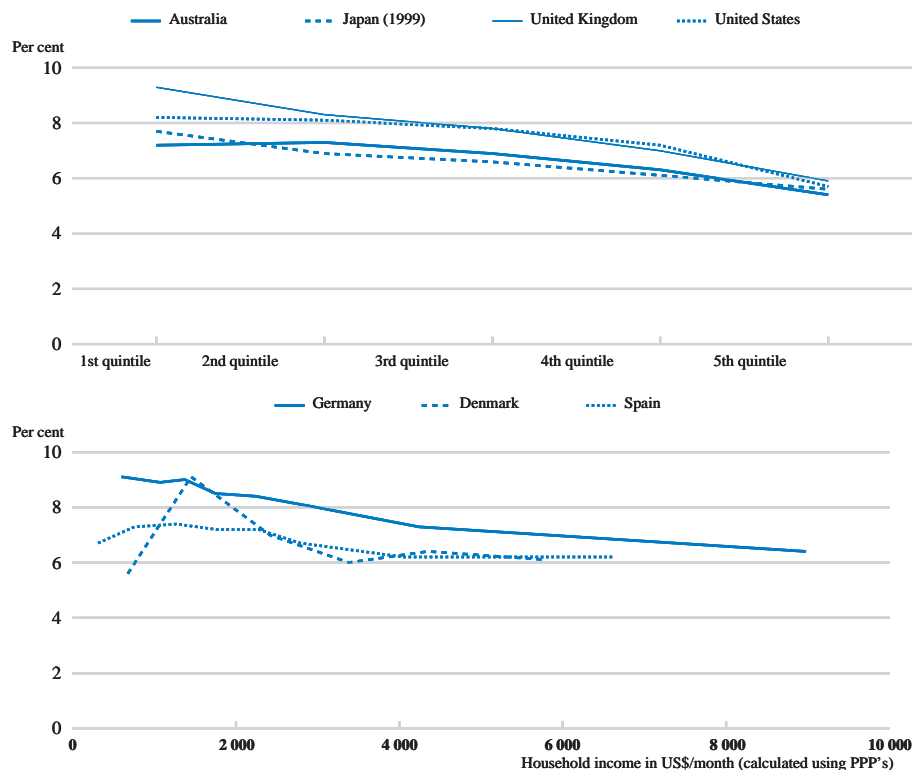
More fundamentally, an approach which reduces the tax rate on selected industries is unlikely to be the best way to minimise costs or to maximise the environmental effectiveness of the policy. To relieve industries of tax burdens for a transitional period, or to sustain domestic production when leakage is seen as a problem, it makes more sense to give relief in the form of “lump sum” compensation which maintains equal marginal incentives to reduce pollution across all industries. This can be done using forms of grandfathering discussed earlier, and will generally result in a more cost-effective policy.

*... should be more carefully designed*

## Distributional consequences

The changes in prices that follow the use of economic instruments will affect the distribution of real incomes. For example, higher prices of energy may hit those with low income somewhat harder than those with high incomes (Figure VI.2).

Figure VI.2. Share of energy<sup>1</sup> in household consumption by level of income in selected OECD countries,<sup>2</sup> 1998



1. Including fuel used for personal transport.

2. For Denmark, Germany and Spain, consumption patterns by decile or quintile are not available.

Source: National household expenditure surveys.

When these changes result from deliberate government policy, there may be a feeling that the policy should be adjusted so as not to “penalise” certain groups too much. However, most countries have put in place social systems aimed at dealing with the hardship people may suffer as a consequence of the continuing adjustments taking place in a market economy – and it is not obvious why one particular type of adjustment should be the subject of a dedicated policy response.

