An OECD Framework for Effective and Efficient Environmental Policies

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AN OECD FRAMEWORK FOR EFFECTIVE AND EFFICIENT ENVIRONMENTAL POLICIES [ENV/EPOC(2008)7/FINAL]

Background

OECD countries have long advocated the strong integration of environmental and economic policies as a pragmatic contribution to "sustainable development". Broadly, sustainable development requires that an appropriate balance be struck between economic, environmental and social goals. Economic activity that is built on a degrading environment is not likely to be sustainable; nor is it likely that environmental quality will be maintained for very long in the absence of a healthy economy, or when environmental policies work against basic social objectives.

Finding the right balance among these complex and often conflicting goals is not easy, but is most likely to be achieved if an "integrated perspective" is used in the policy formulation and implementation processes. The search for better environment-economy-equity integration has therefore underlain many of the recent developments in the environmental policy sphere – certainly, it has been the focus of most OECD work on environmental policies over the years. In turn, effective and efficient policy integration implies the institutionalisation of solid procedures for setting objectives, for identifying and analysing available options, for consulting with stakeholders, and for carrying out regular *ex post* analysis of both policy objectives and instruments.

There has been considerable progress made in recent decades toward better integration of economic and environmental objectives. This progress has led to environmental policies that are increasingly efficient, as well as to economic and sectoral policies that are increasingly sensitive to underlying environmental realities. Two obvious examples are the now widespread application of environmental impact assessment procedures and the increasing use of economic-based approaches to environmental policies (*e.g.* tradable permit systems to control environmental pollutants).

However, much remains to be done, especially in the context of a rapidly-changing and globalising economy. The scope of many environmental problems is widening. Many of these problems are urgent and largely irreversible, involving significant costs of inaction. Despite many improvements in the environmental pressures imposed *per unit* of economic output, the *absolute scale* of economic activity continues to increase, placing additional pressures on the environment.

With the globalisation of economic activity, much of the focus in environmental policy is also shifting toward transboundary environmental problems, such as climate change and biodiversity loss. Not only are these problems likely to be more costly to resolve than many domestic environmental problems, it will also be difficult to reach cost-effective international agreements to resolve them.

Fortunately, the level of environmental ambition is growing in many countries. This increasing ambition is partly a reflection of the growing public understanding of the threats to society from urgent environmental challenges -- and thus, the large welfare benefits to be derived from ambitious and efficient environmental policies. It is also partly a response to the increased incomes that global consumers possess – more affluent consumers tend to demand higher levels of environmental protection.

However, increasing ambitions also amplify the need to choose most cost-effective policy solutions – otherwise, the *cost* of resolving environmental problems could increase in the years ahead. For example, air and water pollution control costs could rise, as tighter air quality controls are imposed, and as new water infrastructure investments are made. On the other hand, more integrated approaches to policy design and implementation, as well as new technological progress (in part stimulated by the new policies and instruments that are being applied) could help in limiting these costs.

As both the costs and benefits of environmental protection expand, the need for stronger integration of environmental and economic policies will therefore also expand, as will the stakes for individual consumers and producers in the society – all of whose incomes and other framework conditions will, in turn, increasingly be affected by policies aimed at protecting environmental quality.

The OECD has provided considerable leadership in the past toward strong environment-economy policy integration. There are many examples of this leadership, but three in particular can be cited here:

- The (1972) OECD Council *Recommendation on Guiding Principles Concerning International Economic Aspects of Environmental Policies* [C(72)128]. This *Recommendation* established the Polluter Pays Principle, which has since evolved in many countries into formal recognition that polluters should bear the full economic costs of any environmental degradation they create.
- The (1991) OECD Council Recommendation on the Use of Economic Instruments in Environmental Policy [C(90)177/FINAL]. This Recommendation provided detailed guidance on the application of economic instruments to environmental policy – and thus, as a vector for improved policy integration.
- When OECD Environment Ministers met in 1991, and then again in 1996, they devoted a considerable part of their discussion to how public policies could be made more environmentally effective and more economically efficient. One key result was that the principle of "policy integration" underpinned the *OECD Environmental Strategy for the First Decade of the 21st Century* that emerged in 2001. That *Strategy* emphasised the importance of integrating environmental quality and economic development objectives among OECD countries; it also focused on the need for OECD countries to strengthen their co-operation with non-OECD countries.

To help ensure that this leadership continues, and to reinforce the importance of environment-economy policy integration for both OECD and non-OECD countries, the OECD has developed this *Framework for Effective and Efficient Environmental Policies.*

The main objective of the *Framework* is to encourage policy-makers to ask appropriate questions about their environment-related policies and institutions (including the integration of environmental concerns in other policy fields), as a way of moving toward more effective and efficient (i.e. integrated) outcomes over time. The *Framework* is therefore intended as a guide to governments in their search for effective and efficient policies related to the environment, aimed at finding the right balance among environmental, economic, and social policy objectives.

The *Framework* is not a series of ready-made prescriptions; nor is it binding. It is intended only to provide a flexible tool that governments at all levels can use as a "checklist" in their pursuit of sustainable development, *inter alia* by internalising environmental externalities in the prices facing firms and households. The *Framework* can be used in various ways in different contexts. For example, it could form a key input to peer review processes. It could also be used to encourage more effective and efficient approaches to environmental problems in the design and implementation of economic and sectoral policies, or as a vehicle for promoting co-operation with non-OECD countries on environmental issues of mutual interest.

The *Framework* focuses first on the *establishment* of effective and efficient policies. It then examines opportunities related to the *implementation* of these policies (with emphasis on the various policy instruments that are available), as well as on the subsequent monitoring of progress. Links to several other policy domains, such as economic policy, trade, investment and development co-operation, are also covered at this point. And finally, it discusses a few ways of addressing concerns about the sectoral competitiveness or income distribution impacts of environmental policies.

The main concern of the *Framework* is how to address environmental externalities – regardless of whether these are related to pollution or to natural resource management. In other words, environmental externalities that occur in the extraction, use or disposal of natural resources are covered by the *Framework*, but no attempt is made here to discuss the optimal extraction and allocation of natural resources *per se*.

Some important underlying themes embedded within the *Framework* are:

- Improved environmental quality can make economic activity more productive (*e.g.* many firms operate more efficiently if the environmental resources needed for production processes are of higher quality). Good environmental quality is generally good for business.
- Environmental objectives should initially be set, and then later achieved, with economic effectiveness in mind. This efficiency criterion has two key dimensions: (i) the marginal benefits and marginal costs of achieving environmental objectives should balance reasonably well); and (ii) whatever environmental goal is set, that goal should be achieved at least possible economic cost (*i.e.* cost-effectiveness should be pursued – lower implementation costs mean that more environmental protection can be offered for a given investment; lower costs also make the economy run more efficiently);
- Economic and sectoral policies should take into account: (i) the need to internalise environmental realities into economic decisions and practices; and (ii) the need to promote technological improvements that make the achievement of environmental goals more likely in the future;
- Environmental and economic policies should be properly co-ordinated and internally coherent. This "efficient programme delivery criterion" has both national and international dimensions. For example, policies in key domestic economic sectors (*e.g.* transport, industry, energy, agriculture) or in the area of international trade and investment should not run counter to key environmental objectives. One should also – to the extent possible – seek to avoid situations in which environmental goals work against important trade, investment, or sectoral economic objectives (*e.g.* transport mobility, trade openness).
- Environmental quality and economic efficiency (and the endowment of economic resources) are only two key elements of "total welfare". Another key dimension is the "social" dimension, including equity." Most people in society will feel their own welfare depends not only on their own individual income but also on the distribution of income among citizens. Increased environmental quality and economic efficiency are therefore often necessary, but not sufficient, conditions for improved welfare.
- When considering which particular instruments should be used to meet a given environmental objective, an assessment should be made of how much each instrument (or each "instrument mix") is likely to contribute to the goals of environmental effectiveness and economic efficiency. Regular *ex post* reviews should also be made of these contributions, to ensure that the programme performance anticipated *ex ante* has indeed been realised.
- The acceptance of a given instrument by the public-at-large is strongly related to the degree of awareness of the environmental problem the instrument seeks to address.
- As the OECD expands its links with key non-OECD countries, it is becoming more important to share "good practice" experiences with these countries, in the search for low-cost policies that contribute to both environmental protection and economic development. The need for global responses to environment-economy policy problems was a key underlying theme of the World Summit on Sustainable Development (Johannesburg, 2002), and especially of the Plan of Implementation that emerged from that Summit.

SETTING ENVIRONMENTAL OBJECTIVES

Environmental policies make important contributions to social welfare (*e.g.* by protecting the natural basis of production, and by improving human health), by causing the targets of those policies to alter their decisions in ways that reflect environmental realities (*i.e.* "internalising externalities"). However, these policies can also entail significant economic costs. It is therefore important to carefully consider whether the additional benefits of environmental improvements, and the additional costs to society of achieving these improvements, balance reasonably well. This implies the need to assess, on a regular basis, the costs and benefits of objectives that are set for environmental policy. When feasible, this assessment should include monetary valuation of the changes in environmental quality in question.

- Are the anticipated marginal costs and benefits routinely examined before a new environmental objective is set, and are these costs, benefits, and objectives periodically revisited, to ensure that policy goals remain valid over time?
- Have uncertainties about key environmental parameters, as well as about links between these environmental parameters and economic values, been adequately addressed in the enunciation of identified costs and benefits?
- In conducting cost-benefit analysis of environmental objectives, is the focus placed on "environmental outcomes" (*e.g.* actual changes in air, soil, and water quality) – and on the impacts of these outcomes (*e.g.* in terms of changes in health conditions) – rather than on "outputs" or "practices"?
- Are the costs and benefits of proposed environmental policies – wherever feasible – expressed in monetary terms, to facilitate comparisons of available options?
- Is a life-cycle perspective used in the estimation of the marginal costs and benefits of proposed environmental policies?
- Are independent analysts involved in the preparation or review of cost-benefit analyses?
- Is the public sufficiently involved in providing information that leads to the setting of environmental objectives, and do they have access to sufficient information about the environmental problem at hand, its causes, and its impacts (both short- and long-term)?

Annotations

The setting of environmental targets is a difficult, but necessary, art. Non-linearities in the nature of environmental problems themselves (*e.g.* the risk of irreversibility and even environmental catastrophe), as well as uncertainty about the linkages between ecosystems and the economic values placed by producers and consumers on potential changes in environmental quality, will make very complex any systematic effort to compare the costs and benefits of proposed policies. The economic value of an environmental improvement (or damage) can be difficult to capture, especially when that value cannot be derived from direct use of environmental resources. Nevertheless, a comparison between costs and benefits still needs to be done, as one important input to decision-making, even when the environmental outcomes of policy action/inaction are uncertain.

Consistent with the scientific and technical understanding of the risks, where there are threats of serious damage to the environment, it is not appropriate to use the lack of full scientific certainty as a reason for postponing cost-effective measures to prevent or minimise this damage. This is sometimes referred to as a "precautionary approach".

In the long-term, governments should also increase their efforts to better understand the two-way linkages between human activities and the environment – basic research and firmer knowledge on these linkages is a crucial part of reducing future uncertainties, and of setting appropriate public environmental objectives.

If the marginal benefits to society of additional environmental improvements are expected to exceed the related marginal costs, economic analysis suggests that the improvements ought to be pursued. On the other hand, if the marginal costs to society outweigh the related marginal benefits – even if the most efficient policy instruments are applied in order to reach the objectives – the economic analysis again indicates that some reconsideration of the policy objective would be appropriate.

The marginal costs and benefits of proposed environmental policy objectives should also be assessed on both an *ex ante* and an *ex post* basis. Likewise, the costs of policy inaction should also regularly be assessed. In conducting these benefit-cost assessments, the focus should be on final environmental "outcomes" (*e.g.* expected or actual improvements in air or water quality, changes in biodiversity) and on the impacts of these outcomes (*e.g.* in terms of changes in health conditions) – rather than on intermediate "outputs" (*e.g.* the number of persons being given a particular subsidy that is aimed at promoting environmentally friendly behaviour). However, changes in environmental outcomes stemming from a given policy will sometimes only materialise after a considerable delay, suggesting that the information requirements facing decision-makers can change materially over time, and will need to be periodically "recalibrated". The impacts of policy will often also be difficult to "disentangle" from other factors that influence environmental conditions (*e.g.* weather). In such situations, it is sometimes only feasible to use the take-up of certain "environmentally friendly practices" as indicators of the environmental impacts of the policy – recognising that these are imperfect substitutes for a focus on environmental outcomes.

Economic values should also – to the extent possible – be placed on environmental outcomes that are measured in physical terms. The idea is to quantify how much the public-at-large value changes in environmental quality. This quantification can facilitate analysis and policy-making in situations where some environmental impacts pull in opposite directions; it can also make it possible to compare the (private) costs and (public) benefits of a given environmental policy. In addition, the analysis should include qualitative descriptions and discussions of outcomes that cannot be quantified or monetised.

When evaluating any policy which might result in an environmental asset being destroyed or degraded, it is the "total economic value" of the lost asset that is of most relevance for the analysis. This includes both "use" and "non-use" values of that asset. "Use" value refers to the direct benefits of actually using an environmental asset (e.g. water withdrawn for irrigation; plants with medicinal value; and visits to a natural park). It also includes planned and possible future benefits of using the resource. "Non-use" values refer to environmental assets that people will not actually use themselves at any point, but may want to preserve for others, for future generations, or simply because they attach a value to their very existence.

