

Voluntary Approaches for Environmental Policy

EFFECTIVENESS, EFFICIENCY AND USAGE IN POLICY MIXES

Environment Sustainable Development Environment Environment Sustainable Development Environment Environment Sustainable Development Environment Environment Sustainable Development Environment Environment Sustainable Development Environment

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Foreword

Voluntary actions by firms and households to improve environmental performance clearly should be welcomed – and there is a considerable literature indicating that firms can profit from taking such voluntary action. However, opinions differ concerning the usefulness for policy makers to rely on voluntary approaches to achieve environmental targets. Some see such approaches as offering a chance to address environmental problems in a flexible manner at a low cost, based on consensus-building between the different stakeholders. Others believe such approaches provide few environmental improvements beyond what would have occurred anyway, while both administrative and abatement costs could be greater than using other instruments.

This report provides an assessment of the use of voluntary approaches, building on a number of new case studies and an extensive search of the available literature. The focus of the analysis is on the environmental effectiveness, economic efficiency and the administrative costs related to voluntary approache either used in isolation or as part of "policy mixes".

Case studies made especially for this report describe:

- *the Accelerated Reduction/Elimination of Toxics program and an Environmental Management Agreement with the steel company Dofasco Inc. in Canada;*
- *the agreement scheme on industrial energy efficiency in Denmark with examples from the paper sector and with the milk-condensing sector;*
- *the Pollution Control Agreements negotiated in Yokohama City and Kitakyushu City in Japan; and*
- *the experiences of Intel Corporation and Merck Pharmaceuticals in Project XL in United States.*

The report was prepared under the supervision of the Working Party on National Environmental Policies, WPNEP, under OECD's Environment Policy Committee. The report was prepared by Nils Axel Braathen with the contribution of Nick Johnstone on Chapter 13 (Voluntary approaches used in combination with emission trading systems). The report is published on the responsibility of the Secretary-General of the OECD.

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1. Summary, Conclusions and Policy Recommendations

1.1. Summary

Voluntary actions by firms and households to improve environmental performance clearly should be welcomed – and there is a considerable literature indicating that firms can profit from taking such voluntary action. However, opinions differ concerning the usefulness for policy makers to rely on voluntary approaches to achieve environmental targets. Some see such approaches as offering a chance to address environmental problems in a flexible manner at a low cost, based on consensus-building between the different stakeholders. Others believe such approaches provide few environmental improvements beyond what would have occurred anyway, while both administrative and abatement costs could be greater than using other instruments.

This report aims to provide an up-to-date discussion of the use of voluntary approaches in environmental policy, both viewed in isolation and – perhaps more realistically – as part of "policy mixes", also involving other types of policy instruments. It builds on a number of case studies of voluntary approaches used in Canada, Denmark, Japan and United States – undertaken especially for this project – but also on a large number of other available studies of voluntary approaches. The focus of the analysis is in particular the environmental effectiveness, economic efficiency and the administrative costs related to voluntary approaches – either in isolation or as part of "policy mixes".

The case studies made especially for this report describe:

- the Accelerated Reduction/Elimination of Toxics program and an Environmental Management Agreement with the steel company Dofasco Inc. in Canada;
- the agreement scheme on industrial energy efficiency in Denmark with examples from the paper sector and with the milk-condensing sector;
- the Pollution Control Agreements negotiated in Yokohama City and Kitakyushu City in Japan; and
- the experiences of Intel Corporation and Merck Pharmaceuticals in Project XL in United States.

The following questions concerning environmental effectiveness are addressed:

- Have the environmental targets been set at an appropriate level?
- Have the existing environmental targets been met?
- To what extent have the achievements been due to the instrument in question? What would have happened in a "Business-as-Usual scenario"?

The environmental targets included in the cases studied especially for this report were most often – but not always – met. Also in most other voluntary approaches do the environmental targets seem to be met, but there are some examples that under-performance is tacitly accepted by environmental authorities – for instance when fulfilling the target proves more expensive than originally thought.

However, even if the targets set for a voluntary approach have been met, it remains a question to what extent this is due to the approach in question. Whilst some of the approaches studied – in general incorporating credible "threats" if targets were not to be met – probably have contributed significantly to target achievement, it is highly unlikely that a number of other approaches have contributed much to target fulfilment. This is most evident in a number of cases where a large part of agreed emission reductions took place between the base year used for the agreement and the time of signing of the given agreement. As firms generally to some extent will also have planned process changes, investment projects, etc., well in advance, even reductions that take place in the first 1-2 years (at least) after the signing of an agreement could often represent a "Business-as-Usual" scenario to the firm.

The econometric studies that are available also often indicate that the contribution of the voluntary approaches in question to target fulfilment has been limited. For example, while earlier studies found the so-called 33/50-program in the United States to have had a significant impact on participating firms, later econometric studies indicate that only about a quarter of the total observed reduction in toxic releases can be attributed to this program.

When targets of environmental policy only reflect "Business-as-Usual", the term "regulatory capture" is often used.

A potential benefit of voluntary approaches – from an environmental point of view – is that they *can* require less preparation to put in place than regulatory approaches. This would mean that one could start to address a given environmental problem more rapidly through voluntary approaches than if one were to go through all the preparations necessary to put in place *e.g.* new legislation or new taxes. On the other hand, the likelihood of a voluntary approach providing any environmental improvements beyond "Business-as-

Usual" depends strongly on their level of preparation. And in any case, if a voluntary approach is adopted in order to be able to address a "new" problem as rapidly as possible, care should be given to *not* constrain a later introduction of other – possibly more environmentally effective – policy instruments.

A number of questions related to economic efficiency are addressed in the report:

- Are marginal abatement costs equalised – implying that total abatement costs are minimised? And, closely related to this: are environmental targets set in an appropriate way?
- Are firms given (increased) flexibility to find less expensive abatement possibilities?
- Does the existence of a voluntary approach impact on the structure of, and level of competition within, an industrial sector?
- What are the impacts of the instrument on technology diffusion and technology development?

To minimise *total* abatement cost, *marginal* costs of abatement should – ideally – be equal among all contributors to the problem, *e.g.* among all firms and households that cause a certain type of pollution. Equalisation of marginal abatement costs can be achieved if all polluters face the *same incentive at the margin* to abate, whereas it would in general *not* be achieved if all polluters were asked to reduce their emission by the *same per cent*.

While voluntary approaches can not compete with environmentally related taxes or emissions trading systems in terms of economic efficiency, they can do better than traditional "command-and-control" regulations, in particular as they can provide increased flexibility in terms of how a given target is to be met.

Even if many voluntary approaches include mechanisms especially designed to stimulate diffusion of existing technologies, it is important to notice that such approaches in general provide weak incentives for the development of new abatement technologies. This is in particular the case if the approach includes provisions that allow public authorities to "tighten" the environmental targets if new technologies were to be developed.

The report raises two issues concerning the administrative costs of a voluntary approach, in particular a negotiated agreement:

- the costs of preparing and negotiating the agreement; and
- the costs of implementing the agreement.

While these costs tend to vary significantly between different approaches, it is found that schemes where administrative costs are very low run the risk of achieving rather poor environmental performance, not much different from "Business-as-Usual".

Free-riding – meaning that a firm manages to obtain the benefits related to a given approach (*e.g.* avoid the imposition of a tax or a stricter regulation), while not taking on any of the associated burden (*e.g.* abatement efforts beyond "Business-as-Usual") – is a significant problem with many collective voluntary approaches. A way to limit free-riding would be to specify environmental performance targets separately for each firm, but this can conflict with objectives related to economic efficiency. This issue has, for example, been addressed in the Danish agreements on energy efficiency in industry, by stipulating that all firms have to undertake all efficiency-improving investment projects fulfilling a common profitability criterion. However, this approach involves considerable administrative costs.

Due to a number of similarities between the two categories of instrument, a special comparison is made between voluntary approaches and different sorts of emissions trading systems. It is suggested that it could be useful to convert some voluntary approaches that involve a sufficiently high number of firms into some type of trading scheme.

The second part of the report deals specifically with the *marginal* impacts of combining voluntary approaches with other types of instruments used in environmental policy. In particular combinations with environmental permitting systems, environmentally motivated subsidies, environmentally related taxes and charges and emission trading systems are discussed.

It is emphasised that when focussing on the marginal impacts of any policy combination, one should keep in mind what would – realistically – be the alternative policy. In some cases it can seem that voluntary approaches have been combined with other instruments in an attempt to avoid trade-offs between environmental, economic and social dimensions of sustainable development. It is, however, unclear if such trade-offs *can* be avoided if significantly more ambitious environmental targets are to be met in the future.

Of particular concern from an environmental point of view is the fact that combining a voluntary approach with several other types of instruments will tend to weaken the environmental integrity of the latter instruments. This has, *for example*, been found to be the case with the opt-in possibility under the – otherwise highly efficient – SO_2 emissions trading program in United States. Evidence of "adverse selection" has been found: it was in particular power plants that had "Business-as-Usual" emissions significantly lower than the number of allowances they would obtain by opting-in that chose to do so.