If nonetheless, a response is seen to be required, it is important that it be designed so as not to blunt the environmental effectiveness of the economic instruments. This means, for example, ensuring that any compensation received for increased energy costs is largely independent of actual energy consumption. Similarly, compensation to enterprises or employees in sectors that need to contract – fisheries, for example, where overfishing has depleted the fishstock – must avoid giving incentives for resources to stay in that industry.<sup>16</sup>

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## Policy implementation: sectoral issues

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*Certain sectoral policies are particularly unco-ordinated with environmental concerns*

The country studies that lie behind this paper looked at a number of specific economic sectors, to assess the extent to which costs were being minimised, and environmental effectiveness being maximised, by ensuring a level playing field in the approach to particular environmental problems across different sectors. Where environmental policy can be implemented through economic instruments, discrimination can be avoided simply by ensuring that the same tax rules or tradable permit schemes apply everywhere. For many problems, however, environmental policy inevitably relies to a considerable extent on a regulatory approach, and it can be more difficult to assess the extent of discrimination. Three sectors in particular stood out as being associated with some of the more difficult problems in this area: agriculture, transport and energy.

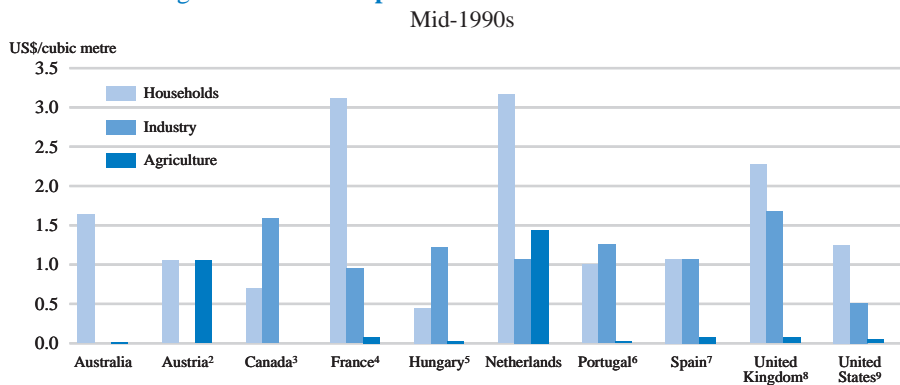
### Agriculture

Agricultural policies in most OECD countries deliver substantial subsidies which, despite reforms, still mostly take the form of strong incentives to keep output high, through output price support and input subsidies. In some countries, agriculture’s role is perceived as the guardian of nature and the landscape even while it exploits and alters them. Although agriculture contributes to a number of pollution problems, most notably of surface water, it is often exempted from the taxes and other measures that are applied to other sectors to deal with these problems. For example fertiliser taxes are rare (other than at very low levels) even where there are links between use of fertiliser, and other sources of nutrients, and water pollution problems.<sup>17</sup>

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16. See Yourc’h (2001) for a discussion of this in the context of the Canadian fishing industry.

17. Fertiliser taxes are not an ideal instrument, because water pollution from “non-point” sources such as farming is a complex process. Other economic instruments are feasible which can, as also can fertiliser taxes, be arranged in such a way as not to impose an overall tax burden on agriculture (see O’Brien and Yourc’h, 2001)

Figure VI.3. Water prices in selected OECD countries<sup>1</sup>

1. For agriculture, industry and households, prices are the median values for the range of prices for each category. Industry price not available for Austria and Australia.
2. Water used for livestock activities is obtained from municipal systems and priced at households rates.
3. Industry: these rates apply to commercial establishments only. While this may include small industries, the rates do not apply for major industrial operations.
4. Agriculture: data refer to the regions of Adour-Garonne and Côteaux de Gascogne; industry: the value refers to 1990-93 and excludes taxes, pollution and abstraction fees.
5. Agriculture: data refer to 1998 water abstraction charges; households and industry: the values refer to 1998 maximum and minimum user charges for public water supply.
6. Agriculture: data refer to the regions of Sorria and Vigia. When it is a two-part tariff, the values were based on the estimated water volumes and the value per cubic metre.
7. Agriculture: data refer to the regions of Andalucia, Castille and Valencia. Industry: the values refer to 1992-94.
8. Agriculture: data refer to Northumbria and Wales.
9. Agriculture: data refer to the regions of Sacramento River and Tehama.

Sources: OECD, *Environmental Indicators for Agriculture – Volume 3: Methods and Results*, 2001 and OECD, *The Price of Water*, 2001.

