

**THE CONTRIBUTION OF EU MONITORING AND REPORTING
TO
'SOUND AND EFFECTIVE' ENVIRONMENTAL POLICY-MAKING**

FIRST DRAFT

Draft Paper I for the project:

Towards a new EU framework for reporting on environmental policies and measures.

Prepared by:
David Wilkinson
Institute for European Environmental Policy, London
under contract to the European Environment Agency.

Project Manager: Maria Teresa Ribeiro

21 September 1999

FOREWORD

The 1998 'Bridging the Gap' conference on future monitoring and information requirements concluded that:

At present some of the systems for monitoring and gathering information about the environment in European countries are inefficient and wasteful. They generate excessive amounts of data on subjects which do not need it; and they fail to provide timely and relevant information on other subjects where there is an urgent policy need for better focused information, and for consistent environmental assessment and reporting.

The conference recognised the need for a concerted pan-European movement involving the EEA, the European Commission and Member States:

- to streamline environmental monitoring and practices;
- to focus new information gathering on key issues and perspectives; and
- to develop an agreed system of indicators to illuminate the significance of environmental change and the progress of sustainability.

One key area where monitoring and reporting falls short of the needs of policy makers is in relation to the actual *effects* of policy measures on the state of the environment, and their *effectiveness* in relation to policy objectives. Current reporting obligations in most items of EU environmental legislation require Member States to collect and report only basic environmental data, and the legal and administrative steps taken to implement Community obligations. Only a small number of recent measures require them to assess and report on the actual impact of measures on the ground, and even here agreed methodologies are lacking for undertaking such evaluations.

The need for a more useful and cost-effective system of reporting applies not only to explicitly environmental policies, but also to sectoral policies with a significant impact on the environment (for example, in relation to transport, agriculture, energy etc), and to initiatives to integrate the needs of the environment into those sectoral policies.

The European Environment Agency has an important role to play in the development of better systems of monitoring, evaluation and reporting, as a contribution to more effective environmental policy-making. This is spelled out in the recently-amended Regulation establishing the EEA (see Box 1).

This paper seeks to illustrate how little we currently know about the actual effects of environmental and environment-related policies, and how monitoring and reporting systems more useful to policy makers need to be developed to bridge the gap.

Box 1: Regulation 1210/90, as amended by Regulation 933/1999, establishing the EEA and EIONET

‘ The objective (of the EEA and EIONET) shall be to provide the Community and the Member States with:

- objective, reliable and comparable information at European level enabling them to take the requisite measures to protect the environment, to assess the results of such measures, and to ensure that the public is properly informed about the state of the environment.....’ (Article 1 (2))

‘ For the purposes of achieving the objective set out in Article 1, the tasks of the Agency shall be: to provide the Community and the Member States with the objective information necessary for framing and implementing sound and effective environmental policies; to that end, in particular to provide the Commission with the information that it needs to be able to carry out successfully its tasks of identifying, preparing and evaluating measures and legislation in the field of the environment;

- to assist the monitoring of environmental measures through appropriate support for reporting requirements (including through involvement in the development of questionnaires, the processing of reports from Member States and the distribution of results), in accordance with its multiannual work-programme, and with the aim of co-ordinating reporting....’ (Article 2 (ii) (part)).

EXECUTIVE SUMMARY

- This paper highlights the need for a more useful and cost effective system at EU level for monitoring and reporting on the actual *effects* of policy measures on the state of the environment, and their *effectiveness* in relation to policy objectives.
- The *ex-post* evaluation of the impact of policy measures is of key importance for
 - establishing future trends in the state of the environment
 - policy learning
 - assessing the cost-effectiveness of measures in comparison with alternatives.
- The effects of measures on the ground can vary widely for a variety of reasons, and may differ greatly from the expectations of policy makers, or the predictions of policy models and scenarios. The 'DPSIR' framework linking Driving Forces - Pressures - Impacts - Responses is a useful tool for illuminating the complex pathways through which policy measures may or may not eventually come to affect the biophysical environment.
- Our knowledge about these effects is currently limited, and the data and information supplied by Member States under current EU reporting requirements - with a few important exceptions - does not enable the Commission or the European Environment Agency to undertake evaluations of the effect and effectiveness of EU measures. The paper examines four case studies to illustrate how different EU measures can have varying impacts on the state of the environment - and the difficulty in establishing such links with the currently limited availability of data, information and analysis.
 - In the case of lead in petrol, data is available from a variety of sources to establish the clear link between, on the one hand, reductions of lead in leaded petrol and increased sales of unleaded, and on the other hand, reductions of lead pollution in air, and of blood lead levels in urban areas. Better monitoring and reporting by Member States would have made the message clearer to policy makers and the public, and could have helped disaggregate the different contributions to cleaner air of reductions of lead in leaded petrol; tax differentials in favour of unleaded fuel; and the introduction of catalytic converters in new cars.
 - By contrast, the Nitrates Directive 91/676 has had a limited effect in Member States. To date, this results largely from failures of implementation, but there are also doubts about the adequacy of the design of the Directive. Important requirements for Member States to report on the effectiveness of action programmes to reduce nitrate pollution have been unsuccessful, and need to be supported by standardised methodologies for evaluating such programmes.
 - There is an intuitive link between the sale of eco-labelled products and reductions in pollution and/resource use. In the case of the EU's Eco-label Regulation 880/92, such effects are unknown since Member States are not required to report on sales of labelled products, nor assess the impact of such

sales on environmental quality. Studies of experience in Sweden suggest that such assessments are possible, and useful.

- Models and scenarios which seek to predict the future state of the environment must include assumptions on the impact of current and future policy initiatives - but these are normally untested by *ex post* evaluations of the actual effects of such (or similar) policies. The EU's *Strategy and Action Plan for Renewable Sources of Energy* makes large assumptions about the potential contributions of different sources of renewable energy, even though there must be great uncertainty surrounding future developments in such a policy-sensitive area. The Communication acknowledges that only monitoring and *ex post* evaluation of Member States policies and measures can establish likely future trends.

- Producing answers about the effects and effectiveness of EU and national policy measures requires a review of the entire Monitoring - Data - Information - Analysis - Reporting (MDIAR) chain. The nature of the data collected, and how it is analysed should be determined by the importance of reporting on policy impacts.
- Requirements to assess and report on policy effects and effectiveness in several new items of EU environmental legislation has made such a review more urgent. In particular, the EU's CO2 Monitoring Mechanism has important implications for existing reporting requirements in several other EU measures.

Introduction

Despite more than twenty-five years of Community environmental policy, general environmental quality in the EU is not recovering significantly, and in some areas it is worsening.

That is the stark introduction to the European Environment Agency's latest environmental assessment report (1). The report observes that

Up to now what has been missing has been an assessment of whether the actual economic, sectoral and environmental policies over the next decade or so will bring improvements, or whether there are trends and developments pushing us off target and seriously challenging substantial progress.

So far in Europe, the link between policy measures – both explicitly environmental and sectoral policies - and their actual impact on the quality of the environment and patterns of resource use, has been inadequately explored. Some measures - both at EU and Member State levels - have clearly had significant effects, while others seem to have no impact at all. Policy makers generally remain ignorant of the precise impacts of their past policies; and although in developing new policies they may seek to rely on models and scenarios to help them predict their likely future effects, such models and scenarios themselves are often based on flimsy empirical evidence about how particular policies work.

A major contribution to the limited work has been done in the field of policy evaluation has been undertaken by the OECD, with a particular focus on the effects of economic instruments. The OECD concludes in one recent report that there is a need 'to look much more closely and systematically than has been the practice up to now at the performance in practice of regulatory policies using an administrative rather than an incentive approach to pollution control'.....'More evaluation, in short, could contribute to better policy'(2).