Putting a monetary value on environmental assets is challenging, not least because the associated benefits frequently do not have a market value; they are also often not "tangible" assets. It is particularly difficult in situations when irreversibility and possible disastrous outcomes enter the equation, and when the environment's carrying capacities are being – or are close to being – overrun. In practice, most environmental objectives will have to be set without full knowledge of the benefits and costs involved. This is not an argument against trying to make as good an assessment as one can, but it makes it particularly important to take into account those cost and benefit elements that cannot be expressed in monetary terms.

Sometimes, market information (and behaviour related to traded goods) can be used to reveal preferences in the population-at-large regarding the values given to non-market goods. In this manner, the value associated with a particular intangible asset can be embedded in the prices for marketed assets, and these values can be used to "unbundle" the values attached to different characteristics of the asset. For example, a house next to a busy street which is exposed to high noise levels would lose part of its value, compared to similar houses further from the highway. This difference can be used to help determine the "cost of noise".

Box 1. Values for noise avoidance in the UK

Day, Batman and Lake (2007) used a large dataset on the housing market in Birmingham, supplemented by measures of noise exposure from road, rail and aircraft traffic, to investigate the publics' "demand" for "peace and quiet". They found mean values for road noise ranging from £31.49 per annum and per household for a 1 dB reduction from a 56 dB baseline, to £91.15 per annum for the same change from an 81 dB baseline. The equivalent values for rail noise were found to be higher, ranging from £83.61 to £139.65 per annum.

Source: Day, Batman and Lake (2007), "Beyond Implicit Prices: Recovering Theoretically Consistent and Transferable Values for Noise Avoidance from a Hedonic Property Price Model", *Environment and Resource Economics*, 37:211–232.

"Travel cost" methods can also be used to determine how much time and money people are willing to spend to gain access to a particular environmental asset, such as a protected wildlife area. "Avoidance behaviour" and "defensive expenditure" methods can also assess how much time and money people are willing to spend to avoid negative intangible impacts. "Cost-of-illness" methods can be used to measure the impacts on human health of air or water pollution. The value of increased medical costs in treating associated illnesses, plus lost wages and profits (because people are unfit to work), are both included using this latter approach. However, this approach does *not* capture losses associated with illnesses of people who do not work.

Box 2. Willingness to pay for contaminated site clean-up in Italy

Alberini *et al.* (2006) used a stated-preference approach to elicit the tradeoffs that people make between income and risk reductions in a hazardous waste site context. They showed people pairs of hypothetical public programmes described by five attributes: the annual risk reduction afforded by the programme; the size of the population living in the area with the contaminated sites that would be addressed by the programme; how soon such risk reductions would be observed; the number of years over which the risk reduction would be observed; and the cost to the taxpayer. They then asked the respondents to indicate (i) which of the two hypothetical programmes they would prefer, and (ii) which they would prefer, programme A, programme B, or neither.

The study found that people *are* willing to pay for permanence, but are not willing to pay just *any* price. They estimated a "value of a statistical life" (VSL) for an immediate risk reduction over the current year to be about €5.6 million. The VSL did not vary significantly with the size of the population that would be affected by the policy. However, the VSL was lower if the risk reduction was expected to occur in the future. For a risk reduction occurring exactly 20 years from now, for example, they estimated their respondents' VSL to be only €1.27 million.

Source: Alberini, A. *et al.* (2006), "Paying for Permanence: Public Preferences for Contaminated Site Cleanup", Nota di Lavoro 113, Fondazione Eni Enrico Mattei, Milan.

It is not always possible to identify a particular market for a good which is associated in some way with the environmental asset which needs to be valued. In these cases, there are no prices which can be used to reveal values that are to be attached to the asset. However, a hypothetical market can still be created, in which people are asked to "state" how much they would be willing to pay to preserve an environmental asset ("stated preference methods").

Ideally, monetary evaluations should also be specific to particular locations. If this is not feasible (perhaps because it is considered too costly to undertake a separate study for each site), it may be possible to apply valuations made in other contexts (*i.e.* using "benefits-transfer" or "value-transfer" techniques).

The setting of environmental policy objectives should ideally be done simultaneously with the setting of objectives in *all* policy areas of relevance – economic policy, social policy, employment policy, education policy, etc. Although it is clearly impossible to fully achieve this goal, it can at least be promoted by favouring governance structures that emphasise co-ordinated decision-making (*e.g.* the *systematic* review of major policy decisions by inter-Ministerial working parties).

Costs and benefits borne today have a higher value than those borne in the future, both because people usually value consumption today more highly than consumption tomorrow (pure time preference), and because capital available today can be put to productive use, whereas capital not available until tomorrow cannot. Hence, the future streams of both the costs and the benefits of proposed environmental policies should be discounted. For projects and policies with a marginal influence on the economy, the discount rate that should be used is the "social rate of time preference". For projects and policies with a substantial influence on the economy, and/or with large and potentially irreversible environmental impacts, the choice of discount rate is not straightforward. For environmental issues with impacts in the very long term, discount rates that decline over time are sometimes used (to reflect uncertainty in future economic conditions). Only a small minority of OECD Member country governments have, however, adopted this approach in their policy evaluation guidelines.

Box 3. Costs and benefits of the Clean Air Interstate Rule in the US

US EPA has estimated that the *Clean Air Interstate Rule*, which will significantly reduce emissions of SO_2 and NO_x in the US, will result in annual *net* benefits of $71.4 or $60.4 in 2010 and $98.5 or $83.2 billion in 2015. The lower estimates reflect a discount rate of 7% and the higher estimates a discount rate of 3%.The (gross) benefits were primarily due to fewer fatalities, non-fatal heart attacks, cases of chronic bronchitis and asthma due to reductions in particulate matter and ozone. In addition, there were non-quantified ecological and visibility benefits. The (gross) costs were related to the installation of control technology in the electric power sector.

Source: US EPA (2005), *Regulatory Impact Analysis for the Final Clean Air Interstate Rule*, US EPA, Washington DC.

The distributional impacts of environmental policy interventions (*e.g.* across income groups, age groups, ethnic groups or regions) should also be considered. The most common way of including distributional effects is to describe them separately from the cost-benefit analysis, without explicitly weighing costs and benefits affecting different individuals.

When thinking about these costs and benefits, consideration should be given to all significant upstream and downstream impacts when setting future environmental objectives (*e.g.* the environmental impacts of extracting raw materials; of producing goods and services; or of disposing of wastes that will be generated) When addressing these upstream and downstream impacts, policies which directly address environmental impacts at the point in the life-cycle where they occur will usually prove to be the most efficient and effective.

In general, agreement on environmental objectives will be more likely if there is a common understanding of the problem at hand, its causes, and its impacts (over both the short- and long-terms), underpinned by correct information.

Governments should also obtain relevant information from stakeholders for the establishment of environmental objectives. This promotes both transparency and accountability. Another way of promoting robust analysis, as well as helping to build confidence in the results, is to involve independent experts in the preparation or review of cost-benefit analyses.

LINKS TO ECONOMIC POLICIES

Policies that affect the environment are typically "cross-cutting" – several governmental organisations are responsible for different parts of the environmental problem. Policy design and implementation therefore need to be well integrated with key economic and sectoral policies – both vertically (international, national, sub-national) and horizontally (inter-sectorally). In other words, environmental goals should be reflected in sectoral and economic policies, and vice versa.

- Are key domestic economic and sectoral policies (especially in the transport, energy, agriculture, trade, investment, and development assistance domains) subjected to a systematic review of their potential environmental consequences (both harmful and beneficial)?
- Are proposed international trade (including export credits) arrangements screened for their environmental impacts; where these impacts are expected to be significant, is a more detailed environmental impact assessment then carried out?
- Are opportunities for improved co-ordination between environmental, sectoral and economic policies periodically explored, at both the national and sub-national levels?
- Has an assessment been made recently of existing economic subsidies, to determine if their removal or reform is likely to result in environmental improvements, and to provide a ranking of these subsidies in terms of their environmental harmfulness?
- Is it clear that environmental cross-compliance programmes are leading to real environmental improvements, and in the most efficient manner possible?
- Are the beneficiaries of environmentally damaging economic subsidies, and the circumstances under which these subsidies are provided, both transparent to the general public?
- Have transitional (and time-limited) compensation measures been developed, to support the process of reforming environmentally damaging economic subsidies?

Annotations

Economic and sectoral policies play a key role in the protection of environmental quality. Decisions made in particular by the Ministries of Transport, Energy, Industry, Agriculture, Fisheries, Tourism, Trade, Investment and Development are vital parts of the eventual environmental effectiveness and economic efficiency of public policy. Environmental policies have an important role to play in the overall mix of policies, but sectoral and economic policies often play the most important role. Appropriate co-ordination and coherence therefore needs to be embodied within this policy mix – both domestically and internationally.

This co-ordination is most likely to be effective when due account is taken of environmental objectives in the initial establishment of objectives in non-environmental policy areas. This implies that sectoral decision-makers should systematically undertake both *ex ante* and *ex post* assessments of the environmental impacts of their activities. This can usually best be achieved through the use of evaluation tools, especially environmental impact assessments, regulatory impact assessments and cost-benefit analysis.

Box 4. The Kiev Protocol on Strategic Environmental Assessment

The Kiev (SEA) Protocol to the UNECE Convention on Environmental Impact Assessment in a Transboundary Context, once in force, will require its Parties to evaluate the environmental consequences of their official draft plans and programmes. Strategic environmental assessment (SEA) is undertaken early in the decision-making process, and can be a key tool for sustainable development. The Protocol provides for extensive public participation in government decision-making in numerous development sectors.

Source: UN ECE, www.unece.org/env/eia/sea_protocol.htm.

Sub-national activities are also important parts of the effective and efficient delivery of environmentally related policies. Local public services, such as town planning, local transport, waste management and water supply, are directly relevant for the achievement of environmental goals. Sub-national authorities therefore need to be active participants in the setting of environmental objectives, and in the choice of instruments designed to meet those goals. Decentralisation of environmental polices is most likely to contribute to improved environmental policies if a clear definition of the respective responsibilities of the authorities at different administrative levels and well-functioning co-ordination mechanisms are in place.

Box 5. Co-operation between Environment Ministers in Canada

To address co-ordination issues related to the different authority given to federal, provincial and territorial governments by the Canadian Constitution, the Canadian Council of Ministers of the Environment (CCME) has been established. Fourteen Ministers normally meet at least once a year to discuss national environmental priorities and determine work to be carried out under the auspices of CCME. The Council seeks to achieve positive environmental results, focusing on issues that are national in scope and that require collective attention by various governments.

Source: www.ec.gc.ca/cegg-rcge/English/ccme/default.cfm.

International trade and capital flows contribute to long-term economic growth, while also providing a foundation for achieving both domestic and international environmental goals. It is therefore important that trade, investment, and environmental policies mutually support each other. This implies *inter alia* the need to reform domestic policies that may be both environmentally-damaging, economically inefficient, and trade-distorting. It also suggests that decision-makers need to fully understand the environmental implications of key trade and investment policy initiatives (*e.g.* trade liberalisation agreements) and apply appropriate measures (be they trade or non-trade related) to prevent or mitigate adverse impacts. Policies to encourage the wider use of environmental codes-of-conduct within the private sector; to increase market access for developing countries in ways that also promote global environmental improvements; and to increase the capacity of developing countries to improve their domestic environments in ways that reflect their own priorities, may also be appropriate in particular circumstances.

Subsidies for various economic purposes are pervasive, both in OECD countries and world-wide. Every year, OECD countries transfer at least USD 400 billion to different economic sectors. Many subsidies distort prices and resource allocation decisions, altering the pattern of production and consumption within the domestic economy and across countries. As a result, subsidies can have unforeseen negative effects on the environment. For example, fuel tax rebates and subsidised energy prices stimulate the use of fossil fuels and greenhouse gas emissions; subsidies for road transport increase congestion and pollution; agricultural subsidies can lead to overuse of pesticides and fertilisers; and subsidies in fisheries can lead to the overexploitation of fish stocks.

Box 6. OECD Council Recommendation on Common Approaches on the Environment and Officially Supported Export Credits

In June 2007, the OECD Council agreed to a Recommendation that Members, before taking decisions on officially supported export credits, apply a set of common approaches for addressing environmental issues relating to exports of capital goods and services and the locations to which these are destined. A general objective of the Recommendation is to promote coherence between policies regarding officially supported export credits and policies for the protection of the environment, including relevant international agreements and conventions, thereby contributing to sustainable development.

Source: http://webdomino1.oecd.org/horizontal/oecdacts.nsf/Display/44D02F8C5835E61DC125730D003588F2?OpenDocument.

Regular efforts should therefore be made to identify those subsidies whose removal (or reform) would benefit the environment. A quick scan of these subsidies would likely be sufficient to understand the main effects that subsidy reform would have on the decisions of consumers and producers, as well as the key linkages between those decisions and the environment. This would also provide an initial ranking of subsidies in terms of their environmental harmfulness.

Using one economic support programme to offset the negative environmental effects of another is also likely to be both ineffective and inefficient. In most case, reforming both of these programmes will be a better solution. For example, high levels of production-linked price support have traditionally been provided to the agriculture sector. This has encouraged overuse of chemical inputs, as well as expansion of farming onto land that is of relatively low value economically – but often of high value environmentally. In turn, this has led to efforts to address these negative environmental impacts via programmes that are conditional on meeting certain environmental standards (cross-compliance). It will generally prove to be more efficient and effective to reform the original subsidy than to retain (and try to correct) the environmental problems it creates through cross-compliance requirements.

A major factor that can promote the reform of environmentally harmful subsidies is increased transparency. It should therefore be made clear to the public-at-large who is benefiting from existing subsidy programmes, and the conditions under which these subsidies are being provided.