1.2. Conclusions

The report demonstrates that a large, and seemingly increasing, number of voluntary approaches is being used in environmental policy in OECD

member countries, most often in combination with one or more other instruments. Even if it would be imprudent to make overly generalised statements about the merits of applying voluntary approaches, a few conclusions can be drawn:

a) While the environmental targets of most – but not all – voluntary approaches seem to have been met, there are only a few cases where such approaches have been found to contribute to environmental improvements *significantly different* from what would have happened anyway.

b) Hence, the environmental effectiveness of voluntary approaches is still questionable.

c) This *could* indicate that a significant degree of "regulatory capture" has taken place.

d) But it remains unclear what would have been the – realistic – alternative to a given policy or policy combination. Would there in practice have been sufficient political willingness to give priority to reaching ambitious environmental targets – if that, for instance, could jeopardise the (often modest) employment in the most affected (highly polluting) sectors?

e) The broadening use of voluntary approaches seems to reflect the fact that policy-makers have tried to find an instrument through which one could avoid having to make such trade-offs. It is, however, unlikely that difficult trade-offs can be avoided if more ambitious environmental targets are to be met in the future.

f) In most member countries, the entry into force of the Kyoto protocol will represent a new situation, where they face an economy-wide, legally binding, environmental target. If, under such a regime, some sectors are given a more lenient treatment, other sectors *will* have to abate more – or the country will have to buy more quotas in the international market.

g) Voluntary approaches are generally designed to limit the impacts of environmental policies on the production costs of participating firms. However, when firms do not face an appropriate marginal incentive to abate pollution (from a tax, or from the value of a tradable emission permit), environmental policy largely fails to stimulate a reduction in demand for the products that cause environmental problems in their production.

h) The *economic efficiency* of voluntary approaches is *generally low* – as they seldom incorporate mechanisms to equalise marginal abatement costs between all producers, *inter alia* because environmental targets tend to be set for individual firms or sectors, rather than at a national level.

i) However, traditional "command and control" policies also rarely equalise abatement costs at the margin between different polluters, and voluntary approaches *can* offer a *higher* economic efficiency than such policies, by

providing increased flexibility in how environmental improvements are to be accomplished.

j) Voluntary approaches can sometimes be put in place more rapidly than alternative policy instruments, like new regulations or economic instruments. However, the likelihood of a voluntary approach providing any environmental improvements beyond "Business-as-Usual" depends strongly on their quality.

k) A "first best" approach would be to replace the "command and control" policies by economy-wide economic instruments – taxes or tradable permits – where technically and administratively possible.

l) A "second-best" option could be to improve the flexibility of pre-existing "command-and-control" regulations, instead of a piece-meal approach that lets only a few companies attain environmental improvements in a more flexible manner.

m) The performance of many voluntary approaches would be improved if there were a real threat of other instruments being used if (appropriately set) targets are not met. However, if it is likely – or widely believed – that the alternative policy would entail significant negative social impacts, the credibility of such threats may not be great.

n) Various types of administrative and transaction costs vary greatly between different voluntary approaches. If too few resources are spent in their preparation, negotiation and enforcement, their environmental impacts are likely to be very modest.

o) Combining a voluntary approach with a tax or a tradable permit system can trigger quite significant additional administrative costs, and the environmental integrity of the other instrument can be weakened.

1.3. Policy recommendations

Based on the discussion in this report, some recommendations for policy formulation can be singled-out:

a) Consider carefully if current environmental targets – or the lack of such targets – represent a reasonable balance between the combined benefits of additional environmental improvements and the total costs of achieving such improvements.

b) Consider also if the targets are set in such a way that they encompass as many as possible of the sources of a given problem.

c) Consider carefully whether targets are met at the lowest possible economic and social costs.

d) If economic costs under current policies are allowed to be higher than what could have been possible, in order to limit social costs (*e.g.* concerning

transitory unemployment and/or impacts on low-income households): consider carefully whether such social concerns cannot be better addressed by *other* policy instruments.

e) If a voluntary approach is *already applied*: consider whether target fulfilment to date is satisfactory, and whether credible threats of the application of additional instruments would be appropriate – and possible to implement.

f) If a *new* voluntary approach is being prepared: elaborate first a "Business-as-Usual" scenario, describing likely developments in the years ahead if no policy-changes were to be made. Quantified targets should be set with reference to this scenario, in such a way that marginal abatement costs and marginal benefits of the environmental improvements balance reasonably well. Consider carefully whether well-prepared alternative policy instruments – that could serve as credible threats – can underpin the voluntary approach. Make sure to collect the information necessary for a later evaluation of the approach in question.

g) Consider carefully various potential impacts of combining a voluntary approach with other policy instruments:

- What are the likely consequences on environmental effectiveness, economic efficiency, administrative costs, sectoral competitiveness impacts, of the other policy instrument(s)?
- What are the likely consequences of "adding" other instruments to the voluntary approach?

This report does not alter the finding of many previous analyses that economy-wide economic instruments in many cases can be a better policy option than voluntary approaches, both from the point of view of environmental effectiveness and economic efficiency. A broader application of economic instruments is, however, frequently hampered by – in particular – a fear of loss of international competitiveness of the most affected (and most polluting) sectors, which in turn could have negative impacts on employment in these sectors. Providing tax exemptions to the sectors in question in return for "voluntary" abatement commitments *can* be one way to overcome "the competitiveness obstacle". However, the environmental and/or economic costs of applying this option could be high. Increased international co-operation to facilitate use of economic instruments would seem to be a better option.

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2. Introduction

Over the last decades, an increasing number of "voluntary approaches" have been implemented in environmental policy in OECD member countries.[1] They have been introduced as supplements to existing "command and control" regulations, as part of policy packages involving also – for example – environmentally related taxes or emissions trading systems, or they have represented the first steps to regulate an environmental issue that has come to concern.

Voluntary actions by firms and households to improve environmental performance clearly should be welcomed – and there is a considerable literature indicating that firms can profit from taking such voluntary action.[2]

However, opinions differ concerning the usefulness for policy makers to rely on voluntary approaches to achieve environmental targets. Some see such approaches as offering a chance to address environmental problems in a flexible manner at a low cost, based on consensus-building between the different stakeholders. Others believe such approaches provide few environmental improvements beyond what would have occurred anyway, while both administrative and abatement costs could be relatively high.

OECD (1999) provided a thorough assessment of voluntary approaches in environmental policy. It distinguished between four types of approaches, in increasing order of the importance public authorities play in their application:

- *Unilateral commitments made by polluters*; Consist of environmental improvement programs set up by firms and communicated to their stakeholders (employees, shareholders, clients, etc.). The definition of environmental targets, as well as of the provisions governing compliance, is determined by the firms themselves. Nevertheless, firms may delegate monitoring and dispute resolution to a third party in order to strengthen the credibility and the environmental effectiveness of their commitments.[3]
- *Private agreements between polluters and pollutees*; Contracts between a firm (or sometimes a group of firms) and those who are harmed by its emissions (workers, local inhabitants, neighbouring firms, etc.) or their representatives (community organisations, environmental associations, trade unions, business associations). The contract stipulates the undertaking of an environmental management programme and/or the setting of a pollution abatement device.

- *Environmental agreements negotiated between industry and public authorities;* Contracts between the public (local, national, federal or regional) authorities and industry. They often contain a target *(i.e.*, a pollution abatement objective) and a time schedule to achieve it. The public authority commitment generally consists of not introducing a new piece of legislation *(e.g.*, a compulsory environmental standard or an environmental tax) unless the voluntary action fails to meet the agreed target.
- *Voluntary programs developed by public authorities, to which individual firms are invited to participate;* Within this type of voluntary approach participating firms agree to standards (related to their performance, their technology or their management) which have been developed by public bodies such as environmental agencies. The scheme defines the conditions of individual membership, the provisions to be complied with by the firms, the monitoring criteria and the evaluation of the results. Economic benefits in the form of R&D subsidies, technical assistance, and reputation (for example by being permitted to use an environmental logo) can be provided by the public body.

A distinction was also made in OECD (1999) between target-based and implementation-based voluntary approaches. Voluntary approaches may concern setting pollution abatement objectives and/or the implementation of measures to achieve them [see also EEA (1997)]. Where the environmental objective is set by the parties involved in the voluntary approach, the voluntary approach was called target-based. Where the target is set within the framework of the regular legislative process by government, and the voluntary approach only consists of selecting and implementing the measures to achieve it, the voluntary approach was termed implementation-based.

OECD (1999) concluded as follows on how well voluntary approaches perform:

> "There is limited evidence as to the environmental effectiveness of VAs which seem to provide little incentive to innovate and can be weakened by a lack of credibility, especially *vis-à-vis* public opinion. Yet VAs are likely to generate significant 'soft effects' in terms of dissemination of information and awareness-raising. On the other hand, their ability to reduce administrative costs remains an open question; transaction costs should also be evaluated. Finally, free-riding and regulatory capture can seriously affect the effectiveness of VAs."

The 1999 report also contained the following recommendations on the design of voluntary approaches, to safeguard against their main shortcomings:[4]

- *Clearly-defined targets;* the targets should be transparent and clearly defined. VAs should define quantitative targets. Moreover, the setting of interim objectives is crucial since they permit all the parties to identify difficulties arising during implementation at an early stage.