The reluctance of national governments and the EU's institutions to undertake or commission *ex post* evaluations of policies is not altogether surprising. Evaluations are technically difficult, and developing new policies also has more political appeal than raking over the consequences of old ones. However, assessing the past and future effects, and effectiveness, of policy measures is of key importance for

- establishing future trends in the state of the environment;
- policy learning - for understanding better what instruments work, and in what circumstances;
- assessing the cost-effectiveness of particular interventions - whether the same effects could be secured in some other way, at less cost.

The range of measures that need to be assessed is very broad. They extend well beyond the conventionally 'environmental', to include many sectoral policies (in

relation to agriculture, transport, energy etc), and also initiatives to integrate the needs of the environment into those policies. The Amsterdam treaty, and the so-called 'Cardiff' process requiring all formations of the Council of Ministers to produce their own 'integration strategies', reflect the key importance for environmental quality of such sectoral policies.

Establishing the past and likely future impact of policy measures requires carefully designed programmes of monitoring and ex-post evaluation. Because of the breadth of the task, for practical reasons the necessary data collection, assessment and reporting needs to be undertaken by Member States themselves, according to standard methodologies to enable comparisons and the aggregation of results to be undertaken at EU level. Currently - to take the example of EU environmental legislation - most reporting obligations require the transmission only of 'state of the environment' data, and of details concerning formal implementation arrangements. But with quantified targets now being set in relation to climate change, acidification, air quality and waste management, it is of key importance that reporting is extended to include

- descriptions of the measures Member States have or intend to put in place to attain those targets;
- assessments of the likely effects of those measures;

and that standardised frameworks and methodologies are established to enable comparisons and aggregation at EU level.

This paper is a modest first step towards that goal. It seeks to demonstrate that

- the effects and effectiveness of policy measures can vary greatly, and may differ considerably from the intentions of policy makers;
- our knowledge about these effects is limited, and current reporting obligations, where they exist, do not generally include a requirement to undertake *ex post* evaluations of the impact of policy measures;
- where such assessments are required, there is an need for standardised methodologies, which currently do not exist.

To illustrate these points in a concrete way four widely-differing case studies of EU policy measures and initiatives are examined:

- measures to reduce pollution from lead in petrol;
- directive 91/676 reducing nitrates pollution from agriculture;
- the EU's eco-label regulation
- the EU's strategy for developing renewable sources of energy.

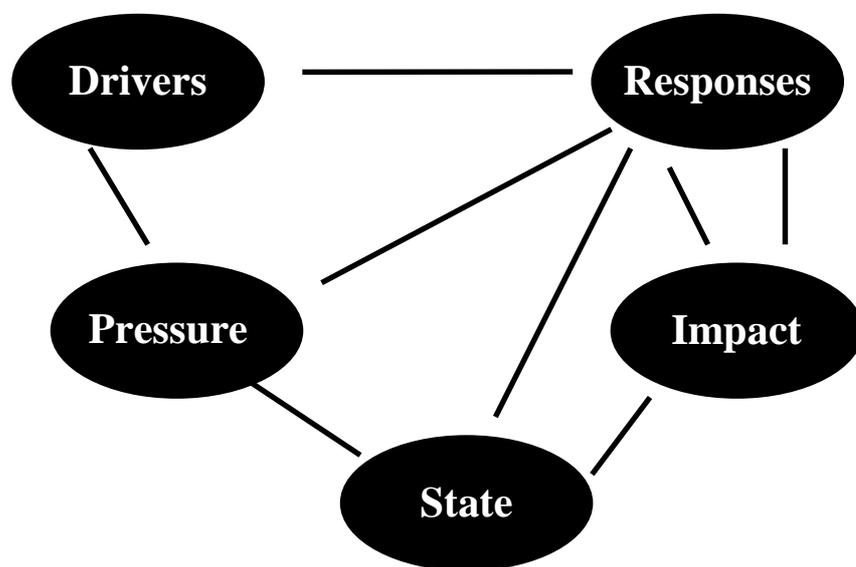
The paper begins, however, with an exploration of the various pathways by which policy measures can affect the state of the environment, and the health of human beings and/or ecosystems.

1.0 How The ‘State Of Action’ Influences The State Of The Environment.

In order to clarify the origins and consequences of environmental problems, the EEA has developed the so-called DPSIR framework (Fig.1.0). This is a useful tool for illustrating the causal links between

- **Driving Forces (‘D’)** (e.g. economic sectors, human attitudes and activities) - which give rise to
- **Pressures (‘P’)** (e.g. emissions, waste) - which produce differing environmental
- **States (‘S’)** (physical, chemical and biological) - which have various
- **Impacts (‘I’)** (on ecosystems, human health and functions) - which may give rise to various political and social
- **Responses (‘R’)** (legislation, economic instruments, public expenditure, voluntary agreements, consumer campaigns etc.) to address the problem.

Figure 1.0: The Driving Forces-Pressures-State-Impact Responses (DPSIR) framework



Driving forces, such as population and economic growth, urbanisation and agricultural intensification, result in emissions of pollutants and other pressures which affect the state of the environment and, in turn, may impact on human health. Responses may address the driving forces themselves as well as seek to reduce their direct pressures or indirect effects on the state of the environment and human health.

Source: ‘Europe’s Environment: The Second Assessment’, EEA 1998

‘Responses’ in the DPSIR framework are what have been described elsewhere as the ‘state of action’ – that is, those measures taken by governments at various levels;

economic sectors; or consumers and the general public to address perceived environmental problems.

Although 'R' comes last in the DPSIR acronym, and the word 'responses' suggests a passive rather than an active element in the relationship, the iterative nature of the inter-relationship means that policy responses are capable of influencing the nature and intensity of all the other elements. In practice in Europe, environmental policy responses have traditionally been directed towards the various pressures on the environment (P). But there are a few examples of measures intended to improve directly the state of the environment (S) (e.g. the liming of acidic lakes and the re-introduction of extinct species), or to minimise the impact 'I' of pollution on receptors (e.g. spatial zoning; public warnings of high urban ozone levels; and ensuring that polluted water is not offered for human consumption, by means of the EU's Drinking Water Directive).

Understanding the nature of the links between all the elements in the DPSIR framework is of key importance in analysing the causes, intensity and consequences of environment problems, as well as the effects and effectiveness of the policy responses designed to address them.

The following factors appear to be significant in determining the influence of R:

- **The element (D, P, S or I) in the causal chain at which R directed.** For example, legislation enabling greater public access to environmental information (targeted at D) will have effects on S which are indirect (through P), and which are likely to be subtle, diffuse and long-term. By contrast, outright product bans (eg in relation to varieties of pesticides) can have an influence on P and I which is immediate and visible.
- **The scope and intensity of the measures:** The EU's Common Agricultural Policy takes up 50% of the EU's budget and regulates the majority of agricultural activity in the Member States. It is *the* major determinant of D in respect of agricultural intensification in Europe. By contrast, measures to regulate ambient noise levels, or improve soil quality, are in all Member States far less developed and more marginal, and thus have only a limited influence on P.
- **Scientific knowledge:** How well do policy makers understand the scientific and/or socio-economic causes of the problem that needs to be tackled?
- **The design of the measures:** How suitable are the chosen policy instruments for their purpose, and how well targeted are they? In other words, how likely is it that the **outputs** of the policy (i.e. legislation, taxes, public expenditure, deployment of staff, information campaigns etc.) will have the anticipated **outcomes** (effects on the behaviour of targeted sectors, firms or individuals); and that these outcomes will have the anticipated **effects** on the intensity of driving forces and/or pressures.