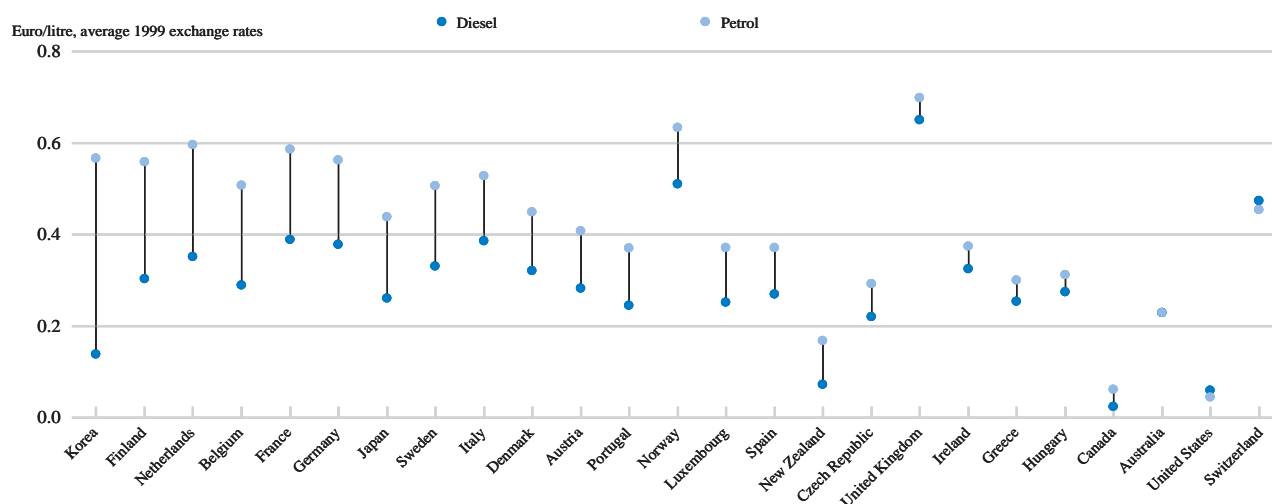
An example related to resource use rather than pollution is in water pricing, where agriculture, a major water user, generally benefits from implicit subsidies for water use, often in the very areas where water is scarce. It is difficult to make direct quantitative cross-country comparisons, but some illustration is possible. The price of water supplied to agriculture is almost always substantially less than that supplied to households or to industry (Figure VI.3). Differences in the quality and quantity of water supplied to households, industry and agriculture make this direct comparison somewhat simplistic,<sup>18</sup> but the difference in the cost of water to industry and to agriculture is almost certainly greater than could be explained by quality differences.

## Transport and energy

A striking example is in the relative taxation levels applied to diesel and petrol. Studies of the costs of environmental damage from fuel combustion emissions show that diesel causes much more environmental damage than petrol, per litre of fuel consumed. Improvements in engine performance have reduced emissions from both types of engine, but diesel remains more polluting. Nevertheless, taxation is almost universally lower on diesel fuel (Figure VI.4). The origin of this inappropriate treatment seems to lie partly in intuitively attractive but mistaken reasoning that diesel is

18. Systematic data on the cost of water supplied to industry and, even more so, to agriculture are sparse. The countries shown in Figure 3 are the only ones where volumetric prices were available for both as well as for households. In Austria the water price shown is that for supplies of drinking water for animals, whereas in other cases it is generally water for irrigation where quality standards can be much lower than for water supplied to households.

Figure VI.4. Taxes on diesel and petrol as of 1.1.2000



Source: OECD/EU Database on environmentally related taxes.

more economical so its use should be promoted,<sup>19</sup> and partly in successful lobbying from transport enterprises and the agriculture and fishing industries.<sup>20</sup>

Important in the transport sector, energy is more generally a key intermediate input and an important expenditure item for consumers. Energy supply generally produces a number of the most significant pollutants and is often treated differently from other sectors causing similar externalities. Although coal extraction subsidies have declined quite considerably over the past 15 years, they remain significant in some countries. In a number of countries, depreciation and other tax allowances result in more favourable treatment for investment in oil and gas extraction than investment in most other sectors. This treatment is likely to encourage overuse and depletion of exhaustible resources as well as associated harmful environmental effects.