Box 7. Transparency regarding recipients of farm subsidies in EU member states

Many member States of the European Union have recently started to publish information on who receives what amounts of subsidies under the Common Agricultural Policy (CAP). This has revealed that a significant share of the subsidies goes to a limited number of farmers – which in turn has strengthened demands for environment-related reform of the CAP.

Source: OECD (2005), *Agricultural Policies in OECD Countries: Monitoring and Evaluation 2005*, OECD, Paris

Decoupling economic subsidies from the use of environmental inputs, as well as from production and consumption activities that harm the environment, can yield important environmental benefits. This approach is also fundamentally more coherent than one which promotes economic goals in isolation of environmental considerations.

Transitional measures are likely to be required in the process of reforming existing subsidies – mainly because the beneficiaries of these programmes will likely be unwilling to accept the reforms unless some form of short-term compensation is also provided. However, transitional measures that promote their entrenchment in the longer-term expectations of those who benefit, should be avoided.

DIRECT ENVIRONMENTAL REGULATION

Direct regulatory instruments (*e.g.* laws or regulations stipulating environmental quality standards or limits on emissions from various pollutions) represent a major proportion of all instruments currently being used for environmental policy in OECD countries, and they will continue to play a key role in the future. While the environmental effectiveness of direct regulatory approaches is often very good, the main challenge is to avoid undue inflexibilities in these regulations that might limit their environmental effectiveness and/or economic efficiency.

- Do existing regulations provide an appropriate level of flexibility to polluters, to encourage them to identify and adopt low-cost abatement options?
- Do existing environmental regulations, as much as possible, focus on achieving an environmental outcome, rather than specifying the technologies to be used to reach that outcome?
- Is it clear that any preferential treatment that is given to a subset of regulated pollution sources does not undermine the environmental integrity of the regulation (*e.g.* does not encourage strategic behaviour aimed at avoiding the application of the regulation)?
- Are any preferences given to pre-existing pollution sources time-limited (to avoid prolonging their useful economic life beyond what would have been the case in the absence of the regulation)?
- Has it been considered whether it could be possible – and beneficial – to replace some existing (or new) direct regulatory instruments by market-based instruments (environmentally related taxes or emission trading systems)?

Annotations

Direct regulatory instruments include laws or regulations stipulating environmental quality standards or limits on emissions from various pollutions, bans on certain products or practices, requirements for the application of certain “best available” techniques, obligations for all polluters to obtain environmental permits from pollution control authorities, etc.

Box 8. Optimising Regulatory Instruments: Better Regulation Initiatives

Many OECD countries have launched major initiatives aimed at changing their regulatory culture in such a way as to achieve the same or better results (including environmental results), more efficiently. The “Better Regulation” initiative is a centrepiece of the European Commission’s “Partnership for Growth and Jobs” (also known as the renewed Lisbon Strategy), launched in 2005. Its key objective is to ensure that the regulatory environment is simple and of high quality, since the regulatory framework in which businesses operate is a key factor of their competitiveness, growth, and employment performance.

Many national governments also actively promote improved environmental regulation as part of larger-scale regulatory reforms. In the UK, for example, the principal directions of reform designed to achieve a 25% reduction of the administrative burden on the regulated community are:

- Compulsory use of comprehensive impact assessment in the development of regulations;
- Simplification of the regulatory framework to make it clear, up-to-date and user-friendly (particularly by streamlining the permitting regimes); and
- Making risk assessment the basis of all compliance assurance programmes.

As part of the simplification initiative in the Netherlands, the Environment Ministry, in close co-operation with industry groups and local authorities, is integrating 25 different permitting systems into one system, starting in 2008. Simultaneously, the Government plans to reduce the number of enterprises that are required to have (individual) environmental permits from 100,000 to 40,000, by expanding the use of ”generic” rules, that are binding for all firms.

Source: http://ec.europa.eu/growthandjobs/index_en.htm.

For environmental authorities, regulatory instruments are flexible – *inter alia* in the sense that they can be used to address a broad spectrum of environmental problems. They may also provide a relatively high degree of certainty about the environmental outcome – although this is not guaranteed. For example, although a particular product may be banned from the market, it is not always clear what product(s) will replace the banned item.

Box 9. CFCs and HCFCs

The ban on Chlorofluorocarbons (CFCs) to protect the ozone layer that was established through the Montreal Protocol triggered the development and use of hydrochlorofluorocarbons (HCFCs) – which turned out to be potent greenhouse gases. Consequently, many countries have later put in place instruments to phase-out use of the latter.

Source: http://ozone.unep.org/.

There are, however, a number of potential problems associated with regulatory instruments, from the perspective of economic efficiency. First, designing regulations places very significant information demands on public authorities – and some of the most relevant information is often only available from those who cause the environmental problem in the first place.

Second, even if the same emission standards are applied to all polluters, these standards will not normally provide the same incentive at the margin for all polluters to abate emissions. From the point of view of the polluters, regulations can also be rather *inflexible* – because they sometimes impose a specific way of abating emissions. If regulations are excessively inflexible, a given environmental objective will not usually be reached at the lowest possible cost.

Third, whereas an environmentally related tax would provide a relatively high degree of certainty as regards the marginal compliance cost faced by polluters, a regulatory instrument does not provide similar certainty – even though careful *ex ante* assessments of expected impacts can also sometimes provide indications about the marginal compliance costs of regulatory instruments.

Fourth, both taxes and tradable permits give polluters a *continuing* incentive to reduce their emissions through innovation, and therefore to develop new abatement technologies. Regulatory instruments provide incentives to innovate (in order to reduce compliance costs) up to the point where polluters are in compliance, but they do not give any incentive to go *further* than this level. This disadvantage can to some extent be addressed by a gradual tightening of the regulations – but the cost of complying with the stricter requirements will again be unknown at the outset.

The cost-effectiveness of regulatory instruments broadly varies with the degree of *flexibility* they leave to polluters in responding to the regulatory requirements. Governments are therefore increasingly moving toward improving the effectiveness and efficiency of regulation-making, especially by emphasising the importance of performance measurement and evaluation.

Box 10. A flexible regulatory approach in Canada

The *Canadian Environmental Protection Act* provides the Minister of the Environment with the authority to establish environmental objectives, and timelines for achieving those objectives, while requiring polluters to produce plans for how they will achieve the objectives – and to implement those plans. Pollution Prevention Planning is a regulatory approach which does not prescribe how objectives are to be met, but instead recognises that the polluter is best placed to choose the most efficient means for achieving the environmental objective within the prescribed timeline. Regular reporting required under the Act allows the regulatory agency to track progress and to take prescriptive action, if necessary.

Source: www.ec.gc.ca/CEPARegistry/plans/P2/

A regulation which specifies that a certain technology has to be used leaves the polluter with very little choice, and can therefore trigger higher costs for abatement than necessary. Such an approach would also discourage innovation in potentially cost-saving alternative technologies – mainly because it would be unclear if the polluters would be allowed to use the new technologies. An emission standard which varies according to the type of fuel that is used could also eliminate incentives for polluters to switch to fuels that cause less pollution. Conversely, a regulation that focuses on the environmental outcome (*e.g.* emissions per unit or ambient quality standards) would provide more flexibility for polluters to find low-cost abatement options.

Therefore, new regulatory instruments should provide as much flexibility as possible for polluters to find low-cost abatement options. They should also not usually specify which technologies are to be used to reach a certain environmental target. Regular consideration should also be given to whether existing regulations unnecessarily limit polluters' flexibility to apply existing cost-saving abatement options – or to develop new ones.

Many direct regulations differentiate between subsets of regulated sources. For instance, some regulations include more lenient provisions for small polluters than for large ones. (On the other hand, larger emission-sources often have better possibilities to influence policy-formulation than small sources do, which can have an impact on the way regulations are eventually designed.) For example, limits on dioxin emissions from waste incinerators beyond a certain capacity are sometimes stricter than for incinerators with a lower capacity. Whereas special provisions for small sources can sometimes be appropriate (perhaps because small firms can have a lower capacity to finance expensive abatement or monitoring equipment), it is important to make sure that this kind of provision does not undermine the environmental integrity of the original regulation (*e.g.* by encouraging the establishment of a significant number of new pollution sources with a size just below the chosen limit, simply to avoid the application of the regulation). Small firms – when considered together – may also represent a large source of pollution. The basic question will therefore remain: can emissions be cost-effectively reduced in these firms?

When new regulations are introduced, stricter provisions are often applied for new pollution sources than for pre-existing ones. Although it can be economically efficient to give existing sources some time to adjust, special treatment of sometimes heavily-polluting existing sources can prolong their economic life *beyond* what would have been the case in the absence of the regulation – because of the additional burden the regulation places on new sources. Hence, any preferences given to pre-existing pollution sources should usually be time-limited.

Even with the most flexible forms of regulatory instruments different polluters will normally face very different costs of reducing emissions by an additional unit. Explicit consideration should therefore be given to the possibility that the regulatory approach could be partially replaced by market-based instruments (environmentally related taxes or by emission trading systems).

ENVIRONMENTALLY RELATED TAXES

Many environmental objectives could be met in a more cost-effective manner by using market-based instruments, such as environmentally related taxes. These taxes provide incentives for polluters and resource users to change their behaviour today. They also provide long-term incentives to innovate for a more environmentally friendly future tomorrow. Although environmentally related taxes are not strongly supported by the public in all contexts, there are various ways in which this support can be increased over time (*e.g.* through measures to limit negative impacts on the competitiveness of certain sectors and/or on income distribution).

- Has the option of using environmentally related taxes – either in terms of new taxes on polluting or resource-using activities, or in terms of gradually aligning existing tax rates with negative environmental impacts – been fully assessed?
- Have opportunities to scale back exemptions and other special provisions in existing environmentally related taxes been reviewed?
- Is using an environmentally related tax the most cost-effective way to proceed, taking account of not just the environmental impact, but also the consequences for wider economic and social objectives?
- Have alternatives to "earmarking" tax revenues for environmental or other purposes been fully considered – to limit inefficient spending that would otherwise not be financed from general tax revenues?
- Has consideration been given to the extent to which the use of a tax would suffice to address any local "hot spots" of pollution? Are there local standards in place to guard against these negative local effects?
- If special measures to address either sectoral competitiveness or social concerns are deemed to be politically necessary before an environmentally related tax can be introduced, have all reasonable attempts been made to ensure that clear incentives are still provided at the margin for polluters/resource users to reduce their emissions or resource use rates?
- Have opportunities been explored to address concerns about the fairness of environmental taxes via non-environmental policy instruments (*e.g.* the social security system or the income tax system) – rather than by modifying the environmentally related tax itself?
- Are existing taxes periodically reviewed, to ensure that they continue to provide as effective and efficient a solution as originally intended?

Annotations

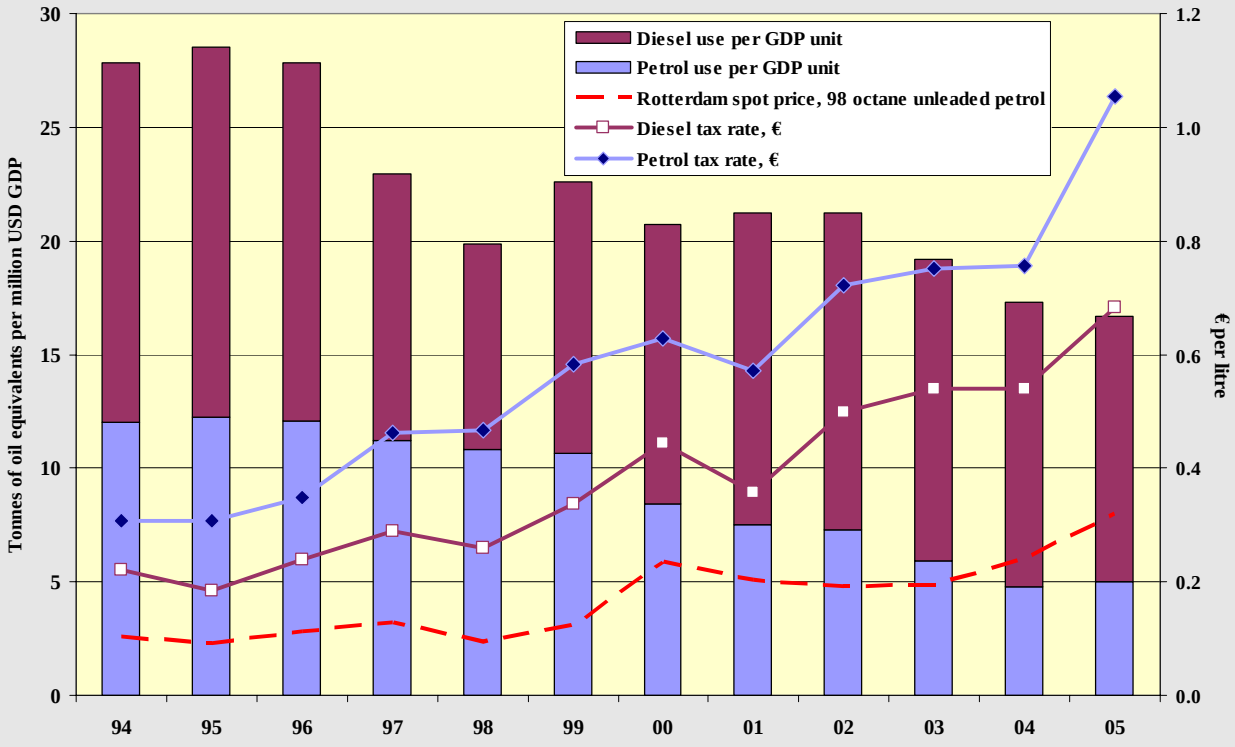
Environmentally related taxes are increasingly being used in OECD countries, and there is good evidence of their environmental effectiveness in many cases. In the short term, these taxes can reduce the production and consumption of products whose manufacture and/or consumption harms the environment. In the longer term, they encourage the development of new production methods and new products that meet consumer demand, even while reducing damage to the environment.