- **The implementation of the measures:** How fully are the intended outputs of the policy actually implemented on the ground, in practice? This is a particularly important issue where the delivery of the policy is very decentralised (as is often the case in the EU), and/or depends for its success on influencing a variety of independent actors. Thus, controlling polluting emissions from a small number of stationary sources is easier than from diffuse sources.

The DPSIR framework is therefore useful in highlighting how the state of action at both EU and national levels can have significant, and sometimes critical, effects on the state of Europe's environment, and how policies themselves need to be reassessed and re-designed in the light of these effects. As discussed above, the links between policy measures and their environmental and health impacts are usually indirect, complex, and can be easily misunderstood or over-simplified. Highly sophisticated models have been developed in areas such as climate change and acidification to predict the impact of various future policy scenarios. But the robustness of such models ultimately depends on the assumptions that are fed into them. These assumptions also need to be continually evaluated in the light of the *actual* impacts of individual policy measures, assessed by means of systematic monitoring, reporting and *ex post* evaluation.

In undertaking such evaluations, it is important to distinguish between questions concerning the *effects* of policy measures, and questions relating to their *effectiveness*. They overlap, but they are not the same, and may be of interest to different institutions.

- Assessing the *effects* – intended and unintended - of policy measures on environmental quality or resource use is clearly of central importance in describing the current state of the environment and likely future trends.
- Assessing the *effectiveness* of measures – that is, whether and how far measures attain some pre-determined objective or benchmark – is necessary for policy learning. Do particular policy outputs in reality produce the outcomes predicted for them, and in what circumstances? Could a better result be achieved with some alternative policy instrument (a market-based measure rather than legal regulation, for example). Or is it simply a question of fine-tuning an existing measure? In this regard, comparative evaluations of varying policy measures applied in different Member States can be particularly instructive.
- In addition, policy evaluations are a pre-requisite for determining the *cost-effectiveness* of measures. Are the observed effects worth the resources spent on achieving them? Are economic instruments more efficient than regulations, and in what circumstances? In other words, to quote the US Defence Department, could we get 'more bang for a buck'?

A Norwegian Committee established in 1992 to evaluate environmental policy instruments concluded

The establishment of systems of outcome assessment should be an integrated part of the use of instruments in any area. Such follow-up processes will enable

the authorities both to correct the course if necessary, and also accumulate experience regarding the properties of the different environmental policy instruments, both in respect of environmental impacts and of costs (3).

2.0 CASE STUDIES

Case Study 1: Reducing Lead in Petrol - Directives 85/210 and 87/416

Instrument:	Legislation - <i>product standard</i>
Target:	Pressure - <i>air emissions</i>
Requirement to monitor effects?	No

Introduction

In the early 1980s great controversy surrounded the relationship between levels of lead in petrol (P, Pressure), lead pollution in air, particularly in inner urban areas (S, State of the environment), and the effects of lead in air on humans, particularly on the mental development of children (I, Impact).

In 1982, an official Circular from the UK Department of the Environment to local authorities (4) observed that:

Lead in air, released on a national scale by petrol engines and more locally from industry, is not for most people the major source of lead intake... Food is the largest direct contributor to lead intake for most people in the UK.

This official view mirrored that of the Associated Octel company, which manufactured lead additives. Its Chief Medical Officer, a Dr P S Barry, had written to the London *Times* in March 1982 in response to an earlier letter from Dr Robin Russell-Jones, a leader of the UK pressure group CLEAR (5). Dr Barry wrote:

There is no evidence which shows 'that low level lead exposure is a major cause of intellectual deficit in urban children' or that 'the health effects of lead in petrol are nothing less than catastrophic, when applied to the population as a whole'. Such emotive language is inexcusable in an accredited professional. Lead in petrol makes a small contribution to the body burden of lead, estimated by measurement as about 10 per cent...

From 1978, the introduction of EU legislation both limiting the maximum level of lead in leaded petrol, and encouraging the sale of unleaded petrol, provided a unique opportunity to establish beyond doubt the links between P, S and I. The monitoring of lead levels in air and in blood during the 1980s and 1990s has provided incontrovertible proof of the damage that lead in petrol had been inflicting on the people of Europe.

Requirements of the Directives

In the early 1970s, permitted lead levels in petrol differed considerably between the then Member States, with some having limits up to 0.84 grams per litre, and some having no limits at all. Pressure from the Federal Republic of Germany resulted in agreement to EC Directive 78/611, which set the maximum permitted lead content of petrol sold within the Community at 0.40 grams per litre. Member States could set an upper limit between 0.40g/l and 0.15g/l (which applied in Germany from 1976), but they could not insist on less than 0.15g/l on the grounds that this was the lowest level thought to be useable in many existing petrol engines without special adaptations.

Further reductions in the lead content of petrol were foreshadowed by Directive 85/210, which came into effect on 1 January 1986. It required Member States 'as soon as they consider it appropriate' to reduce the maximum limit to 0.15g/l. Unleaded petrol was also to be made available from 1 October 1989 throughout all Member States, who were to promote its widest possible use in all existing vehicles. In addition, to encourage sales of unleaded petrol, a further Directive 87/416 permitted Member States to ban the marketing of regular 2-star leaded petrol, on the grounds that cars capable of running on 2-star can also use unleaded fuel without modification.

Meanwhile, the use of unleaded fuel was further encouraged in the Community by increasingly stringent restrictions on permitted emissions from new vehicles of other pollutants - restrictions which effectively required the fitting of regulated three-way catalytic converters. Catalytic converters can operate only on vehicles that run on unleaded fuel. Directive 91/441 tightened earlier legislation so that catalytic converters became compulsory for all new car registrations from 1 December 1992.

Effects on urban air quality

In most European cities, the impact of the reduction in the maximum level of lead in petrol to 0.15g/l was dramatic. Annual average lead concentrations in air in the majority of European cities for which monitoring data is available dropped immediately after 1986 (see Fig 2.1-1). In the UK, where immediate advantage was taken of Directive 85/210 to reduce the maximum level of lead in leaded petrol from 0.4g/l to 0.15g/l on 1 January 1986, urban air lead levels in central London were halved in the course of just a few months (see Table 2.1-1).