- *Characterisation of a Business-as-Usual scenario;* before setting the targets, estimates of a Business-as-Usual trend – what the emission levels or other target variables are likely to be, given natural technical progress within the industry in question – should be established in order to provide a baseline scenario.
- *Credible regulatory threats;* made at the negotiation stage, a threat of regulation by public authorities provides companies with incentives to go beyond the Business-as-Usual trend.
- *Credible and reliable monitoring;* provisions for monitoring and reporting are essential for keeping track of performance improvements. They constitute the key for avoiding failure to reach targets. Monitoring should be made at both the company level and the sector level in the case of collective VAs. In certain contexts, monitoring by independent organisations may be used.
- *Third-party participation;* involving third parties in the process of setting the VA objectives and in its performance monitoring increases the credibility of VAs. More generally, environmental performance should be made public and transparent. It provides industry with additional incentives to respect their commitments.
- *Penalties for non-compliance;* sanctions for non-complying firms should be set. This can be achieved by either making binding commitments or linkages between VAs commitments and regulatory requirements *(e.g.*, the integration of VAs requirements into operating permits).
- *Information-oriented provisions;* in order to maximise the informational soft effects of VAs, support for activities in technical assistance, technical workshops, edition of best practice guides, etc., should be promoted.
- *Provisions reducing the risk for competition distortions*. in the case of collective VAs, safeguards against adverse effects on competition could be provided by notification of new VAs to anti-trust authorities

Since OECD (1999) was published, voluntary approaches have continued to develop, and additional research into the pros and cons of their application has been undertaken. At its first meeting, in 2001, the Working Party on National Environment Policy under OECD's Environment Policy Committee decided to address the issue further, starting with a number of case studies of such approaches. Such studies were hence made of some voluntary approaches in Canada, Denmark, Japan and United States.[5] The present report builds on these case studies, but also draws on other available material, *inter alia* a number of research projects financed by the European Commission.[6]

The report is divided in two main parts: In Part I, an examination of voluntary approaches viewed in isolation is undertaken, with a focus on their

environmental effectiveness, their economic efficiency, the transaction costs related to their establishment and the administrative costs related to their continued operation. A few selected implementation issues are also addressed, and a special comparison between voluntary approaches and emissions trading schemes is undertaken.

Part II addresses a number of issues concerning the use of voluntary approaches in "policy mixes". An ever-present question in the background of the analyses is "*What is the alternative policy?*" – i.e. "*what do we compare with?*". Also this section will discuss environmental effectiveness, economic efficiency, administrative costs, etc., – but the starting point of the analysis is different than in the first part: What is the *marginal impact* on these criteria parameters, given that a voluntary approach is used in combination with one or more other instrument(s)? A number of possible instrument combinations are analysed, both from a theoretical point of view, and through concrete examples.

In terms of the different types of voluntary approaches defined in OECD (1999), most attention in this report is given to negotiated environmental agreements – partly due to their policy relevance and the availability of information. However, attention is also given to voluntary programs developed by public authorities, while unilateral commitments and agreements between polluters and pollutees mostly fall outside the scope of this report.

Box 2.1. **Industry's view on Voluntary Approaches**

The Business and Industry Advisory Committee to OECD (BIAC), and the Trade Union Advisory Committee to the OECD (TUAC), were invited to prepare comments of a draft version of this report. The following is a *summary* of comments received from BIAC:

BIAC welcomes that the report highlights that voluntary approaches can do better than traditional "command-and-control" regulations, in particular as they can provide increased flexibility in terms of how a given target is to be met. However, it is disappointing that the report concludes that the effectiveness of voluntary approaches is still questionable and the economic gain relatively low compared to other approaches.

Both unilateral industry commitments and bilateral agreements between industry and public authorities have proved to be cost-effective and pro-active ways of achieving environmental goals. Indeed, the variety of voluntary initiatives is a resource, offering a host of cost-effective and efficient means to address environmental problems in a way that more traditional command and control approaches cannot.

Box 2.1. **Industry's view on Voluntary Approaches** *(cont.)*

Instead of assessing the "effectiveness" of voluntary approaches against "ideal" targets that governments might have set, the starting point for review should be whether the initiative attained its own objectives. In addition to "end-of-pipe" pollution abatement-oriented programmes, process improvements, energy efficiency endeavours and design for environment programs should be considered, as well as voluntary partnerships.

Industry relies on innovation to improve production efficiency and reduce environmental impacts. Voluntary actions represent a promising approach with respect to many environmental problems. They are based on a consideration of technical trends and other management-related issues and allow those with the best knowledge about their own business to propose and execute measures that are cost-effective.

The report would benefit from emphasising the essential elements for successful voluntary approaches, while at the same time clearly recognising their diversity. Among others, the following aspects should be underlined:

- Voluntary approaches should be appropriate to the local circumstances in which they operate.
- They should include objectives that are attainable, meaningful and address the challenge at hand.
- They should stimulate innovation, technological development and the use of companies' strengths.
- They should be consistent with existing regulations. Governments should avoid subsequent rules and requirements that undermine existing voluntary initiatives.
- They should be phased-in gradually, and rapid changes in their design after implementation has begun should be avoided.
- They should be designed to minimise the degree to which any free riders would hinder the attainment of environmental goals.
- Transparency is a key element to enhance credibility and broad acceptance.

While the report states that voluntary approaches offer low incentives to innovate, BIAC believes that voluntary approaches encourage the development of innovative approaches, the dissemination of existing effective technologies and faster implementation of both.

Voluntary approaches have can help governments avoid costly regulatory processes and transaction costs and allow design and implementation roles to remain within the private sectors.

Governmental actions should *encourage* companies to initiate and implement voluntary approaches, which in our view have in many cases proven to be environmentally and economically effective.

Notes

1. Segerson and Li (1999) and Khanna (2001) provide recent overviews of voluntary approaches. Two recent books that provide numerous examples and discuss economic and legal aspects of such approaches are Orts and Deketelaere (eds., 2001) and ten Brink (ed., 2002).

2. See, for example, Arora (2001), King and Lenox (2001) and Konar and Cohen (2001), all drawing on information from US EPA's Toxic Release Inventory (TRI). King and Lenox (2001) conclude *inter alia* that "Our research provides both additional support for the 'pays to be green' hypothesis and suggests caution in interpreting its implications. Much of the variance in our study is attributed to firm-level differences. Better understanding of these differences might provide a richer understanding of profitable environmental improvement. It may be that it pays to reduce pollution by certain means and not by others. Alternatively, it may be that only firms with certain attributes can profitably reduce their pollution."

   Konar and Cohen (2001) conclude *inter alia* that "Major corporations voluntary overcomply with environmental regulations and externally portray an image of being environmentally concerned. Our evidence suggests these firms are rewarded in the market place for taking these actions. What we have yet to understand fully, however, is whether this relationship is truly causal. Are highly reputable and profitable companies environmentally sound because they can afford to be, or does that environmental concern enhance their reputation. (…)"

   Arora (2001) states that "Our analysis provides some evidence that firms that fail to undertake environmental improvements see a decline in their market value. However, firms that exceed their expected level of activity experience insignificant market impacts".

   Reference can also be made to the concept of "eco-efficiency" as promoted by the World Business Council on Sustainable Development. WBCSD (2001) states that "Eco-efficiency is a management strategy that combines environmental and economic performance. The strategy enables more efficient production processes and better products and services while reducing resource use and pollution. In short, it is creating more value with less impact."

3. Khanna (2001) distinguishes between three types of unilateral initiatives: "Firms can *a)* develop their own plans or management systems to improve their own environmental performance *b)* participate in codes of conduct or guidelines developed by trade associations, and *c*) meet the environmental performance standards for registering with a certifying organisation, such as the International Organization for Standardization. These initiatives differ in the stringency with which they are implemented and in whether they require numeric environmental improvement goals or only the development of procedures and systems that facilitate improved environmental performance. Most of them focus only on the means (proactive efforts) for pollution control rather than the ends (actual performance improvement)."

4. Hansen *et al.* (2002) analysed the recommendations in OECD (1999) and found that "the recommendations should pay more attention to the question of efficiency of agreements and to the difficulties in defining unambiguous targets. Apart from these deficiencies it is concluded that the recommendations cover all phases, are soundly based in theory and give a meaningful evaluation of negotiated agreements".

5. See OECD (2002a), (2002b), (2002c) and (2002d) and the summaries presented below. The full reports of these case studies can all be downloaded free of charge at *www.oecd.org/env/va*.

6. This includes the CAVA project (Concerted Action on Voluntary Approaches, see *www.cerna.ensmp.fr/Progeuropeens/CAVA/Index.html*), the VAIE project (Voluntary agreements – Implementation and efficiency, see *www.akf.dk/VAIE*) and the NEAPOL project (Negotiated Environmental Agreements, see *http://fetew.rug.ac.be/neapol/conference/index.html*).

PART I

Voluntary Approaches Viewed in Isolation

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Effectiveness, Efficiency and Usage in Policy Mixes
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3. New Case Studies

In the preparation of this report, new studies were undertaken by external consultants of two different cases in Canada, Denmark, Japan and United States respectively. The studies were based on a common "Terms-of-Reference", with relatively detailed questions focussing on the environmental effectiveness, economic efficiency and administrative costs of the cases studied. In addition, the consultants were asked to compare the approach in question to a hypothetical tradable permits scheme covering the same issue, and to discuss the role of the approach within a broader package of instruments used to address the environmental problem at hand. The full reports on these cases can be found in OECD (2002a), (2002b), (2002c) and (2002d), while summaries are given in Boxes 3.1 to 3.4 below.

Box 3.1. **Canada – The "Accelerated Reduction/Elimination of Toxics" Program and the environmental agreement with the steel company "Dofasco Inc."**

The Canadian case studies focused on the ARET (Accelerated Reduction/ Elimination of Toxics) program and on the Environmental Management Agreement (EMA) that Environment Canada (EC) and the Ontario provincial Ministry of the Environment (MOEE) negotiated with the steel company Dofasco Inc. They were was written by Mary Jane Middelkoop, François Bregha and John Moffet of the consultancy firm "Stratos", Ottawa, Canada.