## Institutions for co-ordination

*Co-ordination is easy to recommend, difficult to implement*

Notwithstanding these examples of inconsistency between environmental aims and some sectoral policies, or perhaps because of them, it is not a new idea that environmental policy needs to be co-ordinated across sectors and with other policies. The effective co-ordination of environmental policy across sectors requires assessment of

19. The relative fuel economy of diesel *versus* petrol engines is irrelevant as far as an environmental tax is concerned. Such a tax should be set in direct proportion to the environmental damage per litre consumed, which generally implies a higher tax, *per litre*, on diesel. If diesel is more efficient, it may still be used even if it is more expensive – but the consumer would only do this if the relative efficiency (*i.e.* lower fuel consumption) were enough to make the cost (including tax) per kilometre lower.

20. Reductions in emissions from fuel combustion, the dependence of emissions on traffic conditions, and the availability of sophisticated technology for road-use charging are all factors which suggest that a shift of emphasis away from fuel taxes towards road-use charging as a means both of internalising environmental externalities and contributing to the funding of road infrastructure is both feasible and desirable. See European Conference of Ministers of Transport (1998) and (2000).

the economic effects of environmental policies to ensure cost minimisation, and of the environmental impacts of other policies to ensure that these are taken into account. When policies are largely developed and implemented by specialised ministries, often with little routine contact with other ministries, a culture of co-ordination can be hard to establish.<sup>21</sup> Countries have implemented procedures for such assessment, some of which are discussed in this section. Table VI.2 provides an overview of arrangements for environmental impact and regulatory assessment in selected OECD countries.

Environmental impact assessment (EIA) involves looking at the likely environmental effects of public sector projects such as new roads or urban development, with a view to ensuring that these are not ignored when designing projects or choosing among alternatives. A comparative assessment of how well these procedures work in different countries is not available. Almost always drawn up by the department or agency that is proposing the project, EIAs are subject to varying degrees of cross-checking; environment ministries generally establish guidelines on what they should contain, but do not routinely check their quality.

*Environmental impact assessment of infrastructure projects is now a general practice...*

Less frequent are systematic procedures for assessing the environmental impacts of structural and other policies. However, such procedures – for new policy measures – are spreading, under names such as Strategic Environmental Assessments. Again, the ministry sponsoring the legislation is responsible for carrying out the assessment. Cost-benefit analysis of the environmental effects is not mandatory and rarely, if ever, included. Experience with such assessments of policies is relatively limited.

*... but similar assessments of policies are rare*

Just as important as evaluating the environmental costs of policies is to consider the economic costs of regulatory policy. This is true for all regulations, not just environmental ones. Such analysis is becoming a normal requirement for the introduction of new policies in most countries (see Table VI.2) but is still far from universal. Such analyses naturally evaluate the economic costs in monetary terms, but often do not consider calculating the benefits of policy in the same terms.<sup>22</sup>

*Economic impacts need to be assessed too*

Environmental and regulatory impact assessments are ways of checking that particular sectoral or environmental policies do not have undesirable consequences elsewhere. Independent or parliamentary auditing departments (for example the Canadian Commissioner of the Environment and Sustainable Development), or special commissions on particular topics, are increasingly being given the task of evaluating environmental policy implementation and their reports and recommendations are frequently quite influential. More active co-ordination of policies is being tried in certain countries through, for example, sustainable development plans which may include setting policy targets in a variety of areas at the same time, in concert with each other and with public consultation. A recent Belgian example<sup>23</sup> is discussed in OECD (2001c). Whether such plans can do much more than collect a set of essentially independent policies and group them together remains to be seen.

21. In some cases this leads to ministries of environment being combined with other ministries, such as agriculture, transport or energy.

22. One exception is the United States, where Regulatory Impact Assessments (RIAs) do present analyses of both cost and benefits, although some benefits may not be quantified or, if quantified, not necessarily valued in monetary terms. A significant feature of recent US procedures is the regular report to Congress from the Office of Management and Budget, that compiles and tabulates the expected costs and benefits of recently introduced regulations, based on the RIAs. See O'Brien (2001).

23. *Secrétaire d'Etat à l'Energie et au Développement Durable (2000). Plan Fédéral de Développement durable 2000-2004*, Brussels.

