



postnote

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ENVIRONMENTAL POLICY AND INNOVATION

The Government has recently published a strategy for innovation. This identified the opportunity for linking environmental policy and innovation.¹ The development and uptake of innovative ways to reduce environmental impacts may be stimulated by modern policies, known as 'new environmental policy instruments' (NEPIs). These include the Climate Change Levy and the Landfill Tax. This briefing examines NEPIs and their role in stimulating innovation and improving the environment. It also updates POST's previous work in this area.²

Evolution of environmental policy

UK environmental policy in the 1970s and 1980s tended to be informal, reactive, and often voluntary, based on negotiation between industry and Government.³ Releases of industrial wastes to air, water, and land were controlled separately. The 1990 Environmental Protection Act introduced the concept of Integrated Pollution Control (IPC), intended to ensure that substances were managed in a way that minimised their detrimental effects on the whole environment. IPC has since evolved, as part of European environmental policy, into Integrated Pollution Prevention and Control (IPPC).

Environmental policy has embraced the approach of 'sustainable development' where economic and social factors are considered alongside the environment. Several government strategies aimed at making progress towards sustainable development have been produced, the latest of which sets the framework for 'Sustainable Consumption and Production' (SCP).⁴ The aims of SCP are to extract the most productive use out of finite and renewable natural resources, to reduce waste and to change consumption patterns. The result of this evolution is that current environmental policy is an assortment of older and newer approaches to regulation.

The role of technology

The traditional way to reduce the environmental impact of industry has been to fit pollution control equipment to chimneys and effluent pipes. These remove or transform releases, can recover material for recycling or reuse, and are useful for cleaning-up existing industrial processes that cannot be replaced immediately. However they may not be sufficient by themselves to maximise resource use and minimise waste. To address this, techniques have shifted to improving products and industrial processes so that they require less raw material, water and energy, and produce less waste. There has not yet been a significant shift in this direction but, where it has happened, a key driver has been cost-savings from more efficient technologies rather than an explicit aim to reduce environmental impacts.

Environmental policy mechanisms

For a number of decades the environment has been regulated through an approach characterised as 'command and control'. Standards are specified with which potential polluters must comply (the command). There is then stringent monitoring and enforcement (the control). Command and control regulation (e.g. through IPC and more recently IPPC) has achieved some success, especially in reducing air and water pollution. However, it is widely seen as inflexible and raises concerns over whether it inhibits radical innovation. It also involves high costs to implement and enforce, and cannot readily control releases from diffuse sources (such as agricultural fertilisers that may affect drinking water quality).⁵

New Environmental Policy Instruments

The Better Regulation Task Force, an independent body that advises Government, recommends that alternatives to regulation be considered wherever possible to deliver

policy more efficiently and effectively. In this vein, New Environmental Policy Instruments (NEPIs) have emerged in the last decade, intended to be more flexible than command and control regulation. In addition they are intended to stimulate innovation and to reduce the costs of monitoring and enforcement. The box opposite gives examples of the types of NEPI used in the UK. After a slow start, the UK is now recognised as a leader in designing NEPIs.³

Many NEPIs are implemented as part of a mix of policies. For example, tools used to tackle climate change include the Climate Change Levy, Climate Change Agreements, the Emissions Trading Scheme, and tax on fuels. POSTnote 207 examined these in the context of aviation and POSTnote 213 discusses the effectiveness of such instruments in climate change policy. There are concerns that some policies may conflict with others and that this may lessen their effectiveness. They may also affect the competitiveness of different sectors of industry. These issues are discussed later.

Some NEPIs, such as the Landfill Tax and Climate Change Levy, are designed to be 'revenue neutral' - funds raised are distributed back to business. In the case of the Landfill Tax this is through programmes of support to help improve waste treatment, to encourage recycling and to promote new waste management technologies. Also, some of the revenue flows back to business through a reduction in National Insurance contributions (NICs).

The purpose of this is to tax 'bads' such as waste, and to support 'goods' such as employment. The Landfill Tax was introduced in 1996 at a standard rate of £7 per tonne of waste. It has risen progressively to its current level of £14 per tonne, and will be rising to £15 per tonne on April 1st 2004. The Treasury has stated that it will rise further from 2005-2006 by at least £3 per tonne a year thereafter until it reaches a long-term rate of £35 per tonne, and that it will remain revenue neutral.