An advantage of taxes, compared to regulatory instruments, is that the former are often less demanding in terms of the information that public authorities need to have at their disposal, in order to be environmentally effective and economically efficient. On the other hand, the relative newness of environmentally related taxes means that, in practice, it will still be necessary to gather a significant amount of information about the expected impacts of these instruments, before an agreement on using taxes can be reached.

There is a high potential for greater use of environmentally related taxes, both in terms of new taxes that could be applied to environmentally harmful goods and services, and in terms of increases in existing tax rates, where these taxes already exist – in order to better reflect the environmental externalities of relevance. However, these taxes need to be well-designed and their potential impacts on international competitiveness and income distribution need to be fully addressed, if these benefits are to be realised. This is because taxes are relatively blunt instruments and can – if not used correctly – have negative consequences for the achievement of more specific policy objectives.

Box 11. Increased motor fuel taxes in Turkey

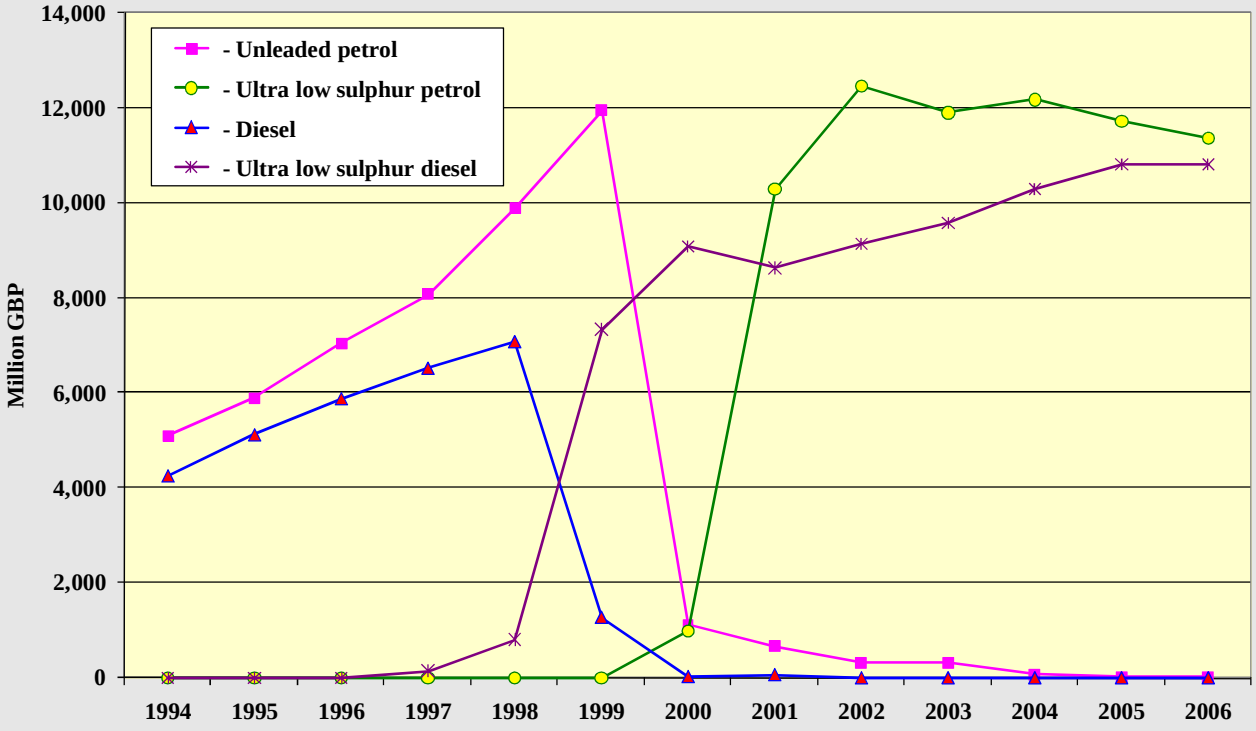
Tax rates on petrol and diesel have increased strongly in Turkey since the late 1990. This has led to a rapid decrease in the use of these fuels per unit of GDP. Given that many low-income households in Turkey do not own cars at all, this reform has also generated progressive impacts on overall income distribution (*i.e.* richer households pay more in tax than poorer households do).



Source: Based on (i) OECD (2006), *The Political Economy of Environmentally Related Taxes*, OECD, Paris, and (ii) IEA data.

Box 12. Differentiation of tax rates according to the sulphur content of fuels

Several OECD countries (Australia, Austria, Belgium, Denmark, Finland, Germany, Hungary, Ireland, the Netherlands, Norway, Poland, Sweden, Turkey and the UK) have introduced a differentiation in their motor fuel tax rates according to the sulphur content of the fuels. This has given oil companies a strong incentive to develop fuel varieties with low sulphur content, and the high-sulphur varieties have rapidly disappeared from the market. The graphic below illustrates the market shares for various fuel varieties in the UK, as evidenced by the amount of tax revenue raised from each. The use of low-sulphur fuels has also, indirectly, allowed better control- technologies for NO_x emissions to be installed in cars.



Source: OECD/EEA database on instruments used for environmental policy, www.oecd.org/env/policies/database .

To enhance the environmental effectiveness and economic efficiency of environmentally related taxes, a key first consideration is the possibility of scaling back the exemptions and other special provisions already contained in existing environmentally related taxes, and to better align the tax-bases (*i.e.* the "object" that is being taxed) and the tax rates with the actual magnitude of the negative environmental impacts that need to be addressed.

The revenues from environmentally related taxes can be used to strengthen the budget balance; to finance increased spending; or to reduce other, distortionary, taxes – taking into account the specific circumstances involved in each situation. For example, several OECD countries have combined the introduction of environmentally related taxes with a reduction in the tax burden on labour (by cutting social security contributions). This approach can reduce the efficiency losses that are induced by tax collection – provided that the taxes to be reduced are more distorting than the (new) environmentally related taxes.

There are sometimes calls for environmentally related tax revenues to be "earmarked" to specific spending purposes – in some cases, to increase environmental spending. However, earmarking also raises a few problems. For example, it could actually violate the *Polluter-Pays Principle*, if the money is used to cover the additional cost faced by polluters for meeting environmental requirements. Earmarking also fixes the use of the tax revenues, which may create an institutional obstacle for later re-evaluation and

modification of tax and spending programs. More generally, earmarking tax revenues for specific uses does not guarantee “value for money”; it also removes this revenue stream from other spending opportunities. As such, it can place unnecessary restrictions on the management of public finances. Indeed, if the increasing use of environmental taxes results in pressure to cut taxes elsewhere (and if environmental tax revenues are being earmarked for environmental purposes), earmarking can threaten the ability to fund existing non-environmental projects. It is therefore usually preferable to avoid earmarking tax revenues Where earmarking *is* used, its ongoing efficacy should be periodically reviewed, in order to avoid inefficient spending that would otherwise not be financed from general tax revenues.

Environmentally related taxes are well suited to addressing problems such as reducing the *total* amount of a given type of emission (or the use of a given polluting product) within the geographical area in which the tax is applied. However, taxes are less well-suited to addressing (on their own) problems where the environmental harm varies with the location of emissions (*e.g.* local “hot spots” of pollution), and with situations where it matters *when*, *how* or *where* a certain polluting product is being used. In such cases, an environmentally related tax might need to be combined with additional instruments, such as standards on ambient environmental quality in different areas, regulations specifying conditions for the use of polluting products, etc.

Environmentally related taxes *can* entail relatively low administrative costs. For example, taxes on petroleum products are levied on a limited number of petroleum refineries and depots, and are therefore relatively simple to administer and enforce. On the other hand, many taxes involve various special provisions that can significantly increase administrative costs. Such mechanisms are often introduced for non-environmental reasons (*e.g.* to address competitiveness or income distribution concerns). Overall, there seems to be a trade-off between the magnitude of administrative costs, on the one hand, and measures to create a “fair” tax on the other (*e.g.* in terms of the impact on low-income households or some sectors of the economy). It will often prove to be more efficient and effective to promote fairness by using non-environmental policy instruments (*e.g.* the social security system or the income tax system), rather than by amending the conditions of the original environmentally related tax.

Closely linked to the use of environmentally related taxes are prices, fees, and charges for various environmentally related services (*e.g.* waste collection, water supply, waste water treatment, energy supply) As is the case for taxes, the prices facing firms and households for these services should reflect the *full marginal social costs* of providing them. In the household waste area, for example, it may be advisable to combine collection charges that vary with the amount of mixed waste being collected with programmes involving free collection of certain recyclable or particularly hazardous products – coupled with “flanking measures” to address the risk of illegal dumping of wastes.

It is also important to periodically review the actual performance of environmentally related taxes, in order to determine if further improvements could be made in their environmental effectiveness or economic efficiency.

TRADABLE PERMITS

Tradable permit systems provide similar flexibility as taxes do for polluters/resource users to choose the method by which they will achieve a given environmental goal. By establishing "caps" or promoting direct investment in environmentally beneficial outcomes, they also emphasise the achievement of environmental goals. Their use in OECD countries has therefore grown significantly in recent years. Nevertheless, there are several issues that need to be considered when using this approach, in order to increase the environmental effectiveness and economic efficiency of permit trading (*e.g.* the choice between a "cap-and-trade" system and a "baseline-and-credit" system; the initial allocation of emission allowances; and ways of limiting the transaction costs associated with the trading system).

- Has the option of using permit trading systems – applied either to pollution control or resource management objectives – been fully assessed?
- Has the possibility of phasing in an emissions cap been considered, using gradual reductions in the total number of permits available – in order to give firms and households a degree of certainty for the long-term, as well as time to adjust?
- Has the option of auctioning the permits to polluters/resource users covered by the system been considered, rather than distributing them for free?
- Where a baseline-and-credit approach is being used, has the "baseline" been defined in a sufficiently stringent and transparent manner?
- Has sufficient attention been given to the administrative costs (including monitoring and enforcement costs) and transaction costs of the system (including the costs of finding a buyer or seller of permits)?
- Do the rules governing administration of the permit system seek to avoid the need for pre-approval of trades, and do they allow for banking and borrowing of permits?
- Has it been considered to what extent the use of a permit trading system would suffice to address any local "hot spots" of pollution? Are there adequate local standards in place to guard against possible negative local effects?
- Has the problem of market power been considered in the design of the permit trading system, and has the option of broadening the sectoral coverage of the system been reviewed?
- Are existing tradable permits systems periodically reviewed, to ensure that they continue to provide as effective and efficient a solution as originally intended?

Annotations

Like taxes, tradable permits provide a flexible, market-based, approach to the achievement of environmental objectives. This flexibility helps to reduce the cost of abatement (both short- and long-term). On the other hand, unlike taxes, the environmental objective is explicitly reflected in the number of permits that are issued, which means that this environmental objective should actually be achieved. In fact, this is a key characteristic of tradable permits systems – they are quantity-based (not price-based) measures, which means that they focus mainly on the environmental outcome, rather than on the economic cost of achieving that outcome.

Tradable permit systems introduce a quantitative limit in the form of either: (i) a maximum ceiling (in the case of cap-and-trade schemes), or (ii) a minimum performance commitment (in the case of baseline-and-credit schemes). These limits can also be expressed either in absolute terms or in relative terms, and the permits can be denominated either in terms of "bads" (*e.g.* pollution emissions) or of "goods" (*e.g.* access to "good quality" natural resources). When cap-and-trade systems are used, there is a high degree of certainty about the environmental effectiveness of the instrument – because the environmental outcome is explicitly embedded in the cap that is chosen.

Box 13. Emission trading systems reduce abatement costs

The first tradable permit system used for environmental policy in the US (1983-1987) addressed lead used as an additive in petrol. The flexibility provided by this form of regulation has contributed to a significant reduction in abatement costs. The (later) trading system for SO_2 emission allowances in the US also contributed to significant reductions in abatement costs – and to a shift towards innovations that provide larger environmental improvements than were available before trading was allowed.

In recent years, several European countries have also introduced various domestic emission trading systems (*e.g.* packaging recovery, CO_2 emissions, and allowances for landfilling of biodegradable household waste in the UK), a common trading system for CO_2 emissions in selected industrial sectors has also been introduced across the European Union. There are indications of significant emission reductions and cost savings in response to several of these trading systems.

Source: OECD (2004), *Tradeable Permits: Policy Evaluation, Design and Reform*. OECD, Paris.

The total cap (in a cap-and-trade system) is of vital importance for the environmental outcome of the scheme. These environmental caps should be set at levels that are consistent with long-term environmental objectives. As for any other form of environmental policy, these caps should seek to strike a balance between the long-term marginal costs and the long-term marginal benefits of the trading programme. In order to give firms and households time to adjust, one useful approach to consider may be to gradually phase in "strict" caps over time, by providing for successive reductions in the total number of permits that are available.

As in the case of taxes, the opportunity-cost of using a tradable emission allowance provides both a direct incentive to avoid pollution and an indirect incentive to innovate for a less-pollution intensive future.

Box 14. Tradable SO_2 emission permits in the US increased focus on environmental effectiveness

OECD work has demonstrated that the introduction of tradable permits for SO_2 emissions in the US with the Clean Air Act Amendments in 1990 did not increase the relevant patenting activity, compared to the case with the former "command-and-control"-based regulation. However, the direction of the innovation activity shifted – previous regulations requiring plants to install scrubbers created incentives for innovation that lowered the costs of operating scrubbers, but did little to improve the environmental effectiveness of the technology. In comparison, innovations occurring since 1990 do serve to improve the removal efficiency of scrubbers.