Figure 2.1-1: Annual Lead Concentrations for Selected European Cities, 1982-1996

Source: EEA-ETC/AQ

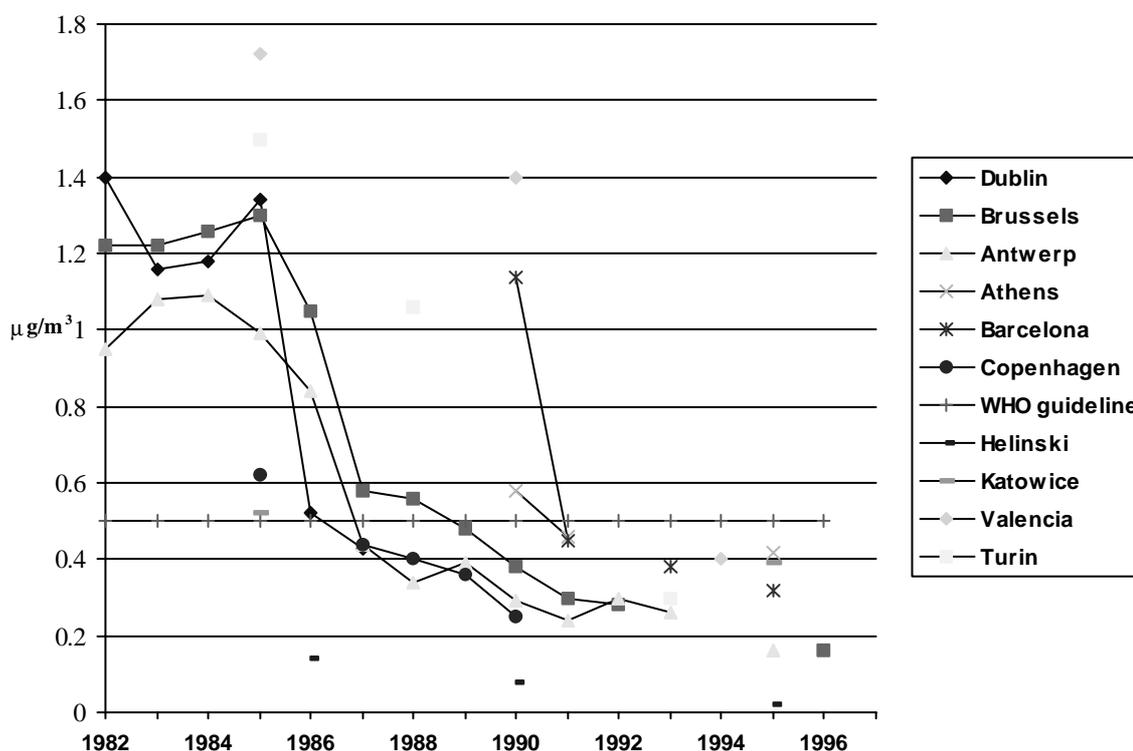


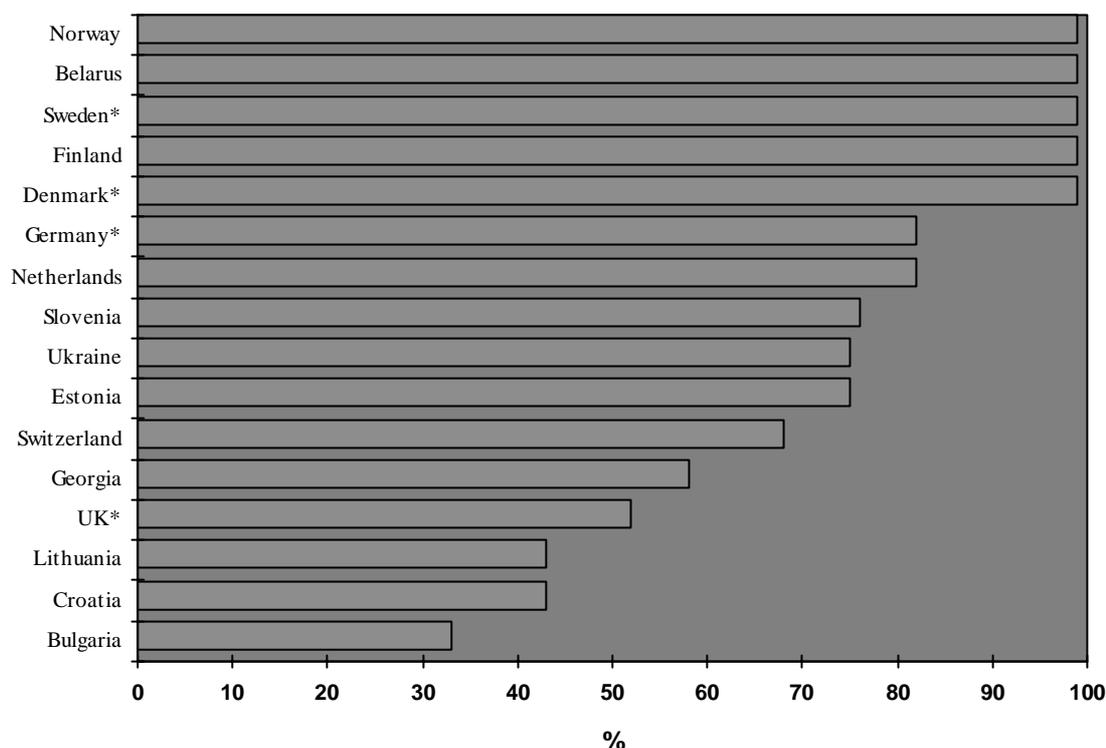
Table 2.1-1: Annual mean airborne lead concentrations at UK sites 1980-1990 (ng/m³)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
KERBSIDE											
Cromwell Road	-	-	-	1,370	1,410	1,450	660	-	-	-	380
URBAN											
Central London	640	580	630	470	520	480	270	280	300	220	-
Brent (London)	770	710	890	990	-	640	300	290	320	-	220
Leeds	650	370	450	440	260	310	180	190	140	-	120
Motherwell	260	230	300	240	180	260	190	180	-	-	200
Glasgow	460	330	240	420	190	270	120	180	130	140	95
Cardiff	-	-	-	-	-	1,280	630	630	620	570	460
Manchester	-	-	-	-	-	2,040	810	810	760	640	510
Newcastle	-	-	-	-	-	180	130	150	110	110	70
North Tyneside	-	-	-	-	-	290	150	190	140	120	81

Source: 'The UK National Air Quality Strategy', 1997

Throughout the EU, this reduction was reinforced and sustained during the 1990s by the introduction and increasing use of unleaded petrol, reflecting the rising share of catalyst-equipped cars in the vehicle fleet, and tax differentials in favour of lead-free fuel in all Member States (see Table 2.1-2) (6).

Table 2.1-2: Reductions in Lead Emissions from Petrol, 1990-1996

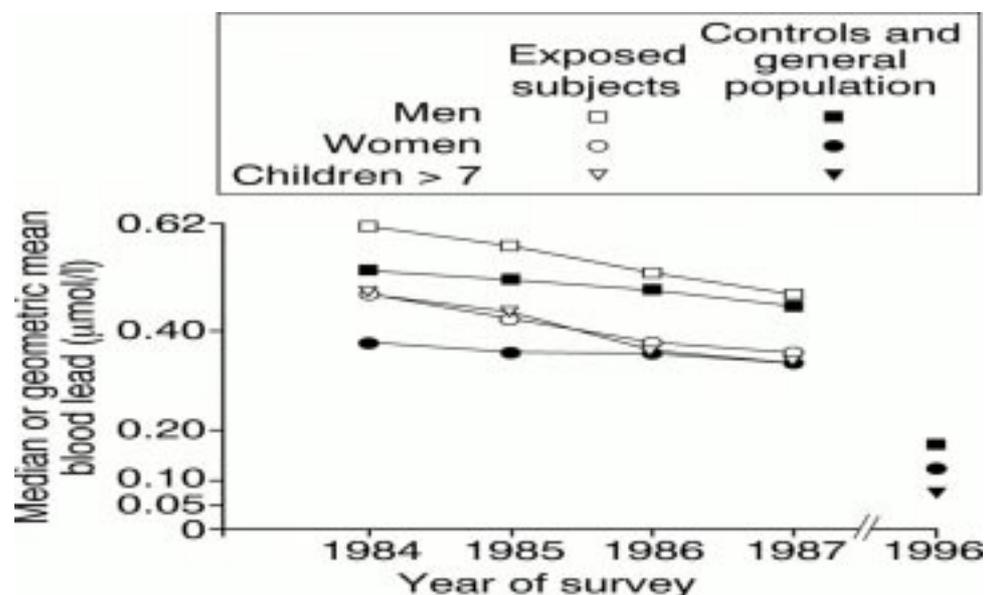


Note: * data refers to change between 1990 and 1995.
 Source: Danish EPA, 1998

Impact on lead levels in blood

In the UK, the marked improvement in the state of the environment (S) was mirrored in a dramatic improvement in the impact (I) on human health. A 1995 survey of almost 7000 subjects in eight regions throughout England indicated that, compared with an earlier monitoring programme in 1984-7 (i.e. before unleaded fuel was available), blood lead concentrations had fallen by about two-thirds in adults and between 70 and 80 per cent in children. The data indicated that 97 per cent of the UK population who are exposed only to environmental sources of lead had blood lead concentrations below 10µg/100 ml.(see Fig 2.1-2). This reflected earlier experiences in the US and Japan. Tellingly, the US switch to lead free in the 1970s occurred in two phases, with an interlude in between when the use of leaded petrol remained constant. During that interval, the drop in blood lead levels was also halted.