Innovation and the environment

The Department of Trade and Industry (DTI) defines innovation as "*the successful exploitation of new ideas*". Technical innovation develops new technologies, while institutional innovation changes organisational behaviour (see box on next page). The Government's innovation policies are intended to play a significant role in directing business to stimulate innovation and to encourage the uptake of new technologies. For example, innovation policy seeks to support basic science and engineering; to provide start-up funds for new-technology based business; to encourage research and development (R&D) through academic and industry links; and to offer tax credits for companies that undertake R&D.

While there is widespread recognition that such innovation is necessary to achieve environmental objectives, the Government acknowledges that current innovation policy and environmental policy are not integrated.

Examples of NEPIs used in the UK

Market Based Instruments (MBIs) provide financial incentives for producers to reduce harmful releases to the environment. They are designed to change behaviours. The Office of National Statistics reports that environmental taxes raised £32 billion in 2001, of which ~14% was allocated for environmental projects. The main types of MBI are taxes, charges and levies, subsidies, tradable emission permits, and deposit refund schemes. Examples include:

- **The Landfill Tax** is a charge on the disposal of waste to landfill. It aims to encourage waste producers to produce less waste, to use alternative methods of waste disposal, and to recycle.
- **The Climate Change Levy** is a charge on energy use and applies to all parts of the business sector. The aim of the levy is to encourage business to develop and use energy efficient technologies. Some businesses can agree to improve energy efficiency or reduce emissions through Climate Change Agreements (CCAs) in return for a discount to the levy. It has been criticised by parts of business and some environmental groups who would prefer a carbon tax.
- **The 100% Capital Allowances Scheme** is available for companies investing in energy efficiency technologies. It is a tax relief on investment in a range of Government-approved energy-saving equipment. Capital expenditure can normally be deducted from tax over a period of time, for example 25% each year on a reducing balance basis. The 100% Capital Allowances Scheme allows all the relief in the first year, thus improving cash flow.
- **The UK Emission Trading Scheme** is a scheme where participants can trade with greenhouse gas emission allocations. A total acceptable emissions level for all participants is determined, which is then divided into units and distributed among them. Allowances can be bought and sold to meet emission targets. Participants who reduce emissions and have surplus allowances can sell their permits to others that find emissions reduction more expensive or difficult. A similar EU-wide emission trading scheme will commence in 2005.
- **The Renewables Obligation** requires electricity suppliers to supply a specific proportion of their electricity from renewable sources such as wind or wave power. Again, credits can be traded to encourage the uptake of renewable energy.

Voluntary Agreements (VAs) are agreements between industry and public authorities to meet environmental objectives. VAs are thought to be a more cost-effective alternative than formal regulatory measures. They are theoretically more flexible and can be introduced in shorter timescales. However, the action is rarely truly voluntary as it is often backed up by the threat of legally binding rules or more stringent monitoring and enforcement. For example, to avoid legislation, the EU car industry entered into a voluntary agreement on CO₂ emissions. The European Commission has proposed that some VAs should have objectives and timetables fixed in law with business given the freedom to decide how to meet them. Hence, VAs are often called negotiated agreements. The OECD has reported that 'voluntary' initiatives are not effective if they are the only measure adopted.⁶

Information and Awareness schemes such as 'eco-labelling' provide information about the environmental performance of products and services, allowing consumers to make informed choices in what they buy. These work best in markets where 'green' consumerism is very strong, for example organic produce. They have less success in markets characterised by a low degree of environmental concern.

The innovation process

Innovation is the development of new ideas, products or services. There are several types of innovation:

- **Institutional innovation** involves the creation of new organisations, or new approaches to the way organisations operate. It reflects new modes of thinking, changed organisational priorities, and cultural or social changes. Corporate Social Responsibility (CSR) is an example of institutional innovation where companies are responsible for reporting their environmental and social impacts, among others. It is suggested that CSR benefits companies by enhancing their reputation, improving competitiveness, and strengthening their management of corporate risks.
- **Technological innovation** involves the creation of a new or improved product, or a new process by which products are made. Innovation is often characterised as passing from basic R&D, through applied research, demonstration, to commercialisation and diffusion. However, these stages do not necessarily occur sequentially, as knowledge and skills are passed backwards and forwards from one stage to another. Difficulties often occur in taking innovations from one stage to another. For example, in renewable energy technologies, research has shown that there is often a 'system failure' in moving technologies from demonstration to commercialisation because the incentives offered (e.g. by measures such as the Renewables Obligation) cannot attract investment into technologies in their early stages of development.⁷
- **Service innovation** involves a shift from selling products to selling services. A company may shift from selling large quantities of chemicals to selling the service the chemical is used for, such as cleaning. Cost reductions, improved resource productivity, and ease of monitoring the life-cycle of products are among the stated benefits.