In the early 1990s, EC set up the multi-stakeholder ARET Committee to design a voluntary program to encourage industry to reduce toxic releases. 117 substances were selected on the basis of toxicity, persistence and bioaccumulation. While the committee successfully developed a list of substances, environmental and labour representatives withdrew from the committee due to disagreements with industry representatives over the priority being given to the *reduction* versus the *elimination* of targeted substances. In 1994, the ARET Committee (representing industry and government) issued the "ARET Challenge," calling for "virtual elimination" of PBT substances, as well as significant release reductions of all other substances listed by the ARET Committee.

Box 3.1. **Canada – The "Accelerated Reduction/Elimination of Toxics" Program and the environmental agreement with the steel company "Dofasco Inc."** *(cont.)*

In 1997, EC and MOEE negotiated an EMA with the company Dofasco Inc, one of four integrated steel mills in Ontario. The general objective of the agreement is to protect and enhance the natural environment, and to advance the prevention and abatement of releases from Dofasco's steel manufacturing facility in Hamilton, Ontario. It establishes environmental performance targets that go beyond the company's regulatory requirements, with specific abatement targets for a wide range of environmental issues in the areas of air, water and waste management. The EMA also provided a single mechanism through which Dofasco could deal with government agencies, encourages continued community involvement, and aims to accelerate the firm's progress towards existing regulatory and other requirements.

Environmental effectiveness

The table below summarises some information related to the environmental effectiveness of the two approaches:

	ARET	Dofasco
Targets include:	Reduction of persistent, bio-accumulative and toxic substance releases by 90%; and reduction of all other toxic substance releases by 50%; in both cases by 2000.	Significant reductions in emissions of PAHs and benzene, 1% annual increases in energy efficiency, meeting provincial abatement targets, increase use of recyclables, etc.
Was a BAU scenario established before the agreement was finalised?	No	No
Measurement and reporting:	Annual reporting, but measurement methods varied between companies.	Annual reporting, measurement methods varies between targets.
Independent verification?	No	Yes (for PAH and benzene emissions)
Have targets been met?	Not for persistent, bioaccumulative releases; but by relatively wide margin for other toxic substances.	Yes
To what extent are achievements a result of the program/agreement?	Impossible to disentangle.	Difficult to say, but a significant share of some of the improvements compared to the base year took place before the agreement was negotiated.

Substances on the ARET list pose different risks, and the aggregate reduction achieved by the participants makes no distinction for the toxicity of the substances, for whether the reductions were achieved in populated or

Box 3.1. **Canada – The "Accelerated Reduction/Elimination of Toxics" Program and the environmental agreement with the steel company "Dofasco Inc."** *(cont.)*

remote areas, or for the conditions of the receiving environment. Both for the ARET program and for the Dofasco agreement is it very difficult to say to what extent – if any – the voluntary approach contributed to environmental improvements beyond what would have taken place in any case.

Economic efficiency

In the ARET program, a limited number of facilities contributed to a large part of the emission reduction. This *can* indicate that reductions were made where they cost the least, which would be a more economically efficient way of achieving the targets than what equal percentage reductions at all facilities would have represented. However, the share of each firm in total emissions at the outset is not clear from the report. The Dofasco agreement only concerns one plant, so a cost-effective distribution of abatement across polluters is not so much an issue. Whether or not the costs of abating emissions at Dofasco were higher or lower than abatement costs at other sources contributing to the same problems that the agreement addresses, is not clear. Both ARET and the Dofasco agreement leave it up to the firms in question to decide on how to achieve given targets. In isolation this contributes to lower total abatement costs than what *e.g.* prescribing the use of certain technologies would have implied.

Administrative costs

The total cost to government of the development of the ARET program, from September 1991 to the issuance of the ARET Challenge in March 1994, was approximately 1 million CAD. The cost to EC from the end of the negotiation stage to the year 2000 also amounted to about 1 million CAD. For most participants in the ARET committee, the most significant expenses were related to time spent on the negotiation process, including preparation for meetings and subcommittee meetings, travelling, actual meeting time, and ongoing communications. The costs were seen as lower than what would have been expected under a traditional regulatory process, for both government and industry. The Dofasco agreement took less than a year to develop, and involved a minimal time commitment on the part of both government and industry. Apart from expenses related to reporting requirements, the agreement did not significantly increase administration costs, and in some instances the costs were actually lowered. The lack of monitoring and verification requirements also kept administrative costs low.

Policy mixes

Dofasco participates in numerous voluntary programs, and is also subject to provincial and federal regulations targeted at a wide range of environmental issues. The text of the EMA makes clear links to existing voluntary approaches as well as legal and other requirements – and requires continued participation in voluntary and mandatory environmental performance programs.

Box 3.2. **Denmark – The agreement scheme on industrial energy efficiency**

The Danish case study discusses the agreement scheme on industrial energy efficiency – as it was designed up to 2000 – with examples from agreements concluded with firms within the paper sector and with the milk-condensing sector. It was written by Signe Krarup, of AKF, Denmark.

A policy package introduced in 1996 combined the introduction of SO_2- and CO_2-taxes with an agreement scheme on improved energy efficiency in industry, and subsidies for *e.g.* energy efficiency counselling and investment. All revenues from the taxes were recycled back to the industry in the form of reductions in the taxation of labour and through subsidies for energy efficiency measures. Firms that entered into an agreement with the Danish Energy Agency got a rebate on their CO_2-tax. While all firms with heavy processes had the right to enter into an agreement, firms with light processes only had the right to sign an agreement – and get a tax rebate – if the tax payment on their energy consumption amounted to at least 3% of value added. In addition, the effective tax had to exceed a certain minimum value.

The agreements could be either individual or collective, covering several firms within a sub-sector with similar production processes. The basis of *individual agreements* was an energy audit, usually carried out by a certified consultant. The audit should map the energy consumption, list potentials for energy efficiency improvements and suggest special investigations into ways to further reduce energy consumption. In order to ensure quality, the audit report should be verified by an independent agency assisted by a technical expert. (As from 2000, several changes to the agreement scheme were made. For example, simpler energy surveys have replaced the former energy audits.)

The collective agreements were not based on energy audits. Instead, an analysis of energy consumption and production processes in the sector was made to identify general potentials for improving energy efficiency in firms. The results of the analysis were reported to the Danish Energy Agency and used to formulate an action programme. In addition to investment projects, special investigations and energy management, the action programme for the sub-sector could include inter-firm projects, such as development projects, which were of interest to all firms. Each firm covered by the agreement had to sign and was committed to the action programme. Obligations for every firm were therefore specified.

Box 3.2. **Denmark – The agreement scheme on industrial energy efficiency** *(cont.)*

Environmental effectiveness

The table below summarises some information related to the environmental effectiveness of the agreement scheme:

Targets include:	Implementation of energy saving projects with a payback-period of less than 4 (heavy process) or 6 (light process) years. Firms also had to introduce improved energy management systems.
Was a BAU scenario established befor the agreement was finalised?	To some extent, yes, through the energy audits that used to be compulsory in the individual agreements.
Measurement and reporting of emissions:	Annual self-reporting, verification by the Energy Agency.
Independent verification?	No, but the Danish Energy Agency checked the reports.
Have targets been met?	Yes, to a large extent.
To what extent are achievements a result of the agreement?	Possibly significant, given a credible threat of loss of tax exemptions in cases of non-compliance. However, larger improvements might have been obtained in the longer term had the tax reductions for industry not been available.

A study by Bjørner and Jensen (2002) estimates the reduction in energy consumption associated with the agreements signed before 1998 to be around 9%. Other empirical studies estimate lower effects. For example, Ahé *et al.* (1998) estimates the energy savings from the agreements entered in 1996 and 1997 to be around 5%.

Economic efficiency

The use of a payback-period criterion imply that firms with many profitable investments would have to realise relatively large savings, while firms with no profitable projects were not loaded with investment projects and special investigations. This could contribute to an efficient allocation of energy savings between firms.

However, there were certain differences between the criteria used for different firms. Firms with light processes used to be required to undertake projects with longer payback periods than firms with heavy processes. In addition, different price assumptions were used when calculating the payback-periods: For firms with heavy processes, a (hypothetical) tax of 3.33 € per tonne CO_2 was added to the pre-tax energy price of the firm, while for firms with light processes, a (hypothetical) tax of 12 € per tonne CO_2 was added. The lower the tax being applied in the analysis, the lower is the likelihood that a given project would pass the test. Hence, some relatively low-cost energy-saving projects in firms with heavy processes could be left unrealised, which would tend to increase the overall abatement costs.

Box 3.2. **Denmark – The agreement scheme on industrial energy efficiency** *(cont.)*

Administrative costs

The costs prior to the negotiations amounted to between 17 000 and 33 000 € on average for the firms. These costs covered expenses for energy audits (which no longer are required) and the verification of the audit reports. After the signing of the agreement, firms used on average 10-30 hours a year for producing their progress reports.

The agreements gave rise to a number of complicated administrative duties for the Central Customs and Tax Administration and the Danish Energy Agency. The two authorities had to co-operate in the administration of tax rebates when firms entered into agreements. The estimated additional costs for the public authorities of the agreements and the support scheme for energy efficiency improvements were 4 million € per year.

Policy mixes

Various policy instruments are used in Danish energy policy to achieve reductions in CO_2 emissions by improving the energy efficiency of industry. Among the other measures are economic instruments such as taxes and subsidies, and information.