Source: Popp (2003), "Pollution Control Innovations and the Clean Air Act of 1990", *Journal of Policy Analysis and Management*, Vol. 22, No. 4,

Tradable permits have often been used in policy contexts in which other instruments have not performed as well as had been hoped. This means that tradable permits are often used to address the most problematic environmental issues – a factor which should be borne in mind when assessing their relative performance.

The transaction costs associated with some trading systems can be quite high. These costs will affect the net social gains that can be realised from trading. In particular, a requirement for pre-approval of trades stands out as one important barrier; these additional requirements (as well as any other administrative procedures which unnecessarily increase transaction costs) should therefore generally be avoided.

On the other hand, the administrative costs associated with tradable permits systems may be considerably lower than those generated by alternative forms of regulation. A clear distinction can also be made here between cap-and-trade schemes and baseline-and-credit schemes. While the former may have relatively higher start-up costs, they are likely to result in significant savings in terms of running costs over the longer-term.

A key deficiency of baseline-and-credit systems is that the environmental cap is not pre-defined. This opens up the possibility that participants in the trading scheme can obtain credit for investments that do little to actually improve the environment. As a result, the "Business-as-Usual baseline" – the point

beyond which credits begin to be earned – deserves particular attention when designing these programmes. Given that good information about abatement costs and technological opportunities is more likely to be available to the regulated sources than it is to the public authorities, there is a danger that the baseline may be defined in such a way that the polluters will eventually obtain credits for investments that largely reflect "business-as-usual" developments.

Unless the environmental outcome depends heavily on the level of emissions over a particular period, the options of banking and borrowing of permits should be actively considered. These approaches can significantly reduce the economic costs of reaching the desired environmental target (even while not fundamentally jeopardising progress toward that target). In turn, this can increase the probability that there will be agreement on even more stringent environmental targets over time.

As for environmentally related taxes, emission trading systems are better suited to addressing the total amount of a given pollution within the geographical area it covers than affecting *where*, *when* or *how* a polluting product is being used. Hence, for environmental problems where these latter aspects matter, (as in the case of local pollution "hot spots"), a trading system might need to be combined with additional instruments, such as local air pollution standards.

The method used for the initial allocation of permits in a cap-and-trade system is of great importance for both the perceived fairness of the system and its economic efficiency. Broadly, auctioning the permits to the polluters covered by the system is the preferable alternative (rather than distributing them for free to existing polluters – this is known as "grandfathering"). Auctioning will raise revenues that – depending on national circumstances – can be used to lower distortionary taxes (thereby increasing economic efficiency) or to increase public expenditures. Auctioning will also limit the realisation of windfall profits for polluters that receive the initial credits.

It takes time for permit market participants to become accustomed to trading in the market, and to fully understand the nature of the commodity that is being traded. At the early stages of policy implementation, this can result in "thin" markets, price volatility, and other phenomena which can undermine the development of the market. Efforts should therefore be made to provide long-term stability for the trading scheme, *inter alia* by announcing the caps that will apply over a relatively long time period.

The problem of market power in trading markets with few participants can often be addressed by broadening the sectoral coverage of the trading system – and (possibly) by broadening the geographical coverage. This will reduce the danger of collusion among existing producers in a given sector – collusion that would seek to keep permit prices high, with the aim to keep potential new entrants out of the market. Using broad sectoral coverage limits this problem, because participants from other sectors have no economic incentive to take part in these illegal activities. Even if there are few sources, market power will not be much of a concern if the initial allocation of allowances is close to the expected final distribution of allowances – or if the allowances are auctioned.

Box 15. Concentration in the UK domestic CO_2 trading market

Smith and Swierzbinski (2007) found that experience of the domestic CO_2 trading market in the UK suggests that issues of market concentration and potential market power should not be neglected in analysing emissions trading and in market design. In this market, despite a large number of potential participants, sales have been very concentrated.

Source: Stephen, S. and J. Swierzbinski (2007), "Assessing the Performance of the UK Emissions Trading Scheme", *Environmental and Resource Economics,* Vol. 37:131–158.

The greatest benefits of tradable permits in the early stages of their implementation may arise from the relaxation of regulatory constraints which have previously been inhibiting the application of simple, but more efficient, technologies which are readily available. Over the longer-term, the price signal emerging from permit trades will provide clear incentives for further innovation and technology development. Early restrictions on the operation of emission trading schemes, in order to reduce concerns about undesirable and unforeseen outcomes, should therefore be avoided.

PUBLIC FINANCIAL SUPPORT FOR ENVIRONMENTAL GOODS AND SERVICES

Most countries use public financial support to encourage environmentally friendly practices and to finance environmental infrastructure investments. While such support can trigger significant environmental improvements, it is important to make sure that it is provided only in cases where public goods are expected to be generated, and to consider whether such support really is the most economically efficient way of reaching a given environmental target. In particular, taxing or regulating environmental "bads" will reduce the risk of unintended subsidisation of environmentally harmful alternatives, as well as reducing the need for public funding.

- Is public support provided only in cases where public goods are expected to be generated (*e.g.* where significant environmental improvements would not otherwise not be provided by producers)?
- Are public support measures likely to be the most efficient and effective ways of reaching a given environmental target?
- Do clear and transparent eligibility criteria exist concerning who is entitled to receive support, and under what circumstances; has an appropriate "reference level" been established to guide the allocation of support?
- Are existing public environmental expenditure programmes consistent with the Polluter Pays Principle and with international rules regarding state aid?
- Do existing public environmental expenditure programmes have the secondary effect of encouraging additional demand for, or supply of, polluting products or activities over the long-term?
- Is public support allocated first to private agents that commit to achieving the largest environmental improvement per unit of support?

Annotations

Many different types of public financial support measures (*e.g.* direct budget allocations or grants; low-interest loans; loan guarantees, preferential tax treatment) are used in OECD countries to promote the achievement of environmental objectives and/or the development and diffusion of new environmentally related technologies. This financial support is given, *inter alia*, to encourage environmentally friendly practices and to finance large environmental infrastructure investments which would not be implemented in its absence (for example, in water supply and waste-water treatment). Financial support is also sometimes used in combination with regulation or taxation, in order to ease the burden of regulatees and to facilitate implementation of stricter policy instruments.

Environmental objectives may be achieved with several different types of instrument. In general, however, policies that require polluters or users of environmental services to pay for the environmental problems they generate are preferable to subsidies. Taxing environmental "bads" – or imposing other types of environmental regulation – can often be a better way of proceeding than supporting environmental "goods", especially when the economy-wide economic costs of financing that support are taken into account. Thus, an important first step in making decisions about public support for environmental goals is to carefully consider whether that support is really the most economically efficient way of reaching a given environmental target.

When providing support for environmental services, it is also important to define an appropriate reference level – the level beyond which performance will be considered to have improved. Without this baseline, the public environmental expenditure programme might be credited with environmental improvements that would have happened even if the expenditure programme had not existed. Establishing a baseline level could also facilitate decisions about which polluters (or resource users) actually have the

related property rights, and which ones in particular should receive support for providing the particular environmental benefits that are of interest. Apart from identifying eligible beneficiaries and eligible types of projects, the expenditure programme should have clear objectives and a defined timeframe. When the stated objectives have been achieved, the support programme should be wound up, in order to avoid perpetuating the subsidy beyond what is needed.

Public environmental expenditure programmes can be relatively complex in their appraisal and selection criteria, or in the administrative rules used to implement them. This can lead to high transaction costs and other forms of economic inefficiency. These criteria should therefore be kept as simple, transparent and direct as possible. The institutions administering the expenditure programmes should also have sufficient capacity to manage them – including the capacity to bear the financial risks some forms of support can involve (*e.g.* loans and loan guarantees). Neither debt nor, contingent and implicit liabilities (e.g. loan guarantees) should be incurred without explicit and prior approval from fiscal authorities.

Public environmental expenditure programmes should be consistent with the *Polluter Pays Principle*, with sound public finance principles (*e.g.* regarding transparency, cost-effectiveness and accountability) and with internationally agreed provisions regarding state aid.

Support programmes should also not have the secondary effect of directly or indirectly encouraging additional demand for, or supply of, polluting products or activities in the long-term. For example, subsidies to fuel-efficient motor vehicles can increase the total number of cars on the road, leading *inter alia* to increased congestion and noise problems.

In order to obtain as many environmental improvements as possible for a given amount of available support, it is also useful to consider ways of allocating this support in a way that provides the most benefits to those recipients that are willing to commit to achieving the largest environmental improvement per unit of support. Cost-effectiveness analysis, or where justified by project size, cost- benefit analysis, should be used in the selection process. One other way of promoting cost-effectiveness is to use a bidding process in the allocation of the subsidy.

Box 16. Auctioning subsidies for greenhouse gas abatement in the UK

Aiming to achieve as much greenhouse gas abatement as possible for a given amount of subsidies (GBP 215 million), the UK Government in March 2002 allowed polluters to offer abatement of their UK emissions over the period 2002–2006 (compared to baseline emissions in 1998–2000), in exchange for a subsidy per tonne abated. Firms entering the auction were required to commit to a specified level of abatement in 2006, and to make gradual progress towards it in the intermediate years 2002–2005. The auction closing price of GBP 53.37 per tonne of CO_2-equivalent abatement in 2006 represents a subsidy payment of GBP 17.79 per tonne of CO_2-equivalent abatement in a single year.

However, there is always a risk of "free-riding" when using subsidies – meaning that those that receive the subsidies would have behaved the same way also in the absence of the support. In spite of the use of auctions to allocate the subsidies as effectively as possible, the UK National Audit Office argued in a critical report in 2004 that the ease with which some participants achieved their targets was partly due to failings in the way that baseline emissions levels were defined. A number of participants had already reduced their emissions well below their baseline at the start of the scheme, and, as a result, they would have been able to comply without further abatement action.

When the UK Government later sent out a consultation document on how to correct some of the problems related to this "over-generosity", six of the largest participants in the scheme volunteered to make additional emission reductions totalling 8.9 million tonnes CO_2-equivalent. This ended the Government's threat of compulsory (and possibly retrospective) changes. However, it did not lead to any recovery in allowance prices, which suggests that this process may not have completely eliminated the excess supply of allowances.

Source: Stephen, S. and J. Swierzbinski (2007), "Assessing the Performance of the UK Emissions Trading Scheme", Environmental and Resource Economics, Vol. 37:131–158.

PROMOTING TECHNOLOGICAL DEVELOPMENT

Low-emission technologies offer considerable promise for facilitating the decoupling of economic growth from long-term environmental degradation. Failures in the operation of markets tend to produce smaller amounts of these technologies than would otherwise be considered optimal, and there is no guarantee that the "right" environmental innovations will appear when and where they are most needed, or at an acceptable cost to society. Several types of policy instruments can promote further technological development: directly -- through public financial support (*e.g.* grants, soft loans or preferential tax treatment); or indirectly through various constraints placed on environmentally harmful products or behaviour, through direct regulation (*e.g.* standard-setting) or through the economic incentives provided by taxes or trading systems. However, these instruments need to be carefully designed, in order to be as effective and efficient as possible.

- Are general measures to stimulate the achievement of a given performance standard favoured over selective measures to promote specific technologies?
- Have the net environmental effects from anticipated innovations been considered – *i.e.* all positive and negative effects, in both the short- and long-term?
- Will the instruments proposed for use provide permanent incentives to innovate and diffuse environmentally friendly technologies?
- Have appropriate safeguards been provided to promote competition among technologies, in order to avoid generation of monopoly-rents in protected markets?

Annotations

Environmentally friendly innovations are surrounded by two market failures – the public good character of any innovations *and* the environmental externality the innovations could help to address. Addressing the first form of failure implies making sure that innovators get credit for inventions that are of value to society-at-large (but not for inventions they can exploit commercially themselves). Addressing the second form of market failure means getting the prices right, in order to make polluters pay for the externalities they impose on society. Getting the prices right will in itself provide incentives to develop and diffuse new low-emission technologies, because a direct incentive to innovate is generated by the increased prices.

Many different policy instruments are used in OECD countries specifically to promote the development and/or diffusion of low-emission technologies. For example, various emission or performance standards are often set with an explicit aim of "forcing" the development and/or diffusion of new technologies – and there are many examples of policies that have succeeded in this regard.

However, once polluters are in compliance with these standards, and although they would still have an economic incentive to make innovations that could reduce their compliance costs, they would normally not have any incentive to make innovations that would further improve their environmental performance. A possible exception could be if they believe that public authorities intend to strengthen the standard in response to their innovation – a policy that would likely give them a relative advantage over their competitors.

Conversely, if an economic instrument (tax or a tradable permit system) were to be applied, polluters *would* have an ongoing economic incentive to make innovations that would improve their environmental performance. In the case of taxes, the incentive would be to avoid paying the tax on all remaining emissions. In the case of a permit trading system, the incentive would lie in the value of the permit itself, regardless of whether the polluter was a net buyer or a net seller of the emission allowances.

However, there is one important difference between a tax and a (cap-based) trading system, with respect to environmental innovation. New innovations triggered by the price signal from a tax could lead to net overall improvements in environmental performance. However, in the case of a (cap-based) trading system, although each participant would have an incentive to make inventions that would improve their own environmental performance, improved environmental performance by one participant will "automatically" lead to lower permit prices and higher emissions from some other participant in the system. In other words, as long as the cap remains unchanged (and is binding), innovation-based environmental improvements generated by one participant will be offset by higher emissions elsewhere in the system – meaning that the original innovation will not have generated any *net* improvements overall.