Barriers to innovation

Several factors affect the development of products and services, and their uptake. Companies must prioritise which projects or activities to develop further, based on an analysis of risks and benefits. Often the social and environmental benefits of products are overlooked in favour of economic benefits, or because of competitive pressure.

New projects require up-front investment that may be difficult to obtain. Lack of expertise or knowledge may hinder development and uptake. Long-term projects that require commitment are subject to uncertainty and are less attractive than those with short term tangible benefits.

The links between environmental policy and innovation work in both directions. On the one hand, environmental policy (such as vehicle emission standards) may stimulate innovation in vehicle engine or exhaust technology designed to meet those standards. On the other hand, the possibilities thrown up by innovation (e.g. the development of fuel cells as a way of powering vehicles) can help policy-makers to set progressively stringent vehicle emission standards.

Another example is that of the catalytic converter which was developed to meet stringent long-term emission targets in the US, set before the technology had been fully developed. In contrast, the global ban on CFC-producing aerosols was relatively easy to implement as alternatives had already been developed.

Issues

Effectiveness of NEPIs in stimulating innovation

Despite often bold claims, there is considerable debate on the effectiveness of environmental policy and its impact on innovation. Some argue that environmental policy stifles innovation by diverting resources away from radical research and towards regulatory compliance through simpler, 'end of pipe' solutions, thus causing innovation to progress only in small steps. Also, some feel that firms may avoid investment in more novel cleaner technologies due to uncertainty about meeting compliance requirements. Others believe that policy supports innovation; directing innovation towards new market opportunities. Also, it is argued that where policy is long-term, it creates a stable climate of expectation and reduces uncertainty for innovating companies.

There are some indications that business is improving its environmental performance, e.g. reductions in greenhouse gas emissions and improvements in air and water quality. However, it is unclear to what extent these improvements have resulted from the use of NEPIs, or from other factors. For example, the UK's reduction in CO₂ emissions owes a lot to structural and operational change in business - 'natural' replacement of older technologies - and that simple economics encourages energy efficiency.

Assessing the impacts of policy and determining a link with the stimulation of innovation is difficult. There has, to date, been very little policy evaluation of the effectiveness of NEPIs, or of whether they stimulate or stifle innovation. This issue was highlighted by POST in 2000, and more recently in a review by the Policy Studies Institute (PSI).^{2,8} The PSI review pointed to a continuing lack of research internationally, with very few studies of adequate quality.

Overall, there is currently insufficient evidence to allow any firm conclusions to be drawn on the effectiveness of NEPIs. Recognising this, the DTI has stated that it will work with the Department for Environment, Food and Rural Affairs and the Environment Agency to examine how environmental regulations can promote innovation and business opportunities in environmental technologies. The team will look at the implementation of IPPC, the design of products and the regulation of vehicle emissions. This work is expected to be completed in mid-2004. Also, over the next few years, the European Environment Agency (EEA) will evaluate the effectiveness of EU environmental policies and their implementation.

Acceptability of NEPIs

The Confederation of British Industry (CBI) sees a role for economic instruments but is concerned that some environmental taxes have been introduced too rapidly, leading to poor policy design and legislation, inadequate thought for the impacts on competition, and little stated justification for the measures.⁹ They also argue that all NEPIs should be revenue neutral to maintain competitiveness, and should encourage business to

invest in R&D. Questions are also raised about whether environmental policy focuses too heavily on business rather than on other sectors (e.g. transport and housing).