As mentioned, Bjørner and Jensen (2002) estimates the reduction in energy consumption associated with the agreements signed before 1998 to be around 9%. A study by Johannsen and Larsen (2000) found investment grants to have (even) more significant impacts on CO_2 emissions, while Bjørner and Jensen (2002) could *not* find any significant impact on energy demand from the subsidies. Since 2001, energy efficiency subsidies are no longer granted to industry.

Bjørner and Jensen (2002) estimated that companies increased their energy use by 1-5% in 1998 as a direct result of the reduction in the CO_2 tax rate from 2 to 0.4 € per tonne CO_2 that they obtained by participating in the agreement. This estimate does *not* include any impacts of the *general* tax preference given to all firms with heavy industrial processes – a reduction in tax rate from 80 to 2 € per tonne CO_2, *cf.* Table 8.1 below.

Box 3.3. **Japan – Pollution Control Agreements in Yokohama City and Kitakyushu City**

More than 30 000 local Pollution Control Agreements (PCAs) are presently in use in Japan. The Japanese case study discusses the PCAs in Yokohama City and Kitakyushu City. It was prepared by Hidefumi Imura of Nagoya University and Rie Watanabe of the Institute for Global Environmental Strategies.

In 1964, Electric Power Development Co., Ltd (EPDC), a company controlled by the former Ministry of International Trade and Industry (MITI), was planning to build a new coal-fired thermal power plant in the Yokohama area. Yokohama was already suffering from air pollution in its coastal industrial area, and it was expected that this power plant would aggravate the air pollution in the city. As the national law had not enough regulatory power to prevent air pollution, Yokohama City developed a "pollution control contract", in which EPDC committed to take measures to achieve agreed targets beyond the levels required by the law. This contract is regarded as the first PCA in Japan.

In 1967, an agreement was concluded between Kitakyushu City and Tobata Kyodo Thermal Power Ltd (TKTP). As it was the first agreement in that city, they adopted an *ad hoc* procedure. The mayor sent a letter to the company, requesting it to take special measures for air pollution control. The company sent a reply to the mayor, stating that it would faithfully take measures to comply with the requests by the mayor. In 1969, a second agreement was concluded. In this case, the mayor of Kitakyushu, the governor of the Fukuoka Prefecture and the president of TKTP met and signed the agreement, which stated that the company had to take measures to reduce the sulphur content of fuels and install dust collectors. After the city enforced a municipal ordinance for pollution control in 1970, the PCAs began to play a complementary role to achieve the standards set by the ordinance.

Box 3.3. **Japan – Pollution Control Agreements in Yokohama City and Kitakyushu City** *(cont.)*

Environmental effectiveness

The table below summarises some information related to the environmental effectiveness of the environmental agreements:

	Yokohama	Kitakyushu
Targets include:	– The concentration of SO_2 should be below 500 PPM. – The amounts of smoke and dust should be below 0.6g/Nm3. – EPDC should periodically monitor the density of smoke, noise level, waster water quality, etc.	– Achieve the national ambient air quality standard of sulphur dioxide. – Items which are not fully dealt with in national laws, such as toxic chemicals, sunshine, greenery.
Was a BAU scenario established before the agreement was finalised?	Yes	Yes
Measurement and reporting of emissions:	Continuous measuring of several pollutants, the data are mostly made public.	Information is lacking.
Independent verification?	Verification by local government.	Verification by local government.
Have targets been met?	Yes, by a wide margin.	Yes, by a wide margin.
To what extent are achievements a result of the program / agreement?	Probably to a significant extent, especially in the first years after the introduction.	Probably to a significant extent, especially in the first years after the introduction.

Economic efficiency

In Yokohama City, the PCAs were concluded with single companies. Hence, there were no mechanisms that could ensure that a given environmental target was achieved by lowest possible cost. On the contrary, the tendency for agreements in Yokohama City to only cover expansions and new plants can cause some low-cost abatement options not to be pursued.

In Kitakyushu City, a collective agreement was concluded between the city and more than 100 emission sources. There was a consultation committee consisting of the environmental authorities of the city and the companies, and they decided the general reduction policy. Then the city and companies made negotiations individually about the allowable emissions. However, it is not clear what criteria were used to distribute the total abatement measures across the firms involved. If more or less similar percentage reductions in all plants were sought, *total* abatement costs would generally not be minimised.

Box 3.3. **Japan – Pollution Control Agreements in Yokohama City and Kitakyushu City** *(cont.)*

Administrative costs

It took more than half a year to conclude the agreement in Yokohama after the construction plan of the coal-fired thermal power station was proposed. The city and EPDC both undertook different tests to estimate the impacts an agreement would have. Further, Yokohama City also submitted a request to MITI for budgetary support to EPDC. All these administrative procedures took much time. In Kitakyushu City, a committee with representatives of public authorities and private companies discussed the design of the PCAs. This multiparty consultation helped to streamline the negotiation procedures and reduce the transaction cost. Today, in both cities, one small section handles the matters related to the PCAs together with other work.

Policy mixes

Many PCAs are used as a supplement to exiting regulations. They are also used as a condition for companies to acquire a permit or licence. The different instruments generally work in the same direction. Japan has "total mass pollutant control" schemes for air and water pollutants. The government designates special areas of control, and allocates emission quotas to prefectures and municipalities. These schemes could in principle be converted to tradable permit schemes.

Box 3.4. **United States – The agreements with Intel Corporation and Merck Pharmaceuticals in Project XL**

Introduced by the US Environmental Protection Agency (EPA) in 1995, Project XL was to provide participants with regulatory relief in exchange for pollution reductions in excess of status quo standards. However, uncertainties regarding the legality of the initiative caused EPA to dilute its design. Because the initiative involves negotiation, EPA also has sought to streamline the program to reduce transaction costs, which initially were quite high. Two of the earliest and most prominent of the individual agreements under Project XL were agreements to obtain relief from air permitting requirements with Intel Corporation and Merck Pharmaceuticals, two companies that rely on rapid innovation to secure market share for their technologically advanced products.

The United States case study discusses these two companies' experiences in Project XL. It was prepared by Ms. Janice Mazurek of the Progressive Policy Institute in Washington, D.C.

Box 3.4. **United States – The agreements with Intel Corporation and Merck Pharmaceuticals in Project XL** *(cont.)*

In November 1996, Intel Corporation became the first major US manufacturer approved for Project XL when it completed an agreement that covers *one* of its 11 US facilities. Intel modifies process chemistries and equipment many times a year. However, its ability to release new products and make refinements to existing products in a timely manner is hampered by air permitting provisions, as the facility must obtain approval each time it makes a manufacturing change. To address these issues, Intel sought a five-year air permit that approved chemical and equipment changes in advance for a new microprocessor manufacturing facility, located in Chandler, Arizona.

Of Merck's seven US facilities, the Project XL agreement covers the Stonewall Plant near Elkton, Virginia. Merck sought flexibility from the requirements of the Clean Air Act in order to reduce the likelihood of costly delays associated with air permitting. The plant is located near the Shenandoah National Park, an environmentally sensitive area subject to requirements under the Clean Air Act that are more stringent than in other undeveloped areas. In recent years, the air quality and visibility in the park have deteriorated. Merck signed its final XL agreement in December 1997.

Environmental effectiveness

The table below summarises some information related to the environmental effectiveness of the two approaches:

	Intel	Merck
Targets include:	Limits on emissions of VOC, NO_x, CO, SO_2, particulate matter and hazardous air pollutants like phosphine and sulphuric acid.	Reductions of emissions of total criteria pollutants (20%), SO_2 (25%), NO_x (10%) and particulate matter less than 10 microns (~0) below 1992/93 averages.
Was a BAU scenario established before the agreement was finalised?	No	Yes, based on historical emissions.
Measurement and reporting of emissions:	Quarterly and annual reporting of estimates based on flows of materials and energy.	Emission tests on smokestacks and estimates based on fuel use; reporting frequency depends on degree of target attainment.
Independent verification?	No	No
Have targets been met?	Yes, by wide margin.	Yes, by wide margin.
To what extent are achievements a result of the agreement?	Impossible to state with certainty.	Impossible to state with certainty.

Box 3.4. **United States – The agreements with Intel Corporation and Merck Pharmaceuticals in Project XL** *(cont.)*

Even if the targets of the agreements in both cases were met by a wide margin, it is impossible to state with certainty whether the achievement of the targets was the result of Project XL, or whether they would have been attained in any case. This is in part due to the lack of a baseline scenario that – at the time of the negotiations – could indicate what emissions were likely to be in the following years.

Economic efficiency

Both cases concern a single plant belonging to a single company. Hence, the question of whether or not abatement was undertaken where costs are the lowest is – within the domain of these agreements – not so relevant. The fact that the agreements provide some flexibility in how to achieve the targets compared to the relatively detailed provisions of the Clean Air Act does, however, indicate that some economic efficiency gains have been realised.

Administrative costs

Total costs to develop a XL project were quite substantial. Blackman and Mazurek (2001) found that the median total cost was $334 999 per agreement for the 11 firms in their study. The average length of time required to develop an XL project agreement was 26 months. A follow-up survey conducted by Delmas and Mazurek (2001) found that the median cost had fallen to $108 000. For Intel and Merck, the cost to participate in Project XL was $588 000 and $706 000, respectively. These costs are considerably above the median – due in part to the long duration of negotiations. Intel's XL negotiation took 17 months to complete, whereas Merck's required 26 months.