There can also be a good economic and environmental case for using other approaches than taxes and permits to promote environmental innovation. For example, as those who make new (environmentally friendly) inventions will not be able to retain all the benefits from those inventions for themselves, potential inventors will not take these benefits into account when they decide how much time and resources they should invest in trying to make new inventions – even though the environment would be improved. Public financial support (*e.g.* grants, soft loans or preferential tax treatment) for this type research and development can help to ensure that these innovation efforts are actually made.

The case for this kind of financial support is stronger for *basic research* activities than it is for *product development*, especially the closer to market-introduction this research is done. This is mainly because those involved in commercial product development are more likely to be able to capture a larger part of the benefits from those products for themselves, and do not therefore need public incentives to get them to act.

The case for promoting environmental innovations is (even) stronger than the case for supporting innovations in general because there are two market failures involved, and both provide valid arguments for public support to the former. There are also arguments for extending the financial support to promote diffusion of environmentally friendly technologies – even if the "pure economic" argument for such support is absent. This is again because diffusion of environmentally benign technologies can help address environmental market failures. The "greening" of public purchases can also help to promote diffusion of low-emission technologies.

On the other hand, governments should normally be reluctant to "pick technology winners". They should instead focus on options that could become economically viable and competitive within a reasonable horizon. An "enabling framework" should therefore be developed for the overall innovation environment, for example in terms of adequate protection of intellectual property rights and a well-functioning education system. This will also allow the private sector to make an effective contribution to solving environmental problems.

Like other sorts of public financial support, support programmes meant to stimulate environmentally friendly innovation can be relatively complex in their selection criteria, and can generate high transaction costs. These selection criteria should therefore be kept as simple as possible, and the responsible institutions should have sufficient managerial capacity – including the capacity to bear the financial risks some forms of support might involve.

Support for specific technologies can create powerful pressures for maintaining the support long after the social returns from these programmes have disappeared. This can make subsequent reform or reorientation of these programmes difficult to implement. It can also bias the search for new (least-cost) technological options in the direction of particular domestic industries, unless sufficient protection is retained against protectionist solutions. It will usually be preferable to mobilise private capital during the deployment stage on innovation, rather than providing public funds that promote one technological solution over another. This is especially true when decisions about very long-term technologies are involved.

Box 17. Environmental policy and innovation

Recent OECD work has confirmed that environmental policy does have a positive effect on technological innovation. For instance, in a case study on renewable energy, it was found that the implementation of different policy measures had a measurable impact on innovation, with tax measures and quota obligations being clear determinants of patent activity.

Changes in relative prices also induce particular kinds of innovation. In a case study of motor vehicle emissions abatement, it was found that changes in fuel prices encouraged investment in "integrated" innovation (in which fuel efficiency gains also arose), but not in "post-combustion" innovation. In the case of renewable energy, changing electricity prices were rarely found to be significant for changes in patenting activity, except for solar energy. However, with rising fossil fuel prices, substitution effects could become more important.

Other market forces can also be important determinants of innovation. In a case study of bleaching technologies in the pulping process, for example, public concerns about the environment appear to have spurred the development of low-emission technologies, predating the introduction of regulatory standards. Interestingly, eco-labelling did *not* appear to influence innovation in this case.

Source: OECD (Forthcoming), *Environmental Policy, Technological Innovation and Patent Activity*, OECD, Paris.

OTHER INSTRUMENTS
(INFORMATION-BASED AND VOLUNTARY APPROACHES)

A typical market failure in the environmental domain is the lack of relevant information among firms and households. Environmental policies that focus on "better information" can help to overcome this problem. Agreements between government and particular economic sectors or industries can also contribute to the positive evolution of environmental policy. The environmental effectiveness of negotiated approaches could be enhanced if governments indicate that follow-up action could be taken in the event that the negotiated targets are not actually met. Involving third parties in the process of setting environmental targets, as well as in monitoring progress, can also increase the environmental effectiveness – and the credibility – of voluntary approaches.

- Has an effort been made to address significant "information failures" with instruments that convey correct, relevant, and targeted information to firms and households (*e.g.* pollution releases and transfers registers, "rating" approaches, or labelling schemes)?
- Has an effort been made to understand (and to make complementary) both the public and the private benefits associated with a given information-based instrument?
- Are the criteria used to develop certification (*e.g.* ISO, EMAS) and/or labelling schemes as objective, non-discriminatory, transparent, and comprehensive as possible?
- Are the same standards of certification and labelling used for both domestic and foreign producers?
- Do programmes that involve voluntary approaches: (i) embody a baseline scenario that makes "business-as-usual" conditions explicit; (ii) seek to balance the marginal costs and benefits of additional environmental improvements; (iii) seek to equalise (as far as possible) the marginal incentives facing individual sources covered by the voluntary arrangement; (iv) indicate that other instruments could be introduced, in the event of non-achievement of the environmental targets; and (vi) involve independent third parties in the setting and verification of the environmental targets?

Annotations

One information-based instrument that is often proposed is Pollutant Release and Transfer Registers (PRTRs) – which are publicly available databases or inventories of potentially harmful chemicals and/or pollutants released to air, water and soil, and then transferred off-site for treatment – from as many relevant individual sources as possible. Other things being equal, it is also desirable that these registers cover as many relevant pollutants as possible. The information in the PRTRs should also be made freely available to the public-at-large, and in a timely manner (*e.g.* via the Internet, and supplemented by a geographical information system, as well as by additional information that helps users interpret the data that is being provided).

Another information-based instrument that can help firms and households make better choices about their environmental respective impacts on the environment is various sorts of "rating" and labelling schemes. These instruments are likely to be most effective when they juxtapose information about the "public good" involved (*e.g.* lower emissions of greenhouse gases) with information about potential private benefits (*e.g.* a reduction in energy costs) that firms and households can obtain.

Box 18. The Nordic Swan label

The Nordic Swan label has been found to have had a significant effect on consumers' brand choices for toilet paper, corresponding to a marginal willingness to pay for the certified environmental label of 13–18% of the price. It also appears that information on environmental performance has had an effect on consumers' choice of detergents.

Source: Bjørner, T. B., L.G. Hansen and C.S. Russell (2004), "Environmental Labeling and Consumers' Choice – An Empirical Analysis of the Effect of the Nordic Swan", *Journal of Environmental Economics and Management,* Vol. 47, 411-434.

The beneficial environmental impacts of these instruments will tend to be reduced when there are relatively few private benefits involved (because the incentive to avoid the underlying externality will be lower). Their environmental benefits will also be smaller, the less choice is available to target groups to change their behaviour (*e.g.* if public transportation is not readily available, consumers will not easily respond to information about how much pollution their automobiles generate in urban settings). Care should therefore be taken in the design of information-based instruments – both to ensure that the rating criteria being used are as objective and comprehensive as possible, and to avoid overlapping incentives that would confuse firms and households, thereby increasing administrative costs.

Trade concerns can also arise from the use of labelling and other forms of information-based environmental policies. For example, if the methodology underpinning eco-labels is open to scientific debate, or if the process for awarding eco-labels is not transparent (especially for producers that are not represented domestically), there is some potential for the criteria to be biased in favour of domestic producers. In order for these schemes not to act as disguised market-barriers, they need to be non-discriminatory, transparent, involve wide consultation on eco-labelling criteria, and be fundamentally non-protectionist in their intent.

An increasing number of firms and individuals are taking voluntary measures themselves to improve their environmental performance – a development which certainly should be welcomed.

The use of "voluntary approaches" as *instruments of public environmental policy* has also grown in recent years. These public policy approaches include environmental agreements negotiated between industry and public authorities, as well as voluntary programmes developed by public authorities, in which individual firms are invited to participate. Exactly how "voluntary" the specific approach is can vary from case to case.

Governments often view voluntary approaches as being both *effective* (in the sense that they can lead to tangible and visible environmental improvements) and *efficient* (in the sense that it is the polluters themselves – *i.e.* firms – are the ones who are asked to pay for the costs associated with the environmental externality that is involved).

A key problem with voluntary public policy approaches, however, is that they always involve some degree of asymmetry in between the government and the particular polluter/sector that is the object of the arrangement. Private companies have a much better understanding than the government does of the evolution of pollution and energy consumption in their own sector (and of the available opportunities for technological development and diffusion). This better understanding can allow them to limit the environmental targets set under the voluntary arrangement to levels that would have occurred in any case – suggesting that the environmental effectiveness of this approach may sometimes not be very high. Experience also suggests that voluntary arrangements often lead to solutions that cost more than is necessary – suggesting that their economic efficiency is also questionable.

Box 19. Collection of mercury switches in the US

To reduce mercury emissions from electric arc furnaces that consume scrap from recycled automobiles, the US has encouraged the removal of mercury-containing switches from scrap automobiles prior to recycling. (Nearly all obsolete automobiles in the US are dismantled and shredded, to recycle the metal.) The US *Clean Air Act* gives the US EPA authority to regulate the steel mills – but not the car dismantlers. However, there is little the steel producers can do about the mercury problem, other than installing expensive end-of-pipe cleaning equipment. The car dismantlers can relatively easily take out the switches before the cars are scrapped – but have no incentive to do so, due to the low value of the mercury metal and the additional costs of soothe extra procedure. Hence, the 2006 US *National Vehicle Mercury Switch Removal Program* is a voluntary programme – involving automobile and steel manufacturers, scrap recycling, vehicle dismantling, environmental groups and the States – aimed at reducing the presence of mercury-containing switches originating from automobile convenience lighting and anti-lock brake systems from the scrap metal supply chain. This programme is expected to prevent up to 75 tons of mercury emissions over the next 15 years.

Source: US EPA, www.epa.gov/mercury/switch.htm.

On the other hand, voluntary public policy approaches can be useful for revealing information about abatement costs, as well as for disseminating information about environmental impacts to the wider public. When they include targets for individual companies, and for pollution monitoring and/or trading systems, they can represent a solid first-step towards cap-and trade schemes (*e.g.* by helping to develop the necessary infrastructure for trading – such as certified emission accounts). Perhaps most importantly, voluntary approaches can also generate more effective and efficient solutions than regulations – because they allow more flexibility in the delivery of environmental programmes.

As a result, if the alternative policy involves a regulatory approach (as it often does), voluntary approaches can be a useful step along the path toward a more effective and efficient environmental policy framework over the longer-term. They can also provide a highly visible "positive" effort in favour of environmental goals on the part of the polluter/sector involved, thereby encouraging other polluters or sectors to follow suit, and supporting development of a "virtuous circle" of environmental activism.

Once the decision has been taken to adopt a voluntary approach, there are various ways in which the effectiveness and efficiency of this approach can be increased. For example, it is necessary to make sufficient investments in the preparation, negotiation, monitoring and enforcement of voluntary public policy approaches; otherwise, there is a risk that the anticipated environmental benefits may not actually materialise.

Box 20. Load-Reduction Agreements in New South Wales

New South Wales (Australia) introduced a licensing system in 1999, setting limits on the pollutant loads emitted by holders of environment protection licenses, and linking license fees to the size of the emissions permitted. In order to promote voluntary pollution reduction measures, polluters may enter into Load-Reduction Agreement with the Department of Environment and Climate Change, formerly the Department of Environment and Conservation. . These agreements stipulate an "agreed load" (lower than the actual pollution load) that the polluter commits to reach within three years. The nature of the abatement works to be undertaken is at the discretion of the licensee. During this period, the license fee payments will be based on the lower "agreed load" – thus freeing up financial resources for the polluter to invest in pollution abatement technologies. In the event the agreed emission reduction is not reached, the polluter would have to repay the fee reduction it had benefited from, with interest. Hence, a credible "threat" is in place that should enhance the probability of compliance.

Source: OECD (2003), *Voluntary Approaches for Environmental Policy: Effectiveness, efficiency and Usage in Policy Mixes*.

More specifically, governments should make clear what the baseline ("business-as-usual") scenario is, and what the environmental benefits of deviating from that path are expected to be. They should then seek to balance the marginal costs and benefits of these programmes, and to equilibrate the marginal costs of meeting these goals across all polluters. Governments could also indicate that follow-up action would be taken, in the event that targets which have been agreed are not actually met. Involving third parties in the process of setting environmental targets, as well as in monitoring performance, can also increase the environmental effectiveness – and the credibility – of voluntary public policy approaches.

MIXES OF POLICY INSTRUMENTS

Environmental policy instruments usually operate as part of a "mix" of instruments (*e.g.* several instruments are often applied to the same environmental problem). It is the net contribution of the instrument "mix" to social welfare that matters most. The environmental effectiveness and economic efficiency of these mixes can be enhanced by adhering to many of the same principles that guide the use of individual instruments, and by explicitly considering the way in which different instruments interact.

- Does the "mix" of policy instruments address a given environmental problem as broadly as possible (*e.g.* covering all relevant sectors of the economy)?
- Are similar incentives provided at the margin to all sources that contribute to a given environmental problem?
- Does each new instrument that is added to the mix also add new scope for improved environmental outcomes and/or increased economic efficiency?
- For environmental problems that have several dimensions, has consideration been given to instruments that address the total amount of pollution, the way a certain product is used, when it is used, where it is used, etc?
- Does the existing instrument mix seek to avoid overlapping incentives, to provide as much flexibility as possible to firms and households in their abatement efforts; and to not set annual targets for environmental issues whose intensity does not fluctuate from year-to-year?
- Could non-environmental market-failures that affect environmental outcomes (*e.g.* market power, incomplete information, incomplete property rights) be better addressed with non-environmental policy instruments, rather than through environmental policy instruments?
- Has the option of using a "safety valve" approach been considered in "cap-and-trade" permit trading systems (*i.e.* putting an upper ceiling on permit prices), to avoid excessive uncertainty about fluctuations in permit prices?
- Is the instrument mix regularly reviewed, to ensure that ex ante expectations about effectiveness and efficiency are actually realised ex post?