Figure 2.1-2: Decrease in blood level concentrations in groups at risk of increased lead uptake from traffic emissions and in control subjects living in areas without heavy traffic and in general population, UK 1984-1996



Source: *British Medical Journal*, 1996: 313:883-884

Reporting on the effects of the Directives

Evidence for the clear link between lead levels in petrol, urban air quality and blood lead levels is derived from a variety of disparate sources. Regrettably, reports by Member States to the Commission are not among them. There was no requirement in Directive 85/210 to monitor and report on the impact of the Directive - such information was to be made available to the Commission only at its specific request (Art. 6), which was never made.

An earlier and important EU monitoring measure – unique then and since among the EU's *acquis communautaire* – was allowed to lapse after only a few years. This was Directive 77/312 on the biological screening of the population for lead, which came into effect in 1978. It required Member States to undertake two screening campaigns of blood lead levels, separated by an interval of two years, using comparable methods of analysis. During each campaign, sampling was to be carried out on three target groups

- people in urban areas greater than 500,000 inhabitants
- people exposed to significant sources of lead pollution
- critical groups determined by the competent authorities in the Member States.

Where specified reference levels were exceeded, Member States were to take action to identify the sources responsible, and then take all 'appropriate measures'.

The Commission reported in 1981 that during the first screening campaign, almost 18,000 people were sampled from 168 separate areas and population groups (7). Significant differences in blood lead levels were apparent in the different study areas. The median blood lead level for the selected population was 13µg lead/100ml blood. Just over 2% of the subjects examined exceeded 30µg, and 1.05% exceeded 35µg. The Commission concluded that 'in general the levels were lower than could have been anticipated from earlier fragmentary studies', and promised a second screening campaign focused on particular problem areas.

But the results of the second screening campaign were never published, even though the Directive formally required annual reporting, and a general report at the end of the programme. One of the reasons for this was that, almost uniquely for an item of Community legislation, the life of the biological screening Directive was limited to only four years, reflecting the reluctance of some Member States to bear the costs of regular screening programmes. A likely further reason was the lower than expected blood lead levels that the first campaign revealed.

Conclusion

The brief life of Directive 77/312 was regrettable. If Member States had been required to monitor and report simultaneously and regularly on:

- the availability and sales of leaded and unleaded petrol
- lead levels in air at standard monitoring points
- blood lead levels in target groups

it would have demonstrated to policy makers and the public beyond doubt the strength of the links between EU legislation, the state of the environment, and human health. As it was, the link had to be established through data that was not comprehensive and collected from various sources.

In addition to establishing the link between P, S and I in the DPSIR framework, monitoring along these lines would have contributed to policy learning, by enabling useful comparisons to be made between different Member States of the relative importance of such factors as the rate of replacement of the vehicle fleet, and the varying levels of tax differential applied in different Member States in favour of lead-free petrol.

Case Study 2: Nitrates in water: Directive 91/676 on reducing pollution caused by nitrates from agricultural sources.

Instrument	Legislation - <i>Restrictions on targeted groups</i>
Target	Pressure - <i>Diffuse pollution from excessive fertiliser use</i>
Requirement to monitor effects?	Yes

Introduction

The Nitrates Directive 91/676 came into effect in December 1993, with the objective of reducing water pollution caused by the run-off of nitrogen fertilisers applied to agricultural land. The history of the Directive illustrates well the point made in Section I – that the effect of a policy measure on the state of the environment depends both on how well it is designed, and on how fully it is implemented. It also highlights the difficulty of requiring Member States to evaluate and report on the effects of measures, without providing them with standard guidelines on how it should be done.

Six years after the Directive came into effect, the EEA reports that

Nitrate concentrations in EU rivers have shown little change since 1980, and the reduced use of nitrogen fertilisers in agriculture does not seem to have resulted in lower levels of nitrate. In some parts of the EU, drinking water contaminated by nitrate is a serious problem, particularly where it is taken from relatively shallow groundwater sources with significant time lag in recovery' (8)

The Directive seems to have had no discernible impact so far on the state of the environment. Why?

Requirements of the Nitrates Directive

The Directive required Member States to monitor water quality and identify surface and ground waters affected by excessive nitrate pollution, on the basis of a number of criteria. The catchment areas draining into such waters were to be identified as vulnerable zones, and Action Programmes were to be established in these zones, to reduce the application of fertilisers and the storage of animal manure. These programmes were to be established by the end of 1995.

In addition, Member States were to develop voluntary codes of good agricultural practice to reduce nitrate pollution, which all farmers were to be encouraged to apply to all agricultural land, regardless of location.

An important and unusual feature of the Directive was the nature and extent of monitoring and reporting requirements. Member States were required not only to *describe* the content of action programmes, but also to assess their *effectiveness* in reducing nitrate pollution, in order to enable adjustments should they prove to be inadequate. Member States were also required to estimate the likely future timescale within which identified waters were expected to respond to the measures in the action programmes 'along with an indication of the level of uncertainty incorporated in these assumptions'. The Directive contained no standard methodologies for evaluating effectiveness or making future projections.

The results of monitoring and evaluation were to be contained in four-yearly reports by the Member States to the Commission, the first to be submitted in June 1996 covering the period December 1991-December 1995.

Effects of the Nitrates Directive

A fundamental feature of the Nitrates Directive has been the widespread implementation failures by Member States. These are described as 'abysmal' by the Commission, in a scathing report issued in October 1997 (9), and have resulted in infringement proceedings against no fewer than 13 of the 15 Member States. Implementation failures have related *inter alia* to the limited criteria employed to designate nitrate vulnerable zones, the late designation of such zones, and the failure to establish Action Programmes.

Such implementation failures make it difficult to assess the *design* of the Directive, i.e. if it had been fully applied, would it have begun to reduce nitrate levels in sensitive watercourses?

Implementation failures have extended to Member States' reporting obligations. In the first reports to the Commission, details of Action Programmes were submitted only by Austria, Denmark, Germany, Luxembourg, Netherlands, Sweden and France. The reports themselves were late. By the due date of June 1996, only Ireland had submitted a report; six months later, reports were still awaited from Belgium, Italy and Spain.

These first reports also proved to be disappointing in relation to the evaluations of the effectiveness of programmes requested in Article 5(6). Austria measured and reported on *outcomes* - in the form of changes in fertilisation practices and livestock numbers - rather than *impacts* on water quality. Denmark reported on both outcomes and biological indicators of water quality. Sweden deployed a complex model for estimating *a priori* the extent nitrate leaching. In relation to forward projections of the effect of action programmes, Sweden was the only Member State to be specific, estimating that its 50 per cent reduction target in the nitrate load in marine waters would be achieved by 2005. France reported that future trends depended on winter

rainfall totals, while Germany considered that the time lag would be ‘substantial’ due to geological factors.

More generally, the Commission itself accepted that the reporting requirements of the Directive would have been improved had they contained a requirement to report on the problems experienced in its implementation (10).

The design of the Nitrates Directive

The experience of the Nitrates Directive illustrates that there are two essential preconditions for assessing the current and future effects and/or effectiveness of any policy measure. Such assessments require that:

- the measure is fully and properly implemented, and
- information of the appropriate kind is collected and reported to the Commission by the Member States on a regular and consistent basis.

Neither of these conditions has so far applied .