Policy mixes

A number of companies, including Intel, participated in both Project XL and the now defunct Common Sense Initiative (CSI), where the focus was to review, and if necessary, revise regulations identified as ineffective or inefficient. But there was little or no co-ordination on behalf of EPA or companies between the two initiatives. In theory, the initiatives had the potential to be complementary. For example, because it dealt with sectors, rather than individual companies (and their proprietary processes) CSI could have served as an opportunity to identify and to reduce information asymmetries associated with Project XL. Environmental groups objected to Intel's use of levels contained in the Clean Air Act as a baseline to assess performance for its new facility. CSI's electronics group, comprising several semiconductor manufacturers, including Intel, could have worked to develop a benchmark based on participants' aggregate performance, against which to assess the performance of Intel's individual XL facility.

Furthermore, CSI could have provided a way to popularise and transfer to other facilities and firms the results of Intel's Project XL efforts. For instance, the results of Intel's experiment could have been transferred to other Intel facilities and to the facilities of other semiconductor manufacturers.

In addition to the case studies described in Boxes 3.1, and 3.4, the subsequent discussion draws on many other theoretical and empirical sources, including a large number of case studies undertaken by other researchers. References are provided in the text, and details on some of the cases are given in boxes.

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4. Environmental Effectiveness of Voluntary Approaches

4.1. The issues at stake

A discussion of the environmental effectiveness of any policy instrument should – *inter alia* – address a number of related questions:

a) Have the environmental targets been set at an appropriate level?

b) Have the existing environmental targets been met?

c) To what extent have the achievements been due to the instrument in question? What would have happened in a "Business-as-Usual scenario"?

These issues will briefly be dealt with one by one in the following sections.

4.2. Have the environmental targets been set at an appropriate level?

Textbooks in environmental economics explain that environmental policy targets should be set in such a way that the *marginal social benefits* of further environmental improvement equal the *marginal social costs* of achieving a further improvement.

In practice, targets are often set differently – *inter alia* because policy makers have only limited (quantified) knowledge of the marginal benefits[1] of environmental improvements and of the marginal social and private costs of achieving the improvements. Targets are often set through formal or informal "bargaining" between various stakeholders involved.[2] Also, many targets (related to cross-border pollution) are (best) set through international negotiations, where a strict alignment of costs and benefits for each party can be difficult to achieve.

A full discussion of these issues is outside the scope of this report. One potential problem will, however, briefly be singled-out at the outset of this discussion of environmental effectiveness: *Is it likely that, for example, so-called "regulatory capture"* [*c.f.* Box 4.1] *can have caused environmental targets to be set "too low"?* If so, the marginal social benefits of additional abatement would be (significantly) higher than the marginal social costs of achieving them – and environmental conditions after a given policy has been put in place would differ only marginally from what they would have been like in a "Business-as-Usual" scenario. We return to this question after having reviewed some of the available evidence on target achievements.

Box 4.1. **Regulatory capture**

Since the abatement of emissions is costly, polluting firms have a clear incentive to obstruct the introduction of a more stringent environmental policy. If they succeed, the regulation is not passed and they do not pay additional expenses for the environment. The policy is said to have been "captured" by industry. More generally, environmental regulation is captured when regulatory costs are zero for a firm. This includes cases where new legislation has been successfully obstructed but also cases where it has been passed but has been flawed: either the objective to be achieved set by the law corresponds to a Business-as-Usual pattern or the objective is more ambitious, but firms know that it will not be enforced. In using this definition, a voluntary approach will be considered as being captured by industry when the environmental target set is no more than the abatement associated with a Business-as-Usual pattern. But to go beyond this all-or-nothing view of capture, it is also considered that there is a degree of capture when the target is close to the Business-as-Usual pattern: the closer the target to this pattern, the higher the degree of capture of a voluntary approach by industry interests.

Policy-makers may collude with industry in the use of voluntary approaches because it speeds up the regulatory process. As a result, public authorities can demonstrate to public opinion that they are able to diligently undertake action and that they have contributed to solving many environmental problems during the legislature. Similarly, an environmental agency may collude with industry in the use of voluntary approaches in order to save its budget resources.

Source: OECD (1999), which includes a broad discussion of this issue.

4.3. Have the existing environmental targets been met?

The answer to this question will of course vary between different approaches, and this report can only present a limited number of examples. Many of the references listed at the end quote additional examples.

Most of the environmental targets included in the case studies described above were in fact met. *One* example of the opposite is the target for persistent, bioaccumulative and toxic substances under the ARET program in Canada. While the ARET target was a 90% reduction in releases of such substances by 2000, a 61% reduction was actually achieved by that year, *c.f.* OECD (2002a).

Khanna and Damon (1999) studied impacts of US EPA's 33/50 program on toxic releases and economic performance of firms in the chemical industry during the programs first three years, 1991-93 (see Box 4.2).[3] They found that

the target of the program was largely met – but not so much due to the program itself (see further discussion in Section 4.4).

King and Lenox (2000) studied the Responsible Care program of the US Chemical Manufacturers Association (CMA) – which is a (b)-type unilateral initiative according to the grouping suggested by Khanna (2001).[4] The program had a twofold purpose: To improve the environmental and safety performance of CMA members and to thereby improve public perception of the industry. All members of CMA are required to adopt Responsible Care as a condition of membership. King and Lenox (2000) state that "it is important to remember that the industry as a whole made great strides over the period. Total toxicity-weighted emissions were reduced by nearly 50 per cent".

Box 4.2. **United States – The 33/50 program**

The 33/50 Program was launched by the US EPA in 1991 to induce firms to voluntarily reduce their emissions of 17 high priority toxic chemicals. The program aimed to reduce the aggregate releases of these chemicals by 33% by 1992 and by 50% by 1995. Firms had complete flexibility in the amount of reductions undertaken and the means used to achieve them. The EPA, however, encouraged firms to reduce pollution at source. Reductions were evaluated relative to the level of releases reported in the Toxic Release Inventory for 1988. Of the firms emitting one or more of these 17 chemicals in 1988, 14% had pledged their participation by 1993.

Total releases by the firms studied by Khanna and Damon (1999) fell 54% over the 1991-1993 period. However, according to Khanna (2001), after correcting for sample selection bias and effects of other factors on releases, only 28% of the reduction relative to the pre-program level could be attributed to the program. The rest of the reduction in releases that was observed would have occurred any way for other reasons, such as production changes, regulatory threats, etc.

The commitment of German industry to limit its emissions of carbon dioxide has been evaluated regularly by the Rheinisch-Westfälisches Institut für Wirtschaftsforschung, see Buttermann and Hillebrand (2002) and Box 4.3.[5] They found that the CO_2-emissions from German in 1999 were 41 million tonnes lower than what they had been in the base year, 1990.

Despite some significant improvements in industrial energy efficiency, Buttermann and Hillebrand (2002) states that heterogeneity of the reporting from sectors involved remains a problem, for instance that some sectors report own numbers that differ from official data.[6]

Box 4.3. **Germany – The climate protection declaration of German industry**

In a declaration from March 1996, five federations representing the whole industry committed to reduce specific energy consumption 20% between 1990 and 2005. Branch targets vary from 15 to 30% reductions in greenhouse gas emission, either in absolute or in relative terms. Rheinisch-Westfälisches Institut für Wirtschaftsforschung was appointed to monitor the target achievements, and Buttermann and Hillebrand (2002) presents the following table, showing changes in CO_2 emissions, measured in million tonnes, compared to 1990:

	1995	1996	1997	1998	1999
		Observed			
Industry	–35	–41	–33	–35	–41
Electricity generation	–22	–11	–24	–16	–24
Total	–57	–52	–57	–51	–65
		Estimated			
Industry	–35	–41	–42	–46	–53
Electricity generation	–26	–28	–30	–30	–25
Total	–61	–69	–72	–76	–78

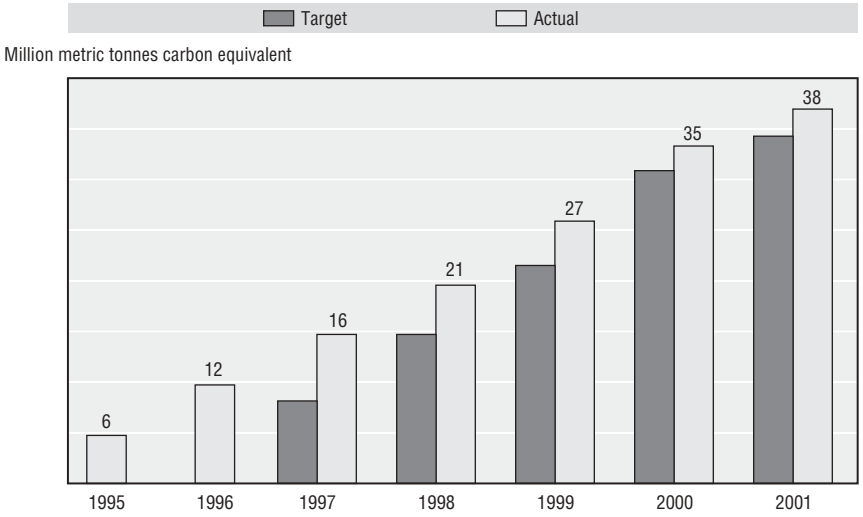
The estimated emission numbers correct for changes in production levels in the sectors concerned. The emission reductions can be traced back to a number of different measures, including modernisation of existing plants, the building of new plants to replace out-dated equipment, and development of new energy supply concepts.

Buttermann and Hillebrand (2002) states that the reporting from the federations involved is (still) very heterogeneous, and that it is especially noteworthy that several federations provide their own numbers that differ from official data.