Table VI.2. Environmental impact and regulatory assessment in selected OECD countries

	Environmental effects		Economic effects of environmental policies	Public domain
	of projects	of policies		
Australia: federal	Required for actions that significantly impact on matters of national environmental significance. Economic and social matters must also be considered.	No requirement.	Regulatory Impact Statements may apply	Yes
Australia: Queensland	Required, under defined procedures, for major projects. More limited EIA for others, can depend on risk and local government provisions. No CBA required.	None	Regulatory Impact Statements required for "new and revised regulations and other subordinate legislation likely to impose appreciable costs..." CBA of regulatory options	Yes, for EISs and RISs, with mandatory period for public comment.
Austria	Yes No CBA	<i>Ad hoc.</i> Some sectoral laws require it.	No (Fiscal impact only)	Yes
Belgium: Flanders	85/337/EEC implemented	Legislation for Strategic Environmental Assessments under preparation.	No (Some <i>ad hoc</i> examples)	Where 85/337/EEC applies, yes.
Canada: Alberta	Yes, with exemptions (list of exemptions includes oil wells). CBA required. Assessment often done even when EIA not formally required.	Part of normal inter-ministerial consultation	Fiscal implications only	Yes
Canada: federal	Yes, when they have important environmental effects. Can be delegated to Provinces.	Strategic Environmental Assessment required (1999 Cabinet Directive) when policy proposal may have important environmental effects. No CBA required.	Regulatory Process Management Standards recommends cost-benefit analysis regarding health, social, economic or environmental risks; CBA guide. 1999 Regulatory Process Statement requires that benefits of regulations exceed costs, and that impact on economy is minimised.	Database of EIAs in Canadian Environmental Assessment Agency. Environmental Commissioner's reports
Denmark	Obligatory for projects which may have significant environmental impact. No CBA required.	Environmental Impact Statements No CBA required. Checklist approach	Regulatory impact statements required for all bills. "The evaluation of the business economic consequences [of any bill presented to parliament] should as a minimum discuss the immediate effect of the bill on the costs for trade and industry, including administrative consequences."	Yes. Annual "Environmental Assessment of the Budget" reviews costs of environmental policy, with some evaluation of the environmental impacts of the national budget. Cost-benefit framework, but few formal analyses presented
European Union	1985 Directive 85/337/EEC, modified in 1997, requires Member states to carry out EIAs for certain kinds of project. Defines minimum standards for all EIAs. No CBA required.	85/337/EEC specifically excludes legislative action.	No EU provisions	Where 85/337/EEC applies, yes.
Finland	Obligatory for projects which may have significant environmental impact. No CBA required	Yes. No fixed procedures.	Legislative proposals are required to include "economic assessments".	Yes, for projects
Germany	EIA required for federal and Länder projects. No CBA required	Generally required for all laws and regulations. Specific procedures in some cases. No CBA required	All proposed laws must include analysis of effects on private interests. EIAs must present the economic impact of environmental measures.	Yes
Norway	Required under several laws, for major projects: 85/337/EEC implemented. No CBA required.	Assessment required by Administrative Order.	Assessment required by Administrative Order (for economic, administrative and environmental effects).	Yes, for EIAs under 85/337/EEC. Yes, with some modifications, for assessments required by Administrative Order.

Table VI.2. Environmental impact and regulatory assessment in selected OECD countries (*cont.*)

	Environmental effects		Economic effects of Environmental policies	Public domain
	of projects	of policies		
United States	Required for “policies, regulations, and public laws of the United States”, which includes private entities seeking a federal permit. Most often associated with Federal Infrastructure and permitted projects. No CBA required, but larger projects will typically include an economic impact analysis and CBA.	Environmental Impact Statements. No CBA required.	Economic Assessments (formerly Regulatory Impact Assessments) required for any “significant” regulatory measure ( <i>e.g.</i> economic impact of over \$100 million). Includes inter-agency review and CBA. (Conclusions of CBA not binding). Annual publication of costs and benefits of regulations (OMB) since 1998. New legislation is pending in Congress to make this a more permanent requirement. “Regulatory flexibility analysis” (RFA), for regulations that have a “significant economic impact on a substantial number” of small entities. Numerous provisions also in the authorising environmental legislation.	Yes

*Note:* The information in this table was compiled on an *ad hoc* basis through bilateral contacts. The coverage and accuracy of the information presented is not uniform.  
*Source:* OECD.