It is important to emphasise that the full and proper implementation of the Nitrates Directive might still not secure its objective of significantly reducing nitrate pollution in Member States. The design of the Directive allows considerable discretion as regards the stringency of Member States’ Action Programmes in vulnerable zones. The only quantified requirement for inclusion in Action Programmes - a maximum limit per hectare of 170kg N on the application of livestock manure - is subject to the possibility of a four-year derogation, and there is scope for other national variations. As a result, the response of Member States may well be inadequate to secure significant improvements.

Experience in Denmark suggests that even where detailed and stringent limitations on the use of nitrogen fertilisers apply, the concentration of nitrates in watercourses is in practice slow to respond (see Box 2). There is similar evidence from Sweden. Agriculture contributes some 42 per cent of Sweden’s share of the nitrogen load to the Baltic Sea, but an action programme to reduce nitrate leaching from agriculture in Laholm Bay on the west coast, launched in 1986, has yet to be successful. By mid-1995, the goal of reducing the total loading of the bay by 25 per cent was far from being attained, despite numerous actions at the local level (11).

Box 2: Measures to reduce nitrates from agriculture in Denmark (12)

In Denmark, pollution of surface and ground water by nitrates from agriculture is a major problem. Livestock density is among the highest in the EU, after the Netherlands and Belgium – as is the intensity of use per hectare of nitrogen fertilisers (both commercial and livestock manure). The concentration of nitrates in watercourses in agricultural areas is at least five times higher than in areas dominated by natural habitats. In the early 1990s it was estimated that leaching from agricultural land accounted for about 80% of the total nitrogen loading in watercourses.

Since 1985, the Danish Government has introduced a number of increasingly stringent Action Plans to reduce nitrogen discharges from agriculture. The most recent have been the 1991 Action Plan for Sustainable Agriculture, and the 1998 Action Plan for the Aquatic Environment. The former set a target of a 50% reduction by 1993 of the 1985 level of nitrogen discharges from agriculture. In quantitative terms, this amounted to a reduction of 100,000 tonnes from field leaching and surface run-off, and 27,000 tonnes from farmyard manure storage. The deadline for the achievement of these targets was subsequently postponed until 2003.

Since 1985, the Danish Government has introduced a battery of measures to achieve reductions in N discharges. They include:

- limits on livestock density;
- restrictions on the timing and location of manure spreading;
- minimum manure storage capacity on farms, and grants towards storage investment costs;
- an (increasing) minimum ratio of manure to commercial fertiliser in the application of nitrogen on individual farms;
- annual farm crop rotation plans to ensure that 65 % of farmland is under green cover crops during autumn and winter;
- farm-level annual fertilisation accounts (since 1994) showing total crop demand for nitrogen, and actual use of nitrogen;
- economic instruments (since 1998) in the form of fines imposed on farmers for excess fertiliser use; and a tax on fertilisers purchased by farmers not preparing fertilisation accounts;
- designation (since 1997) of 2,500 Sensitive Farming Areas covering 13% of the agricultural area in use in each county.

Despite the increasing scope and intensity of these measures, during the period 1989/90 - 1995/6, only around one-third of the reduction target of 100,000 tonnes of nitrogen discharges from field load was achieved. Modelling suggests that existing measures should be sufficient to reduce nitrogen discharges by a further third by 2003 - the deadline postponed from 1993. It is hoped that the remaining one-third reduction will be achieved by the 1998 Action Plan for the Aquatic Environment.

Conclusion

The Nitrates Directive has so far had little discernible impact on the behaviour of EU farmers (P), and on the levels of nitrate in watercourses (S). This does not necessarily mean that it will be permanently ineffective: only when Member States implement the measure fully will it be possible to tell whether its design is adequate. However, experience elsewhere suggests that its requirements may not be sufficiently stringent to achieve its objectives.

A positive feature of the Directive is the obligation for Member States to report on the effectiveness of action programmes. This is a considerable advance on most other EU legislation, but it requires additional standardised guidelines from the Commission on how it should be done. If reporting was of a better and more uniform standard, then it

would be easier for the Commission to judge whether more stringent requirements should be added to the Directive.

Case Study 3: Increasing consumer awareness: EU Eco-label Regulation 880/92

Instrument:	Voluntary instrument - <i>Public awareness through labelling</i>
Target:	Driving Forces; Pressures - <i>Consumer attitudes; better products</i>
Monitoring requirements in Regulation?	None

Introduction

Eco-labelling programmes operate in a number of EU Member States in parallel with the EU's own eco-label scheme established in 1992. Eco-labels are awarded to those products with a low environmental impact measured over their entire life cycle, and are designed to influence consumer choice (D) and encourage manufacturers to produce more environmentally-friendly products (P). The eventual impact on the state of the environment (S) of an eco-label scheme is determined by

- the extent of the environmental impact of a product group
- the proportion of eco-labelled products in that product group
- the stringency of the award criteria
- the sales of eco-labelled products in relation to sales of non-labelled goods.

A recent OECD report (13) observes that a major problem in seeking to evaluate the market and environmental effects of eco-labels is the fact that

the vast majority of data on the experience of individual eco-labelled products is considered by producers as confidential commercial information, and is hence unavailable.

However, the fact that many manufacturers seek the award of an eco-label indicates that it does confer some market advantage – i.e. the product may be sold at a higher price in response to higher demand; or its market share can be increased or at least maintained; or a new market can be created for a new product. A number of separate studies have been undertaken in Sweden, which have identified positive impacts on market share and pollution reduction of eco-labelled products.

Reporting requirements in the EU Regulation

Unfortunately, the environmental impact of the EU's eco-label is a matter of speculation. It has suffered from implementation problems, and currently covers only 18 product groups. Forty-one eco-labels have been awarded to 31 manufacturers, covering 216 products. Despite its limited coverage, evidence from some national or regional schemes suggests that it will have had some beneficial impact on the state of

the environment and resource use, which should increase as further product groups are covered (see Box 3). However, the data necessary to prove this assertion is unavailable because of the limited reporting requirements in the Regulation. The Commission and/or the Member States are obliged to publish only

- details about the eco-labelling scheme
- the names and addresses of national competent authorities
- the selected product groups and their associated ecological criteria
- a list of products awarded the eco-label, and reasons for the award
- a list of the relevant manufacturers and importers.

There is no requirement on the Commission or the Member States to report on sales of labelled products, even though this information must be collected by national competent bodies in order to determine the level of the annual fee payable for the use of the eco-label (14). Indeed, on the grounds of commercial confidentiality, Article 13 expressly forbids the disclosure by the Commission or the competent bodies of any information acquired in the process of assessing a product. These confidentiality provisions remain in the Commission's current proposal for amending the Regulation (15).

Box 3: Environmental effectiveness of Swedish eco-labels

In Sweden, both the Nordic Swan and the Swedish Good Environmental Choice (or 'Falcon') eco-labels have had an important market presence for some high-turnover consumer goods sold in large retail chains. The Falcon label has been awarded mainly to various types of detergents, cleaning agents and paper products. Initially, large detergent manufacturers were not interested in eco-labelling their products, but retailers showed a preference for stocking 'Falcon'-labelled brands, which consequently began to win market share from the big brands. In response, the large manufacturers were obliged to develop new formulations for their products to meet the Falcon criteria. Consequently, the market share for eco-labelled detergents increased from negligible in 1990 when the criteria were published, to almost 50 per cent in 1993.

One of the three largest retail chains in Sweden, ICA, launched an environmental programme in 1987 which included giving priority to products with the Good Environmental Choice or Nordic Swan labels. Other retailers have followed suit, encouraged since 1994 by the award by Swedish regional government of diplomas to stores selling a minimum proportion of eco-labelled goods. The increase in the stocking and sale in 1994-5 of eco-labelled goods in ICA stores is illustrated in the table below.