A number of voluntary programs to limit greenhouse gas emissions in United States, including the so-called "Energy Star®" and "Climate Leaders" programs, are described in US EPA (2002). Energy Star® is a set of eco-labelling schemes for different product categories – but contrary to many other eco-labelling schemes, the energy efficiency promised by the goods that carry the Energy Star® logo will bring direct cost savings to the purchasers. It is stated that these programs in total lead to a 38 million tonnes of carbon equivalent reduction of greenhouse gas emissions in 2001. The targets of the programs

have been more than met,[7] particularly in the first years of the programs' existence, *c.f.* Figure 4.1. The publication also states that "net of their investments in energy-efficient technologies, consumers and businesses are saving about $70 billion cumulatively through 2012 and more than $6 billion in 2001".[8]

Figure 4.1. **Estimated carbon equivalent emission reductions compared to program goals in United States**



Source: US EPA (2002).

Börkey and Glachand (1999) studied impacts of the Dutch covenant concerning the base metals industry (see Box 4.4).[9] They found that the first phase of the covenant, up to 1995, was a partial failure, as only half of the objectives had been reached, and they said that the authorities blamed this *i.a.* on the unfavourable economic situation in the early 1990-ies for this industry. All in all, the authorities were said to find the covenant a success. The targets that were not expected to be met by 2000 were rather costly to meet, and the public authorities were said to accept this under-performance. For the cost reasons, it was decided to postpone these objectives from 2000 to 2005, to give the firms more time to find lower-cost abatement options.

Corus Staal (2001) and (2002) provide information on later developments in reaching the targets of the covenant. The results are somewhat mixed. While for instance emissions of some heavy metals decreased from 1999 to 2000, annual emissions of for example zinc increased from 9 to 14 tonnes, and emissions of mercury increased from 14 to 90 kg. As illustrated in

Figure 4.2, the target for NO_x emissions has proven very difficult to meet. The firm has commented on this as follows:

> "Despite the various efforts made in recent years to reduce NO_x emissions, we have unfortunately not been able to approach the covenant targets for the year 2000. The total reduction in comparison to the baseline (1985) was about 19%, while the target was a reduction of 55%. (…) However there are almost no remaining cost-effective measures that can be taken to reduce our NO_x emissions further. Therefore the guideline target of achieving a reduction of 90% in 2010 seems to us to be an impossible task." [Corus Staal (2001)]
>
> "Emission trading offers companies the possibility of complying with their obligation to reduce emissions of nitrous oxides (NO_x) either by taking emission-reducing measures themselves or by buying reductions that are realised elsewhere. Emission trading makes use of the different costs of reduction measures taken by different companies, with the result that reductions are achieved in the companies where this can be done at least cost. In 2001 the government and industry have further developed the system of NO_x emission trading. Measures to reduce NO_x emissions in an industry such as ours are very expensive, so the Corus plant in IJmuiden wants to participate in NO_x emission trading, which will probably begin in 2004." [Corus Staal (2002)].

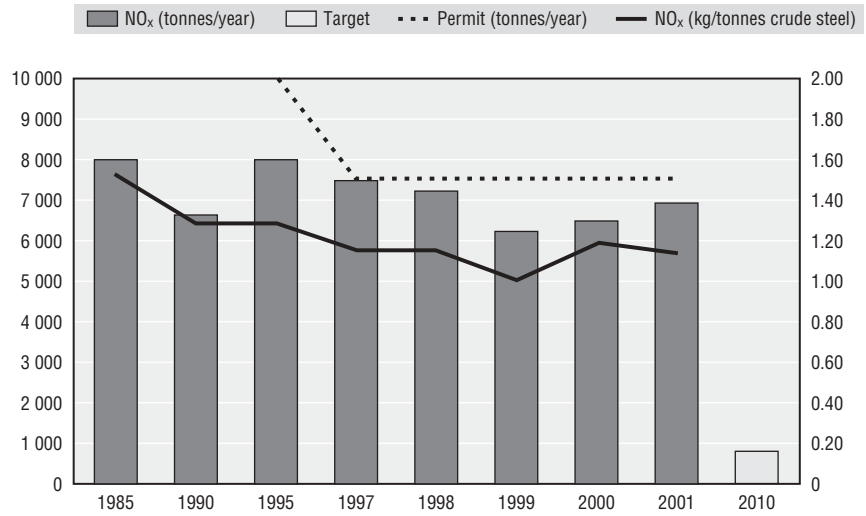
Box 4.4. **The Netherlands – The base metals covenant**

The Dutch covenant with the base metal industry was signed in 1992 between the branch association SBM, the Ministry for the Environment, the provincial authorities and the water boards. This is a multi-issue agreement covering a wide range of pollutants. Quantitative sectoral targets were set for the years 1995, 2000 and 2010, but the targets were made dependant of their economic feasibility. The authorities committed themselves not to introduce new regulations during the period that the covenant is in force.

While the base metals industry produces *inter alia* steel, aluminium, zinc, etc., the steel company Corus Staal represents by far the largest share of total production and emissions.

Brand (2000) studied the agreement on SO_2 and NO_x emissions reductions by the power generation industry in the Netherlands. This agreement was somewhat special, as one unit (SEP – Samenwerkende ElekticiteitsProduktiebedrijven/Co-operating electricity production companies) effectively controlled the whole sector, and for instance could allocate emission

Figure 4.2. **NO_x emissions at Corus Staal**



Source: Corus Staal (2002).

reduction obligations in a cost-minimising way between the regional production companies. Further, import restrictions on electricity meant that cost increases due to environmental regulation without much impact on the firms affected could be passed on to the electricity users. According to Brand (2000), "the covenant has proved to be very capable of achieving the targets set: a maximum amount of emission of SO_2 and NO_x by the electricity producers in the year 2000". This was achieved by taking older coal-fired plants without desulphurisation equipment out of production, replacing them by gas-fired installations, equipping other coal-fired plants with flue gas installations, and a switch to coal containing less sulphur.

Rietbergen, Breukels and Blok (2000) analysed the implementation and efficiency of the Long Term Agreement (LTA) on energy efficiency in the paper and glass manufacturing industry in the Netherlands. They found that the LTA stimulated the firms to develop a more structured and systematic way of dealing with energy conservation, and improved the firms' technical knowledge about energy conservation options and possibilities to apply for subsidies and tax reductions.

Agreements signed in 1996 and 1997 between the aluminium and the packaging glass industries on the one hand and the French Ministry of Environment on the other hand were analysed by Chidiak and Glachant (2000). They state that the ministry "mostly accepted industry self-designed commitments (mainly based on investments and technical improvements

planned since the late 1980s), but in the negotiation process, information gathering and exchange was quite important...". Further, they write concerning the packaging glass case, that the industry is confident to keep its specific emissions objective concerning CO_2, while "some problems may be encountered to comply with the absolute emissions objective, due to higher than expected production level (at the time the VA was signed a 8% increase in production was predicted for the period 1990-99, while the actual production increase amounted to 16% for the period 1990-98)". Regarding the aluminium industry Chidiak and Glachant write that from "the 1997 progress report issued by Pechiney," [the company concerned] "it is clear that most of the objectives have already been achieved" (...). "Nevertheless, the attainment of absolute emission objectives remains highly uncertain."

AGO (1999) describes the Australian Greenhouse Challenge program. This program, started in 1995, invited companies, industrial associations, etc., to prepare an inventory of greenhouse gas emissions, assess opportunities for abatement, forecast emissions in 2000, sign an agreement, monitor progress and provide annual reports on achievements. The program focussed on no-regret options for abatement. The "Implementation Plan" of the program stated that "Forecasts of impacts will not be interpreted as or used to set arbitrary targets, and no penalty will apply where forecasts are not achieved".

According to AGO (1999), progress reports available at that time indicated that actions included in participants' action plans would lower emissions among end-users of energy in 2000 by about 23.5 million tonnes CO_2 equivalents (or 16%) compared to what they otherwise would have been in that year – assuming there were no changes in enterprises' emissions efficiency. Participants from the electricity generation and distribution sector were in a similar way projecting abatement reductions of 5 million tonnes CO_2 equivalents (or 3%), but due to increased activity levels, absolute emissions from this sector were still projected to grow 23% over the period 1995-2000.[10]

In conclusion, the review above indicates that environmental targets set in voluntary policy approaches in many – perhaps most – cases are met, sometimes by a wide margin. However, when the costs of achieving the targets are found to be very high, the targets tend not to be strictly enforced.

4.4. To what extent have the realised achievements been due to the voluntary approach?

While the target of a given voluntary approach in most cases seems to be met, it is important for policy makers to ask whether or not this is due to the application of the approach in question – or whether outside factors largely explain the developments. *If* the latter should be the case, this *could* be an indication that the targets at the outset had not been set at a level that

properly balances the costs of achieving additional improvements with the benefits of such marginal improvements. In other words: there *could* be a case of "regulatory capture", where industry's regulatory costs are close to zero – but where industry still obtains benefits, like a heightened public image, R&D subsidies, tax concessions, etc.