## Cost-benefit analysis

Cost-benefit analysis (CBA) of the environmental impacts is not generally obligatory in environmental impact assessments – it is not required in any of the countries surveyed – and rarely undertaken. Valuation problems often arise because in most cases no direct price measures are available for environmental effects, *e.g.* the emission of a ton of sulphur dioxide; they need to be estimated, and it may even be thought that no price can, or should, be attached to them (for example, when they concern mortality). For these reasons, fully quantified CBA may not always be feasible.

In spite of these problems, quantitative CBA is a more accessible tool than often thought. Where precise valuations are uncertain but upper and lower bounds are known with reasonable certainty, ranges for costs and benefits that reflect the range of uncertainty about the underlying parameters, along with sensitivity analysis, can be presented. It may be that the range of values for net benefits lies entirely to one side of zero – there is no ambiguity about whether the project or policy is beneficial, even if the exact level of benefits is uncertain. For objectives or costs which cannot be valued at all, quantitative or qualitative information available is still useful. If, for example, there is a reluctance to put a value on human lives, a figure for the cost per life saved can be useful information when comparing alternative policies to achieve certain objectives; or even when comparing policies which appear quite distinct, *e.g.* clean-air versus hazardous substances, comparing costs per life saved can suggest where incremental policy or expenditure priorities should be directed.

The fact that CBA cannot always provide complete answers does not prevent it providing useful information, therefore. Rather it will not in many cases be suitable as the sole decision criterion for governments, and it should not be a requirement for policies to be implemented that their monetised benefits exceed costs. However, a

*Valuation problems in cost-benefit analysis...*

*... do not prevent its use*

reasoned justification of why non-quantifiable or impossible-to-value benefits are sufficient to tip the balance should be required. In fact, there is an implicit cost-benefit analysis undertaken whenever a project, regulation or policy is proposed – whoever is proposing it presumes that the benefits exceed the costs. Formalising such analysis means that assumptions that may otherwise be hidden have to be made explicit and can thus be checked for their validity, or at least for consistency of use.

## A role for the courts

Other aspects of co-ordination may be more focused on policy implementation than on policy development. In some cases, and at some levels, the judicial system

Table VI.3. Legal liability and standing in selected OECD countries

	Can polluted individuals take court action against polluters?	Compliance with the law a defence?	Can NGOs take court action against polluters?	Can citizens/NGOs take action against government agencies for non-enforcement or non-implementation?	Specific legislation
Belgium <sup>a</sup>	Yes	In some cases.	Yes	Yes	There are specific liability rules in the Flemish region for damage as a consequence of e.g. groundwater extraction and soil pollution.
Denmark <sup>b</sup>	Yes. Damages only for monetary loss or compensation for actual remedial expenditures undertaken	Basic test is negligence. Compliance with law likely to be a defence.	Yes (they must have “fixed structure” and have objectives that are relevant to the case.)		Danish Society for the Conservation of Nature has statutory right to make complaints against certain administrative decisions
Finland <sup>c</sup>	Yes	No (except certain types of water pollution)	No (except for destroying or impairing nature, under the NCA)	No	Environmental Damages Act (1994). NCA: Nature Conservation Act (1996)
Ireland <sup>d</sup>	Water and air: Yes (except for discharges by local authorities) Other: No	Water and air: Yes	Yes (at least for water, air and planning)	Yes, under judicial review of actions, not clear for in action	
Norway <sup>e</sup>	Yes	Usually	No	No. Specific decisions can be contested.	
European Union				Individuals and NGOs can take action in national courts to require implementation of EU provisions if incorporated in national legislation.	
UK (England and Wales) <sup>f</sup>	Yes	Probably no	Yes	Yes, under judicial review of actions, not clear for <i>in action</i>	
United States <sup>g</sup>	Yes	No (may mitigate)	Yes (under specific citizen suits provisions in environmental laws)	Yes (where agency has statutory duty to act, and where plaintiff can show “injury”)	Administrative Procedures Act Various Executive orders

a) Belgium: Faure, M. (1999), “Environmental liability in Belgium”, in K. Dekelelaere and M. Faure eds. *Environmental law in the United Kingdom and Belgium from a comparative perspective*, Intersentia.