A survey of business by the environmental group Green Alliance found there was widespread support for economic instruments as part of a package of measures including taxes, trading, and voluntary agreements (see box on page 2). However, there were concerns that VAs would not work without the threat of sanctions. The Green Alliance itself recommends that Government and business should develop credible and transparent voluntary agreements, with ambitious targets that require innovation and behavioural change, and which include strong penalties for missing targets.¹⁰

There is a broad consensus that for environmental policy to be most effective, the best approach is to use a combination of instruments. This includes both NEPIs and the traditional command and control approach, to which business already responds. As an example, participants in the Green Alliance study called for a clearer and more strategic approach to climate change and energy policy, applying to all sectors, and clearer long-term objectives to provide greater certainty to drive business planning and investment. There was also a call for the Government to lead by example, using its strong buying power to help drive the market. The Government recently announced that it will purchase certain products that comply with minimum environmental standards.

The influence of the EU

Most UK environmental policy originates from the EU. The implementation of EU legislation has (in some instances) inhibited the use of NEPIs in the UK. In particular, Europe-wide standards and tight deadlines for compliance mean that policy has had little option but to rely heavily on 'command and control' regulation.³ The EU is shortly to publish an Environmental Technology Action Plan, addressing what is deterring new environmental technologies and how innovation in this area can be stimulated. The UK Government has proposed suggestions to improve progress:

- better use of EU R&D programmes to promote environmental technologies
- state aid rules to allow Government support for the development of new environmental technologies
- environmental legislation focussed on outcomes rather than prescribing how they should be achieved
- tackling climate change through renewable energy and energy efficiency
- medium and long-term strategies that reduce uncertainty in the direction of policy
- public procurement across Europe focussed on purchasing less damaging goods and services.

Remaining challenges for UK environmental policy

Environmental policy will continue to evolve to meet targets, but the DTI has recognised that several challenging issues remain:

- a continuing lack of policy evaluation means that it is not currently possible to establish firmly which

environmental policies are most effective in meeting environmental objectives

- environmental and innovation policies remaining disconnected and hence less able to stimulate innovation in environmental technologies. The DTI innovation strategy noted that "*there is a particularly strong case for Government to join up its innovation and environmental policies to reduce the costs of environmental damage.*" At present, however, there are no firm plans on how to do this
- existing evidence indicating that no single policy style or mechanism is necessarily appropriate to all businesses in all business sectors. As such, there is a need to tailor policy to make it more effective.

Overview

Environmental policy has evolved to reflect changing attitudes towards the environment. In recent years, a new generation of policy tools (NEPIs) has been introduced, which includes environmental taxes, trading systems, and voluntary agreements. Their reception has been mixed. Both industry and NGOs acknowledge that NEPIs could have benefits in terms of flexibility and effectiveness. However there are also concerns over their effect on competitiveness. Meanwhile, there has been little research providing reliable evidence on their impact. Questions therefore remain over the efficiency and effectiveness of such instruments in meeting environmental goals or in stimulating innovation in environmental technologies. In its recent innovation strategy, the DTI recognised these deficiencies, and will undertake a review (reporting in summer 2004) of how environmental regulation can encourage innovation.

Endnotes

- 1 *Competing in the Global Economy: the Innovation Challenge*, DTI, December 2003.
- 2 *Cleaning Up? Stimulating Innovation in Environmental Technology*, POST Report No. 136, April 2000.
- 3 *'New' Instruments of Environmental Governance? National Experiences and Prospects*, Jordan, A., et al, London: Frank Cass & Co. Ltd., 2003.
- 4 *Changing Patterns: UK Government Framework for Sustainable Consumption and Production*, DEFRA/DTI, October 2003.
- 5 *Leaders and Laggards: Next-Generation Environmental Regulation*, Gunningham, N., and Sinclair, D., Sheffield: Greenleaf, 2002.
- 6 *Voluntary approaches for environmental policy, Effectiveness, efficiency, and uses in policy mixes*, OECD, 2003.
- 7 *The UK Innovation Systems for New and Renewable Energy Technologies*, ICCEPT & E4tech, June 2003.
- 8 *Resource Productivity Innovation: Systematic Review*, Policy Studies Institute, September 2003.
- 9 *Green Taxes, Rhetoric and Reality*, CBI, April 2002.
- 10 *Next Steps For Energy Taxation, A Survey of Business Views*, Green Alliance, November 2002.

POST is an office of both Houses of Parliament, charged with providing independent and balanced analysis of public policy issues that have a basis in science and technology. POST is grateful to Clare Bayley for preparing this briefing and to the Economic and Social Research Council for funding her Fellowship with POST.

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