Annotations

Combining two instruments can sometimes enhance the effectiveness and efficiency of both. For example, a labelling scheme can reinforce the benefits that emerge from an environmentally related tax, and *vice versa*. A well-designed system for separate collection of recyclables can also increase the environmental benefits associated with a variable waste collection charge (*e.g.* by reducing the danger of illegal dumping – the charge makes households more inclined to sort recyclables that can be disposed of for free). To exploit these possibilities for mutual reinforcement, instruments that provide as much flexibility as possible to the targeted groups should be used. Economic instruments will generally provide this flexibility – but *some types* of regulatory instruments (*e.g.* ambient-based environmental standards) can do so as well.

Box 21. Energy taxes and labels promoting energy-efficient refrigerators in Denmark

Jänicke *et al.* (1998) studied the impacts of a combination of rapid increases in electricity taxes over several years and a labelling scheme indicating the fuel efficiency of refrigerators in Denmark in the 1990s. They found that the two instruments did in fact underpin each other. The impacts of both instruments were further enhanced by *e.g.* special training provided to about 20% of all sales staff connected with retail sales of "white goods".

Source: Jänicke, *et al.* (1998), *Innovation and Diffusion through Environmental Regulation: The Case of Danish Refrigerators.* FFU-report 98-3, Forschungsstelle für Umweltpolitikk, Freie Universität Berlin.

From the perspectives of both environmental effectiveness and economic efficiency, policy instruments should address a given environmental problem as broadly as possible (*e.g.* covering all sources of pollution in all relevant sectors of the economy). They should also provide similar incentives at the margin to all sources that contribute to the environmental problem at hand. Economic instruments (*e.g.* emission trading systems and taxes) can provide equal marginal abatement incentives, but this is generally much more difficult to achieve with instruments that do not rely on market-based approaches.

For environmental problems that have many dimensions (*e.g.* water pollution from agricultural sources), it can be appropriate to supplement instruments that address the *total amount* of pollution with instruments that address the *way* a certain product is used, *when* it is used, *where* it is used, etc. In many cases, regulatory instruments, information instruments, training, etc., can be better suited to address these latter dimensions than a tax or an emission trading system. Instrument mixes are also often preferable when direct monitoring of pollution is difficult, as in the case of nutrient run-off from diffuse sources in agriculture.

Except for situations where mutual reinforcement between instruments is likely, or when the instruments address different dimensions of a given problem, the introduction of overlapping instruments should be avoided – because this overlap will tend to reduce the flexibility of target groups to respond in the most effective and efficient manner possible. For example, an efficiency standard for electrical appliances that is applied next to a cap-based CO_2 emission trading system that covers pollution generated from the electricity generation sector would not provide any additional incentives to abate CO_2 emissions (at least in the short-term, and as long as the cap is kept constant), but could entail increased costs for the producers and users of the appliances in question.

While emission trading (especially cap-and-trade) systems can provide a degree of certainty as to the environmental outcome, the compliance costs that will eventually be faced by polluters are likely to be quite uncertain under these systems. This uncertainty can sometimes be reduced by introducing a "safety valve" in the permit prices. In effect, this allows polluters to emit whatever amount they like, in return for paying a fixed price (*i.e.* a "tax") for any emissions for which they do not hold an allowance, should the permit price exceed a pre-defined level. This approach needs to be carefully designed, however, in order to preserve the environmental integrity of the overall pollution control system. One way of preserving this integrity would be to require polluters who use this "safety valve" to make the necessary emission reductions in later years.

Unless the environmental problem associated with a given pollutant depends significantly on year-to-year emissions, setting *annual* abatement targets should generally be avoided – since such targets make it difficult to apply "safety valves" on the permit prices in trading systems.

It is often preferable to primarily address *non-environmental* market-failures (*e.g.* market power, incomplete information, incomplete property rights, split incentives between landlords and tenants) with non-environmental instruments, such as competition policy instruments, improvements to patenting systems, deregulation of the housing markets – rather than using environmental policy instruments to address these problems.

When modifications are made to one part of the instrument mix, the environmental and economic impacts associated with other parts of the mix should also be re-evaluated. This reassessment can be very important when "qualitatively new" instruments are added to the existing mix, such as when a quantity-based instrument (*e.g.* a quota-based emissions trading system) is combined with price-based instruments (*e.g.* taxes and subsidies). It is also important to regularly review the effectiveness and efficiency of the instrument mix that is in place – to ensure that the programme performance anticipated *ex ante* has indeed been realised.

MONITORING, COMPLIANCE AND ENFORCEMENT

No environmental policy instrument will be environmentally effective or economically efficient without appropriate compliance assurance mechanisms. These mechanisms in turn generate both costs and benefits, both of which need to be explicitly considered when deciding how much monitoring, compliance and enforcement are needed, in particular circumstances.

- Are the problems of monitoring, compliance, and enforcement considered early in the design stage of environmental policies, and are sufficient resources devoted to these activities?
- Do compliance strategies take account of compliance patterns, regulatees' profiles, and other factors that can affect the incidence of compliance?
- Do compliance monitoring activities promote the detection of non-compliance (including by the regulatees themselves or by third parties)?
- Is it likely that non-compliance detection level will be higher for situations involving higher levels of environmental risk?
- Do legal and non-legal sanctions create financial risks that at least are equal to the potential benefits from non-compliance?
- Are compliance monitoring and enforcement activities designed and applied in a transparent, targeted, proportionate, and consistent way?
- Within the compliance assurance system, are the roles and responsibilities of different parties well specified? Do governmental authorities have sufficient capacity for compliance monitoring and enforcement?

Annotations

Systems of environmental enforcement ("compliance assurance") cover a broad array of actions that governments undertake – either alone or in co-operation with other stakeholders -- to monitor and to promote compliance. Within these systems, voluntary compliance and reversal of an offence is the key goal; punishment of the offender should be a secondary purpose. Policies that recover unlawful benefits gained by violators of environmental norms can also help to ensure that non-compliers do not obtain a competitive advantage.

It is important to consider early in the policy formulation process issues related to the eventual compliance with a given environmental policy. For example, feasibility is a pre-condition for ensuring regulatees' acceptance of requirements, and to keep the costs of that compliance within reasonable limits. To reduce the costs of compliance, introduction of new regulatory requirements should therefore be co-ordinated, to the extent possible, with investment cycles. This underlines the importance of obtaining relevant information from the regulated community – and others – for the specification of environmental requirements. Regulatory Impact Analysis is a central tool for determining the feasibility of potential objectives and instruments.

To promote enforceability, all environmental regulations should therefore define the scope of their application; provide an effective date for (partial or full) compliance; identify areas that might need further elaboration in secondary legislation; and include a clear reference to sanctions, in the event of non-compliance.

Sanctions should also ensure that good environmental performers do not suffer any relative economic disadvantage as a result of their efforts to comply. This implies that sanctions should be proportional to any economic gains that might result from non-compliance. The penalties at the top of the "enforcement pyramid" should therefore serve as a deterrent for non-compliance.

Box 22. Regulatory enforcement pyramid

A good way of achieving an optimum mix of persuasion and coercion aimed ultimately at compliance is the "regulatory enforcement pyramid". Under this approach, regulators start first at the bottom of the pyramid, and assume that polluters are willing to comply voluntarily. However, they also make provision for circumstances where this assumption proves to be incorrect, by including provisions that would ultimately escalate the sanctions, in the event of non-compliance. For example, the enforcement pyramid might begin with advice and written recommendations; move later to issuing administrative notices and on-the-spot fines; and then escalate to prosecutions, with increasingly serious consequences. The stronger the sanctions at the disposal of the enforcer, the more it is likely that the environmental objective can be achieved via "soft" means.

Source: OECD (2005), *Economic Aspects of Environmental Compliance Assurance.*

Identifying the regulated community and understanding its particularities (including the number and size of enterprises, their potential environmental impacts, human and financial capacities, and their compliance levels) facilitates authorities making the right choices in compliance and enforcement mechanisms, prioritising inspections and focussing communication and enforcement in such a way as to optimise the use of public funds.

Certain polluters may be more strongly affected by obstacles to compliance than others. For example, smaller polluters will often the lack the knowledge and resources needed to comply effectively; they may also be less exposed to external pressure than larger polluters are. In these cases, persuasion may be a better option; but persuasion will be most effective if polluters see opportunities for gaining competitive advantage as a result of improved environmental performance.

Wide social disapproval of non-compliant behaviour will be another important factor in preventing non-compliance. Preventative approaches will be important especially when other approaches are unrealistic (*e.g.* because of the high costs of inspecting numerous small polluters; in these cases, effectiveness can often be increased through enhanced information or education).

Compliance monitoring can be exercised via three basic channels: (i) self-monitoring by the regulated community and subsequent provision of reports; (ii) periodic (both announced and unannounced) inspection by competent authorities; and (iii) complaints and other actions by the general public. Two additional instruments may also be used: audits by third parties and ambient monitoring.

A credible threat of sanction for non-compliance also needs to exist. Communication can therefore influence the perception of actual enforcement actions – by making them visible.

As is the case for regulations themselves, compliance assurance efforts should be directed primarily (but not exclusively) towards those sources whose activities give rise to the largest risk of serious environmental damage, where the risks are least well controlled, or to address deliberate criminal activity. For example, high-risk sites (*e.g.* certain chemical plants or waste disposal facilities) should receive regular visits, so authorities can be sure that the environmental risks continue to be effectively managed. Some relatively low-risk sites that are poorly managed may also have more potential to generate problems than higher-risk sites where the proper control measures are in place.

Box 23. Risk-based enforcement approaches

Several OECD countries have developed tools to better assess the environmental risk associated with individual facilities (or categories of facilities). For example, in the Netherlands, priorities for monitoring and enforcement are identified for each environmental law and for each regulatee *separately*, via evaluations carried out by experts. In the UK, a more integrated approach is applied -- the risk/performance assessment focuses on a more general assessment of the operators involved. In both cases, "scores" are allocated to operators, allowing the regulators to establish priorities for enforcement.

Source: OECD (2005), *Economic Aspects of Environmental Compliance Assurance.*

Overall, enforcement authorities should treat the regulated community with consistency, and in a transparent and proportionate manner. *Consistency* implies the use of similar approaches to address similar circumstances. Consistency should also be promoted at the national and sub-national levels and through effective interaction with other enforcement authorities. *Transparency* makes clear what enforcement actions may be taken, in which situations, and why. Transparency helps those who are regulated understand what is expected of them, as well as what they should expect from the Environment Inspectorate. It also helps to maintain public confidence in the authorities' ability to regulate. *Proportionality* implies that the enforcement action should be commensurate both with the risks to the environment and with the severity of violation.

A key element in any well-functioning enforcement system is the clear definition of the roles and responsibilities of the various institutions that are involved -- most importantly, the executive and judiciary authorities. Environmental inspectorates are usually at the core of these systems. Clear and legally defined powers should be assigned to these agencies. These agencies should enjoy the full authority to make independent and objective decisions, and be free from political pressures. They should, however, be bound by appropriate concerns for integrity, transparency and accountability.

ENVIRONMENTAL POLICY AND COMPETITIVENESS

There is no convincing evidence that environmental policy *harms* overall economic competitiveness. Ambitious national policies can have a negative impact on the competitiveness of certain sectors, and under particular circumstances, but these negative effects usually find positive offsets elsewhere in the economy. Moreover, where competitiveness concerns *do* exist for individual sectors or firms, there are often practical ways of reducing these concerns. On the other hand, there is no convincing evidence that *stringent* environmental policy directly *improves* economic competitiveness for the country as a whole either – even though it may lead to new market opportunities for individual firms (and thus, to improved profitability). It may even be the case that *lax* environmental standards detract from (rather than contribute to) national economic competitiveness, particularly in the longer-term.

- Has the proposed new environmental policy instrument been integrated into broader policy reforms (*e.g.* introducing environmentally related taxes as part of a broader fiscal reform)?
- Has the government sought to enter into (multilateral or bilateral) environmental agreements with other countries, as a way of reducing the competitiveness problems for all countries associated with a given international environmental problem?
- Are new environmental policy reforms announced early, and phased in gradually?
- Where market-based instruments are involved in a proposed policy reform – and if some form of compensation for reduced competitiveness is deemed necessary – has the option of recycling the (tax or permit auction) revenues back to the most affected sectors/firms been considered? If so, would the recycled revenues be delinked from the original polluting activity?
- Have the possibilities of using reduced tax rates (instead of complete exemptions) been considered, as a way of maintaining a positive incentive for the firms concerned to abate emissions?
- Has the option of border tax adjustments been considered? If so, have the full economic and environmental implications of this approach been considered, including both the likely administrative costs and potential compliance problems with WTO obligations?