Table 2.3: Number of Eco-Labelled Goods 1994-1995 (16)

Product Group	No. of eco-labelled items in 1994	No. of eco-labelled items in 1995	Share of sales in 1995
Detergents	16	26	83%
Dishwashing liquids Dishwasher powder	9	16	74%
Cleaning agents	15	18	53%

Shampoo and soap	5	16	5%
------------------	---	----	----

Source: ICA Handlarnas AB Environmental Report 1995

The increased share of sales of eco-labelled goods will have reduced damaging environmental impacts in Sweden, on the intuitively-probable assumption that the environmental standards of labelled products would have been lower without the eco-labelling schemes. A quantitative evaluation of the environmental impact of the Nordic Swan was published by the Nordic Council of Ministers in 1996. One of its conclusions was that the eco-labelling of detergents has played a major role in influencing new product development, with the result that the use in detergents of optical whiteners, certain surfactants and chelates in Sweden has now been ended.

A further study (16) by the Nordic Eco-labelling Board calculated the environmental impact of increased demand in Sweden for eco-labelled unbleached or environmentally-bleached paper fibre. Discharges of chlorinated organic compounds were estimated to have been reduced from 175,000 tonnes to less than 10,000 tonnes in 1993.

Measuring the impact of eco-labels

The OECD report referred to above (13) - and other evidence in relation to the impact of the EU's energy labelling Regulation (18) - suggests that eco-labels do have an impact on the demand for labelled products. The OECD suggests that this is directly linked to the general level of environmental awareness and consequently the consumer demand for green products. The involvement of environmental NGOs, consumer organisations and the media are key factors contributing to increasing the level of consumer awareness of environmentally-preferred products. Thus in Sweden, eco-labels have had a significant impact on the market (see Box 2 above).

The available evidence suggests that eco-labelling schemes are most effective in conjunction with additional, complementary measures. Eco-labels have a greater impact when they become a requirement imposed by large retailers, and/or when they are used as tools to identify green products for government procurement and institutional purchasing. This has sometimes forced manufacturers in specific product categories such as detergents and cleaning agents to modify their products in order to qualify for a label. In this context, it is important that eco-labelled products should not cover more than a small percentage of the market at any one time in order to maintain the incentive on manufacturers continually to raise standards. A balance therefore has to be reached between the stringency of the criteria and the number of eco-labelled products.

The impact of increased sales of eco-labelled products on the state of the environment are everywhere difficult evaluate, although attempts have been made for the Nordic Swan, the Swedish Environmental Choice and the Blue Angel. As the OECD observes, this is principally due to a lack of published information.

Case Study 4: Encouraging the development of renewable sources of energy - EU Strategy and Action Plan

Instrument:	Non-binding reference framework - <i>multi-level, multi-instrument</i>
Target:	Driving forces - <i>multi-sector</i>
Monitoring requirements?	Yes - <i>assessments of effectiveness of national programmes</i>

Introduction

The increased use and further expansion of renewable sources of energy (RES) is a necessary contribution to meeting the EU's commitments to reduce CO₂ emissions under the Kyoto Protocol, and to sustainable development generally. In 1995, only 6 per cent of the EU's gross inland energy consumption was derived from RES. RES as a share of national gross inland energy consumption ranged from almost 25 per cent in Austria, to as low as 0.7 per cent in the UK.

The Commission in 1997 published a White Paper *Community Strategy and Action Plan Energy for the Future: Renewable Sources of Energy* (19). The White Paper sets as an indicative target the doubling of the share of renewables in the EU's gross inland energy consumption to 12% by 2010. This would reduce CO₂ emissions in the EU by an estimated 402 million tonnes/year by 2010.

According to the White Paper, the main contribution to the growth of renewables could come from biomass i.e. wood, energy crops, agricultural waste and manure, organic municipal waste, sewage sludge, and biogas (mainly methane). It estimates that biomass could contribute 135 Mtoe by 2010 - a three-fold increase over the 1995 contribution from this source. The second biggest increase could come from wind energy, with a contribution of 40GW. Significantly larger contributions could also come from solar thermal collectors, photovoltaics, geothermal energy and heat pumps. In absolute terms, hydropower would remain the second most important renewable resource, but with relatively small scope for future expansion (see Table 2.4-1).

Table 2.4-1: Estimated contributions of renewables by sector

TYPE OF ENERGY	SHARE IN EU IN 1995	PROJECTED SHARE -2010
1. Wind	2.5 GW	40 GW
2. Hydro	92 GW	105 GW
- Large	(82.5 GW)	(91 GW)
- Small	(9.5 GW)	(14 GW)
3. Photovoltaics	0.03 GWp	3 GWp
4. Biomass	44.8 Mtoe	135 Mtoe
5. Geothermal		
- Electric	0.5 GW	1 GW
- Heat (inc. heat pumps)	1.3 GWth	5 GWth
6. Solar thermal collectors	6.5 million m ²	100 million m ²
7. Passive Solar		35 Mtoe
8. Others		1 GW

Source: COM(97) 599 p.48.

The scenario in the EU strategy

The White Paper's projected shares from different sectors are derived from the Commission's 1997 TERES II study. This produced a number of different scenarios which predicted that by 2010 the contribution of RES to gross inland energy consumption could be between 9.9-12.5%, but that the technical potential was much larger than this. The scenarios in the TERES II study, and therefore the framework set out in the EU strategy, rest upon a number of assumptions about the development of policies at EU and Member State levels, and about their effects on the behaviour of a number of sectoral actors. Significantly, the White Paper emphasises that 'the renewable energy component of the energy mix is very sensitive to changing policy assumptions'. It observes:

a policy for the promotion of renewables requires across-the-board initiatives encompassing a wide range of policies: energy, environment, employment, taxation, competition, research, technological development and demonstration, agriculture, regional and external relations policies... a comprehensive action plan is required to ensure the necessary co-ordination and consistency in implementing these policies at Community, national and local levels.

The wide range of relevant policy measures that need to be taken at EU and/or Member State level are listed in an Annex (20). They include:

- *internal Market measures*, including fair access for RES to the electricity market; restructuring the Community framework for the taxation of energy products; the promotion of biofuels in transport fuel etc.
- *reinforced Community policies*, including the 5th Framework programme for RTD; including support for RES as a main priority in the reform of the Structural Funds; promotion of biomass in the revision of the CAP and the new Rural Development Regulation etc.

- *strengthening co-operation* between Member States *support measures*, such as consumer information campaigns
- *financial support and promotion* e.g through the EU's *Campaign for Take-off*

The scope and complexity of such a wide range of policy measures means that the Commission's assumptions in the White Paper about possible future shares from different types of renewables need to be treated with great caution. The future development of biomass is a good example of the need to monitor and evaluate the effects of different national policies and combinations of policies.

Projected contributions from biomass by 2010

The scenario presented in the White Paper suggests a very large expansion in the contribution of biomass - an extra 90 Mtoe by 2010, to be produced from 10 million hectares of agricultural land. The additional contribution is to be derived from

- biogas (from livestock production, sewage treatment and methane from landfill of waste);
- agricultural and forestry wastes (e.g. straw, timber thinnings etc.);
- energy crops (liquid biofuels; short rotation forestry; other energy crops)

Table 2.4-2 below sets out the projected contributions by sector.