b) Denmark: E.M. Basse (1999), “Denmark” in “*International Encyclopedia of Environmental Law*”, Kluwer Law International, The Hague/Boston/London.

c) Finland: P. Vihervliori (1998), “Finland” in “*International Encyclopedia of Environmental Law*”, Kluwer Law International, The Hague/Boston/London.

d) Ireland: Y. Scannel (1994), “Ireland” in “*International Encyclopedia of Environmental Law*”, Kluwer Law International, The Hague/Boston/London.

e) Norway: Ministry of Environment.

f) UK: Faure, M. (1999), “Environmental liability in the UK” in K. Dekelelaere and M. Faure eds. *Environmental law in the United Kingdom and Belgium from a comparative perspective*, Intersentia.

g) US: Information provided by Professor Richard Stewart, New York University Law School.

may play an important role in the application of environmental policy, and to some extent in its formation. Table VI.3 provides a schematic comparison of the role of legal liability and the courts in some OECD countries.

In most countries it is possible for individuals or entities that have suffered material damage through pollution to take the polluter to court for compensation; in some countries parties with no material interest may also take court action, although without expecting to recover damages. This in itself may act to deter polluters, to a degree which depends in part on whether polluter liability is “strict” or whether polluters may avoid liability for pollution caused so long as they were in compliance with the law. But the extent to which courts give consistent signals is unclear; legal processes can be slow and costly, and may create uncertainty.

The judicial system may also have a role in forcing governments to fulfil their legislative commitments, which have a tendency to exceed their capacity for enforcement. Some nevertheless fear that too much reliance on the courts may lead to insufficient attention being paid by the government to policy design. In fact a significant role for the courts in overseeing implementation of legislation is largely restricted to the United States, where some environmental legislation includes provisions for just this kind of action.

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## Conclusions

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This survey of aspects of environmental policy and its links with economic policies reveals a number of common themes across countries and environmental issues. In assessing the extent to which policy instruments chosen succeed in achieving an integrated approach and in generating least-cost solutions, the paper does not assess the objectives themselves, but many of the examples in the country studies suggest that more systematic assessment of measurable costs and benefits of many targets (and careful assessment of any non-measurable benefits) would be beneficial.

Taking the themes in turn, the trend towards increasing use of economic instruments is to be encouraged; increasing the extent to which prices and costs faced by consumers and producers reflect the full costs of the products and activities concerned will be highly beneficial. In some areas environmental costs can not easily be quantified, or a command and control approach seems necessary; even in these cases, however, a focus on environmental performance rather than technical standards and, where possible, use of economic incentives is to be encouraged. As for competitiveness, it should always be emphasised that, for a given domestic environmental target, giving exemptions or other special treatment to protect the competitiveness of particular sectors can only increase overall costs – damaging *national* welfare rather than protecting it. The conditions under which special treatment is justified are rather narrow, certainly narrower than the range of contexts in which it is actually invoked. When special treatment is desired, and this applies to distributional concerns too, it is important to use measures that maintain appropriate incentives at the margin.

Special treatment for certain sectors such as agriculture or transport is often claimed to be justified on social or regional grounds, and energy policy is often focused more on the role of energy as a vital intermediate input than on the environmental consequences of its use. However, most countries have social and regional

policies that should deal with these concerns without requiring special attention to these matters in environmental or sectoral policy. Again, measures to deal with these problems need to preserve appropriate marginal incentives in environmental policy.

As far as institutional means to improve co-ordination and coherence are concerned, a variety of approaches exists, with most countries recognising that there is room for improvement in co-ordination. Procedures such as environmental impact assessments and economic or regulatory impact assessments are now widespread. It is perhaps too early to judge the impact of these and of other methods such as cross-sector sustainable development plans, public information access policies and audit office reports, for example. The effects should be positive but will be difficult to assess.

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