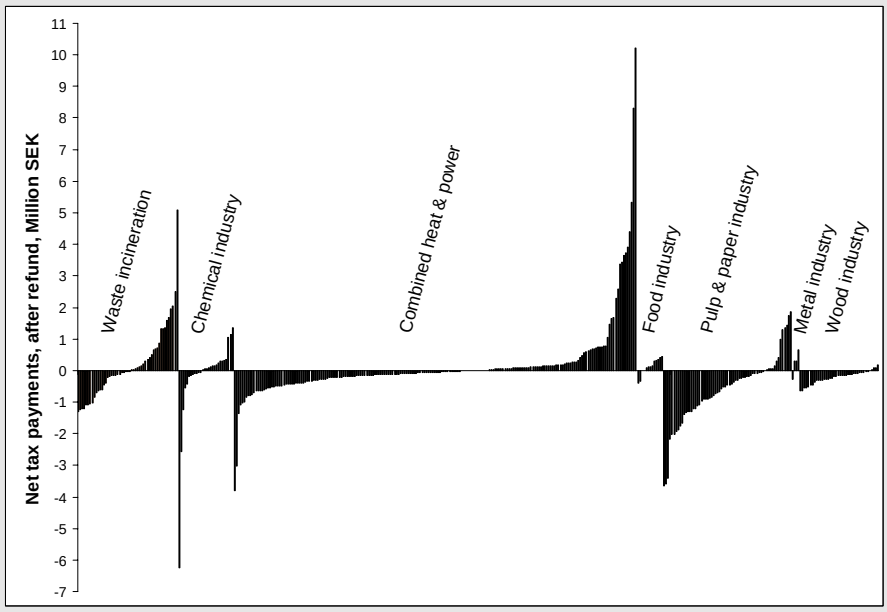
Annotations

A major political concern when implementing environmental policies is often a fear of reduced international competitiveness of the most polluting (often energy-intensive) sectors of the economy. Ideally, governments should focus on the impacts of environmental policy instruments on the economy as a whole – rather than on impacts in specific sectors – because instruments that make some firms worse off will generally make some other firms better off. Hence, any negative competitiveness impacts on the economy as a whole will be lower than the impacts on the most affected sectors.

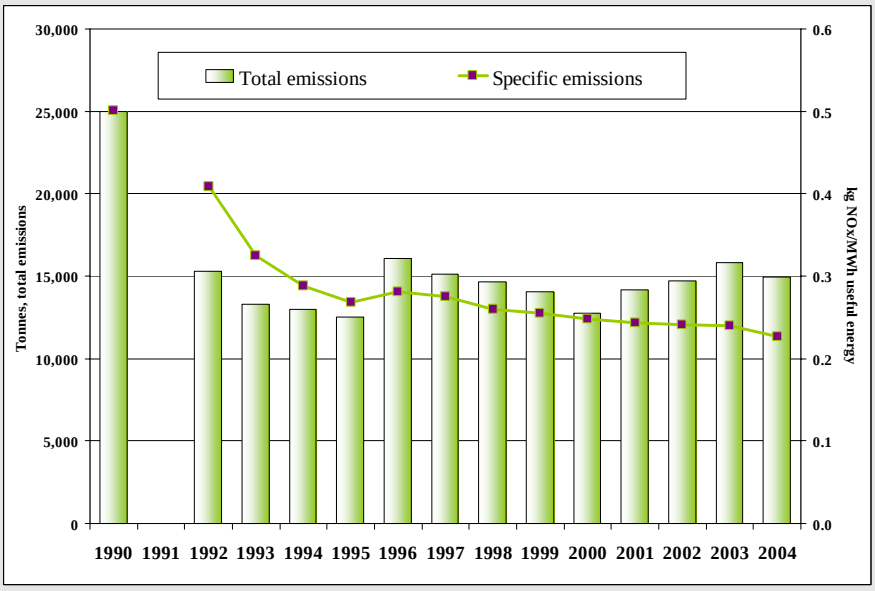
Individual firms compete at both the national and international levels. Any environmental policy (such as an environmentally related tax or a regulation) *can* affect an individual firm's competitiveness position at both levels, if their competitors are not subjected to the same restrictions. For this firm, it matters little whether the additional competition arises from domestic or foreign producers. Because the firms who lose at the national level will tend to be offset by other firms who gain, the net effects on domestic competitiveness will usually be very low.

Box 24. Limiting the competitiveness impacts of the charge on NO_x emissions in Sweden

Firms in Sweden that produce more than a certain amount of energy have to pay a charge on measured NO_x emissions. In order not to distort the competition with plants producing amounts of energy below the set limit, the revenues raised are returned to the firms covered by the charge – based on the quantity of energy each produces. Plants with low emissions per unit of energy produced are "net winners", while firms with high emissions are "net losers", as illustrated below, showing *net tax* payments, after refunds, from each of the plants covered by the charge.



The scheme has led to significant technological developments, and emissions per unit of energy produced have been reduced more than 50% since when the charge was first announced, as illustrated below.



While the refund system alleviates the competitiveness problem that a charge without refunds could have caused, it provides no incentives for the customers of the plants covered by the charge to buy fewer of the products that (still) cause (some) pollution.

OECD (2006), *The Political Economy of Environmentally Related Taxes*, OECD, Paris.

At the international level, the issue is more complex. In general, the larger the group of countries that puts similar environmental policies in place, the more limited will be the impacts on sectoral competitiveness. Multinational firms will tend to favour harmonised environmental rules, because this approach generates economic benefits for all participants in the agreement. This suggests that governments should actively seek to involve other countries in the policy reform that is under consideration. On the other hand, harmonised action may not be appropriate for cases involving environmental externalities that are essentially domestic in character – because these externalities will differ from country to country, so flexibility in the policy response would be more appropriate.

The same arguments apply to claims that environmental policy will lead to increases in overall economic competitiveness. Some firms may benefit from improved competitiveness as a result of the imposition of environmental policies. For example, it seems clear that environmental policies lead to additional technological change and diffusion. However, there is little empirical data to indicate that economies as a whole benefit from these processes. For one thing, environmental R&D could – at least partially – "crowd-out" other R&D, which *could* have promoted a country's competitiveness even further. Further, some domestic firms will gain in competitiveness from environmental policies; others will lose – at the macroeconomic level, therefore, the evidence of a positive effect on overall competitiveness is not yet convincing.

Even though *any* environmental policy instrument can have impacts on firms' competitiveness, the use of environmentally related taxes or tradable permit systems to reduce emissions *is* in particular likely to have negative impacts on the international competitiveness position of *some* industrial sectors, especially when such instruments are implemented in a non-global manner. Unilateral implementation of ambitious environmental policies by single regions or countries may therefore lead to significant production decreases in the countries and sectors concerned.

The reason these particular instruments, more than others, can impact negatively on *some* firm's competitiveness is that they not only make the firms pay for the measures they take to reduce their emissions, but also place a price on all remaining emissions.

Making polluters pay for the externalities they place on others has the effect of reducing the comparative advantage of polluting firms. By definition, therefore, non-polluting firms will find that their comparative advantage has increased. In addition, reduced emissions will be of direct economic benefit to certain firms.

While not being without their own drawbacks, there are several ways negative sectoral competitiveness impacts stemming from the use of environmental policy instruments could be limited. For example, announcing environmental policy reforms early, and phasing them in gradually, can give affected polluters sufficient time to adjust to the new situation.

Integrating the introduction of a new environmental policy instrument into broader policy reforms can remind the public that most policy reforms engender both positive and negative effects, and that the goal of policy is to lead to a net benefit situation. In effect, this "integrative" approach demonstrates that the negative sectoral competitiveness impacts stemming from the environmental policy instrument can be at least partially attenuated by the positive impacts of other elements of the reform package.

If a decision is made to address a sectoral competitiveness problem, every reasonable effort should be made to maintain an incentive at the margin for the polluters/sectors to abate their emissions. In effect, the environmental objective should be kept squarely in the foreground of the policy discussion. Maintaining an incentive to reduce emissions, while still addressing the anticipated competitiveness problems, can be achieved in several ways.

For example, where *taxes* are being considered in the environmental policy reform – and if some form of compensation for reduced competitiveness is deemed necessary – one approach could be to recycle (partially) the revenues raised back into the most affected polluters. Recycling in a way that maintains the original incentive to reduce emissions might involve payments that are not connected to the original polluting activity. Although limiting the competitiveness impacts, this approach to revenue recycling forgoes the opportunity to use the revenues from environmentally related taxes to reduce tax rates in other, distortionary taxes (*e.g.* income taxes or social security contributions). It also tends to reduce the environmental benefits of introducing the tax in the first place.

Border tax adjustments might be another approach to reducing the competitiveness effects of environmentally related taxes. Here, the negative effects of the tax on sectoral/firm competitiveness are offset by a compensating tax on the international competitors of the sector/firm that is to be taxed domestically. Although border tax adjustments are sometimes feasible, careful consideration of their full environmental and economic implications should precede their adoption. Particular attention should be paid in this respect to both the likely administrative costs of BTAs and their likely compatibility with internationally agreed trade disciplines (*i.e.* WTO).

A third option involving environmentally related taxes is to apply reduced tax rates for those sectors/firms that are expected to suffer the most severe competitiveness problems. Although this approach reduces the marginal incentive to abate emissions, it still maintains *some* incentive to do so. This option is therefore better than a full exemption from the tax.

Where the policy reform involves a *permit trading system*, the allocation of some of the initial permits for free is another option for reducing the competitiveness impacts on particular sectors or firms. Recycling of revenues back to the affected sectors/firms is also possible in the case of permit trading systems in which the initial permits have been auctioned. Here again, the environmental objective is achieved, even while solid economic incentives to abate are maintained – both for today and for tomorrow.

ENVIRONMENTAL POLICY AND LOW-INCOME HOUSEHOLDS

Like all public policies, environmental policies imply different benefits for, and different burdens on, different groups in society (*e.g.* groupings according to income classes, age, regions, or ethnicity). Environmental policies can, for example, sometimes weigh more heavily on low-income households than they do on the richer parts of society. There are several possible ways of ensuring that these individuals do no slip through the social safety net.

- Have the potential distributive effects (both economic and environmental) of all feasible policy options (or of policy inaction) been fully examined ?
- Have the indirect distributive effects and likely behavioural responses both been taken into account when the distributive impacts of proposed environmental policies were examined?
- Do low-income households have access to sufficient information which allows them to fully express their preferences for improved environmental quality?
- Are opportunities to use direct compensation measures to address distributive concerns about low-income households being fully exploited (*e.g.* through the social security or personal income tax systems)?

Annotations

Many environmental policy instruments have been found to have a regressive impact on the income distribution of households. A low-income household spends a larger proportion of its income on heating, for example, than its higher-income neighbours, so an energy tax might weigh more heavily on the former group than on the latter. Similarly, a low-income household could spend relatively more of their income on water consumption. Several options exist for countering these negative distributional effects; it is important, when using these options, to maintain the overall environmental effectiveness of the original environmental policy.

A key first step is therefore to better understand the distributive effects of the environmental policy under consideration. This step should start with an assessment of the distributive consequences of the existing ("no new policy") situation. This will provide a "baseline", against which to evaluate changes induced later by the environmental policy itself.

If the scale and value of possible environmental damages are not well understood by affected households, the market will not result in a situation where underlying personal preferences are properly reflected in policy decisions. It is therefore important that households have access to sufficient information to enable them to act according to their real preferences.

To help remove information failures that contribute to disparities in the distribution of environmental quality, information should be provided, for example, on exposure to environmental hazards. This could imply the need for specific information programmes, targeted at low-income households.

The distributive implications of a given policy proposal can only be properly judged in the context of: (i) the distribution of current environmental damages; and (ii) all other feasible future policy interventions. The important question is not "how much a particular policy proposal might affect low-income households *in itself*", but "how much a particular policy proposal might affect these households, *relative* to other policy options (including not doing anything at all about the environmental problem)".

Although the distributive burden of environmental policies is most often assessed with their *direct* financial effects, *indirect* effects (including behavioural responses) are equally important – and usually much less evident. This implies the need to take a "general equilibrium" perspective on distributive effects – a perspective that also accounts for secondary behavioural reactions by those who will be affected by the proposed environmental policy. For example, as environmental quality improves in a neighbourhood,

house prices may increase, causing people in some income categories (but not in others) to feel more prosperous, leading to increased consumption (and production), and therefore, to additional environmental problems over time.

Other indirect distributional impacts of environmental policies could occur when low-income households can no longer afford a particular neighbourhood and therefore have to move elsewhere (*e.g.* situations where industry moves into a low-income neighbourhood because of lower costs, thereby causing greater environmental damage to poor people).

Some types of *mitigation* measures for low-income households (or other groups in society in focus in income distribution debates), such as exemptions or lower tax rates, can reduce the environmental effectiveness of proposed policies. Under most circumstances, therefore, direct *compensation* measures are preferable for addressing distributive concerns related to low-income households. The latter approach will usually involve compensation through other public policy instruments, such as the social security or personal tax systems. For example, basic personal tax allowances can be increased (or tax credits introduced) for low-income households. For individuals whose incomes are so low that they pay little or no tax, compensation for the negative distributive effects of environmental policies can be provided by direct cash transfers. Compensation policies of this type can simultaneously maintain the abatement incentive embedded in the environmental policy, while still reducing the negative impact of this policy on low-income households.

To address the problem of inequitable distribution of *environmental risk*, solutions should focus on the *causes* of that inequitable distribution – not the *evidence* of it. Further, it is inefficient to compensate those that will be exposed to environmental risk in the *future*, regardless of their relative income. This approach would lead to an inefficient increase in the exposure to environmental harm, because it countervails the *private* response of avoidance behaviour. (Compensation for those unknowingly exposed to environmental risk in the *past* is a different story – this is an equity issue, -in principle- not affecting future behaviour.)

Box 25. Compensation for low-income households in the Netherlands

In 1996, the Netherlands introduced a regulatory energy tax (RET) on the use of natural gas and electricity. The rates of the RET have been raised several times, and the rate of the first bracket of the personal income tax system has been reduced, explicitly to redress in part the distributional impact of the RET (*i.e.* as "compensation"). The administrative costs associated with this compensation mechanism were negligible, since the compensation measures were a part of the annual revision of the personal income tax rate structure.

Source: OECD (2003), *Implementing Environmental Fiscal Reform: Income Distribution and Sectoral Competitiveness Issues*, OECD, Paris.

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