Table 2.4-2: Biomass: Projected contributions by sector, 2010

SECTOR	CONTRIBUTIONS
Biogas (livestock, sewage treatment, landfills)	15 Mtoe
Agricultural and forest residues	30 Mtoe
Energy Crops	45 Mtoe
TOTAL	90 Mtoe

As discussed in Section I of this paper, the scope of some policy measures - such as those under common agricultural policy - is so comprehensive that they form the principal influence on Driving Forces (D) in particular sectors. Thus, the future development of biomass in the EU will be largely dependent on developments in the CAP, and how they are applied at national and regional levels. Crucial future policy decisions include the following:

- relative CAP price supports for cereals (which will determine the availability of straw waste) and other crops in relation to biomass
- the nature and extent of cross-compliance (ie the attachment of environmental conditions to financial support for farmers) required by Member States for direct CAP payments;
- the extent of national support for forestry under the new Rural Development Regulation, and which species are grown.

Developments in other policy sectors will also be crucial, including:

- the impact of EU and national biodiversity action plans on agricultural land-use
- the impact of the Landfill Directive 1999/31 on emissions of methane
- the extent to which national and regional authorities construct biomass combined heat and power (CHP) plants to make use of biomass.

The White Paper itself recognises that the scenario it presents rests upon many key assumptions about what policies will actually be put in place, and how they will work in practice. These assumptions will need to be tested by constant monitoring of what actually happens on the ground. Thus, the White Paper proposes the establishment of a working group of Commission and Member State representatives ‘in order to monitor the measures undertaken and evaluate the impact of energy policy decisions at all levels with regard to the use of renewable energy’. It adds:

Co-operation within an EU framework provides added-value for the effectiveness of the actions and also considerable benefit to Member States, as successful policies and experiences on national and local levels can be disseminated and objectives and actions can be co-ordinated.

To ensure comparability, such an EU framework will need to include common methodological guidelines in relation to monitoring and evaluation procedures.

3.0 CONCLUSION

The discussion of the four case studies has highlighted the fact that the effects and effectiveness of policy measures can vary greatly, and may differ considerably from the intentions of policy makers. In some cases, the link between a measure and its impact on the ground is very strong and relatively straightforward to establish, as the example of lead in petrol demonstrates. But in other areas – indeed for the majority of EU measures - the actual effects of policies on the environment are simply not known. Tempting though it may be, it cannot simply be assumed *a priori* that policy targets (where they are set) or the expressed intentions of policy makers will necessarily be realised in practice. For the extent to which policies actually impact on the environment depends on many variables, including the adequacy of the design of the measure itself; how fully it is implemented; and whether policies in one sector serve to reduce the effectiveness of those in another. The discussion of the Nitrates Directive raises serious questions about all of these.

It is important to establish *whether* the features of particular measures are achieving what they intended, and *why* – in other words, what works, for which target groups, and in what circumstances? (21). Understanding what has worked and why would not only clarify the effects of past measures, but would also provide a firmer empirical foundation for the generation of more reliable models and scenarios for predicting the *future* impact of current measures and proposals. Many such models appear to be based on assumptions that are at best questionable.

However, current reporting requirements in most items of EU environmental legislation tend to produce data that is of limited use in establishing their impact on the ground. And in other policy sectors, little attention has so far been given even to the principle of including environmental impacts in existing reporting frameworks. In order to determine effects and effectiveness, new approaches are required for monitoring, evaluation and reporting. Producing answers about the effectiveness of measures requires a comprehensive review of the Monitoring - Data - Information - Analysis - Reporting (MDIAR) chain: the nature of the data collected and how it is analysed should now take account of the need to report to policy makers and the public on policy effectiveness.

A number of important issues will need to be addressed to minimise the burden of new reporting requirements. For example, it might be possible to devise a mechanism which would require different groups of Member States to report on the effects and effectiveness of different measures. A further question to be addressed is whether reporting should continue to be organised around the reporting obligations contained in items of legislation, or whether a broader, non-legislative framework would be more appropriate.

In any event, pressures to review the MDIAR chain are mounting as reporting obligations in more recent items of EU environmental legislation begin to include the requirement to assess effectiveness. Examples of such measures are listed in Box 4.

Box 4. *Items of current and proposed EU legislation containing requirements to report on effectiveness*

COM(99)271	Proposed Water Framework Directive
1999/389	GHG monitoring mechanism
96/62	Air quality framework
91/676	Nitrates from Agricultural Sources
90/219	GMOs - contained use
92/43	Habitats and species conservation
R2078/92	Agri-environment measures
85/210	Lead in petrol
R3528/86	Monitoring of forest damage
96/61	Integrated pollution prevention and control
1164/94	Cohesion Fund
86/278	Sewage sludge
91/157	Batteries and accumulators
78/176	Titanium dioxide
86/57	Exchange of information - water

The most significant of these is the revised EU's revised CO₂ monitoring mechanism (Box 5), The large number, and wide sectoral coverage of the GHG-reduction policies and measures to be assessed both by Member States and the Commission has important implications for current reporting obligations in other items of EU legislation.

Box 5 *Reporting obligations in relation to the effects of policies and measures in the EU's CO₂ Monitoring Mechanism.*

Member states are to include in National Programmes:

- Details of national policies and measures including:
 - Objective of the measure
 - Type of policy instrument
 - Status of implementation
 - Intermediate indicators of progress
- Measures being taken for the implementation of relevant Community legislation and policies
- Estimates of the effect of policies and measures on emissions and removals

The time is right therefore for a comprehensive review of EU monitoring and reporting to enable it to make a surer contribution to 'sound and effective' environmental policy making.

References

1. *Environment in the European Union at the turn of the Century* , EEA, 1999 p.7.
2. *Evaluating Economic Instruments for Environmental Policy* OECD 1997 pp132,133.
3. Norwegian Ministry of Environment *Evaluation of environmental policy instruments in Norway: Report from a Committee appointed by the Ministry of Environment in October 1992 (MoE, Norway, Feb 1995)*. p.36
4. Department of the Environment and Welsh Office Joint Circular 22/82 *Lead in the Environment*, 7 September 1982, pp 2-3.
5. Quoted in Wilson, Des *The Lead Scandal: The Fight to save children from damage by lead in petrol* Heinemann, London 1983 p. 103
6. ref Stephen Smith, Institute for Fiscal Studies.
7. Council Directive 77/312/EEC on biological screening of the population for lead: Progress Report on the Implementation of the Directive - COM(81)88 10.3.81.
8. European Environment Agency *Environment in the European Union at the Turn of the Century* – Appendix to the summary: Facts and findings per environmental issue – p.16.
9. 9.European Commission *The Implementation of Council Directive 91/676 EEC concerning the protection of waters against pollution caused by pollution from nitrates from agricultural sources* COM(97) 473 1.10.97.
10. *ibid.* p17.
11. OECD Environmental Performance Review: Sweden, 1996, pp 144-145
12. OECD Environmental Performance Review: Denmark, 1999, chapter 7.
13. *Eco-labelling: Actual effects of selected programmes* OECD/GD(97)105 – OECD 1997
14. Decision 93/326, Art.2
15. European Commission *Proposal, and amended proposal, for a Council Regulation on a revised Community eco-label award scheme* COM(96) 603 11.12.96; and COM(99) 23, 27.1.99
16. ICA Handlarnas AB Environmental report 1995

17. *Nordic Eco-labelling – Scheme and Evaluation* Nordic Council of Ministers 1996;
Nordic Eco-labelling: Environmental Strategy Nordic Eco-labelling Board,
February 1996
18. For a discussion of the impact of EU energy labelling requirements on purchasing
behaviour, see Winward J, Scheillerup P, and Boardman B *Cool Labels: the first
three years of the European Energy Label* Environmental Change Unit, Oxford,
1998
19. COM(97) 599 26.11.97
20. Ibid. Annex I A *Preliminary Indicative Action Plan for 1998-2010*
21. Pawson R and Tilley N *Realistic Evaluation* Sage 1997 Ch.3