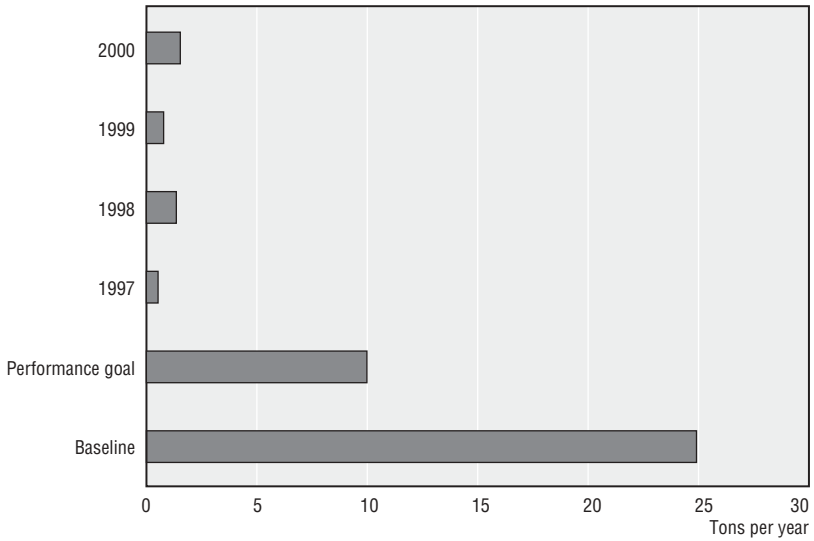
A given approach should, for example, obviously not be given much credit for the achievement of a target if a major share of the improvements compared to a base year takes place before – or soon after – the entering into force of the approach, for example the signing of an agreement, or the public annunciation of a unilateral commitment. This is linked to the information asymmetries that are endemic to any type of environmental regulation. While public authorities have limited knowledge of firms' abatement costs and business strategies, the firms themselves might, for instance, for economic reasons already have planned to close down an unprofitable polluting facility, or to invest in new, cleaner production equipment. If so, they could like to "cash in" improved environmental recognition in doing so, or they might like to give stricter regulation the blame for social adjustment costs related to a long-planned plant closure.

It is obviously difficult to say with certainty to what extent a given development is due to a particular policy instrument. There is the counterfactual problem: *one doesn't know for sure what would otherwise have happened*. The mere fact that a (voluntary or other) instrument is put in place to address a given problem can make firms and household more aware of the problem in question, causing changes in their behaviour. And a given policy-change is seldom the only factor that influences developments. There will simultaneously occur changes in market prices, consumer preferences, technological knowledge, industrial structures, etc. Through various econometric techniques one can, however, to a significant degree control for such outside influences, in order to isolate the effects of the policy change in question.

The case studies prepared especially for this report (*c.f.* Boxes 3.1 to 3.4) provide a mixed picture. The Pollution Control Agreements in Yokohama and Kitakyushu seem to have contributed significantly to the observed environmental improvements in the first years after implementation, and this can also be the case for the Danish agreement scheme on industrial energy efficiency. It is in this connection worth mentioning that there was a *credible threat* underpinning some of the agreements: Yokohama City could block a transfer of land that was necessary for building the new power plant if the company concerned would not enter into an agreement. In Denmark, fulfilment of an energy efficiency agreement is a necessary condition for obtaining a significant tax reduction.

In other cases, it seems more doubtful that the approach in question played a major role in achieving a given target. As illustrated in OECD (2002b), improvements for many pollutants addressed in Intel's Project XL agreement have been spectacular, both compared to the baseline and – in many cases – compared to the targets set under the agreement. Figure 4.3 illustrates the case of aggregate emissions of hazardous organic air pollutants.

Figure 4.3. **Aggregate emissions of organic hazardous air pollutants from Intel's Project XL plant**



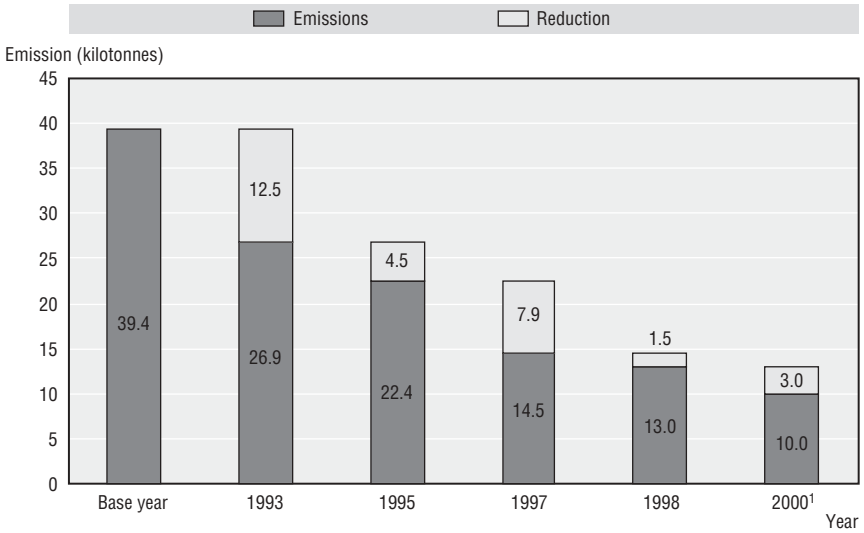
Source: OECD (2002b). Intel (2002b) indicates that organic hazardous air pollutants emissions increased to 1.8 tons in 2001.

The stated Performance Goal represented a quite significant improvement compared to the set Baseline – but the actual emissions over the whole period 1997-2000 represent such a radical improvement compared to the target that it is hard to imagine that the company ever saw the target to represent a real constraint. In fact, Intel designs its products years in advance. It would follow that the firm would largely know *ex ante* what its emissions would be five, and ten years into the future. It is thus tempting to speculate that the company in this case knew at the time of negotiation of the agreement that they would easily meet this target, without making any major changes to their "Business-as-Usual" plans.

Also regarding the two Canadian cases studied for this report, it is unclear how much the voluntary approaches contributed to the environmental improvements registered. Figure 4.4 below shows actual and predicted emissions

from ARET participants. While emissions were reduced more than 50% after 1994, one can notice that a large share of the total emission reduction took place *before* the ARET challenge was issued in March 1994. These reductions were reported to accommodate industries' requirement to have early action recognised. Table 4.1 shows emission changes related to the Environmental Management Agreement of Dofasco Inc. Here as well, for some of the pollutants almost all improvements took place *before* the agreement was signed, but for PAH and benzene very substantive reductions took place after 1996.

Figure 4.4. **Actual and projected emissions from ARET participants**



1. Projected.

Source: OECD (2002a).

Many other studies also raise the question of how much a given voluntary approach has contributed to observed environmental improvements. Some of their findings are summarised below.

Table 4.1. **Change in emissions of key substances and energy use at Dofasco Inc.**

	Change from Base Year to 1996	Change from 1996-2000
PAHs	0.0%	–64.7%
Benzene	+1.5%	–83.3%
Energy	–15.2%	–5.0%
GHG emissions	–24.4%	+1.1%
NOx emissions	–26.7%	–14.5%

Source: OECD (2002a).

Chidiak and Glachant (2000) wrote in their study of the French agreement with the glass packaging industry that "it (…) appears that the VA played only a minor role as compared to other motives for improving energy efficiency, and most CO_2 reductions stem from activities undertaken to achieve other goals (cost reduction, modernisation, compliance with other environmental regulation or other VA goals, etc.). Similarly, the VA didn't lead to a change in firms' energy management practice nor its organisation."

Concerning the French agreement with the aluminium industry they stated that heavy investments to improve the electrolysis process and a number of smaller efficiency improvements related to better metering equipment, process optimisation, etc., explain the observed energy efficiency improvements. "Most of these initiatives appear to be very closely related to developments other than the VA…". (…) "It is important to note that the investment phase was well under way by the time the agreement was signed and hence most of the specific emissions objectives were nearly achieved by then. Overall the VA meant no additional pressure as regards the firm's practice on energy and raw material consumption … "

Rietbergen and Blok (2000) studied the Long Term Agreement (LTA) on energy efficiency in the Netherlands and concluded *inter alia* that "on average about one third to half of the energy savings in the Dutch Manufacturing industry can be attributed to the Long-Term agreements, including the supporting measures like subsidy schemes and financial incentives".[11] Rietbergen, Breukels and Blok (2000) state in their study of the LTA with the paper and glass manufacturing industry in the Netherlands that "there is no empirical evidence that the LTAs have stimulated the development of new energy efficient technologies". They further say that "the firms indicate that all the investments in energy conservation projects would have also been taken anyway".

In the analysis of the agreement on SO_2 and NO_x emission reductions in the power generation sector in the Netherlands, Brand (2000) states that

> "A large part of the reductions were realised by the closure of old coal-fired plants without abatement technology. These plants were on the list to be closed because of their life-time and (BEES) regulation.[12] The covenant might have speeded up this process a little. Furthermore, the sector made some improvements with the desulphurisation equipment over the years. At the same time however, the sector has started to use coals that contain more sulphur instead of less. It is a question to what extent the reductions of SO_2 emissions by the power generating industry are due to the covenant? There is no easy answer. What would have happened if there hadn't been a covenant and normal practice would have taken place complying with the BEES regulation? It seems that the effect of the covenant is clearly visible at a macro level where the

reductions of SO_2 and NO_x emissions are guaranteed by the sector. At a micro level, however, sometimes higher emissions can occur."[13]

The 4th National Environmental Policy Plan in the Netherlands included an evaluation of past policies, *c.f.* Ministry of Housing, Spatial Planning and the Environment (2001). Here it was *inter alia* said that:

"In the preparation of the NEPP 4 the Central Economic Planning Agency (CPB) evaluated government policy for CO_2, NO_x, traffic emissions, noise nuisance around Amsterdam Schipol airport and eutrophication. Based on its evaluation the CPB formulated these and other conclusions:

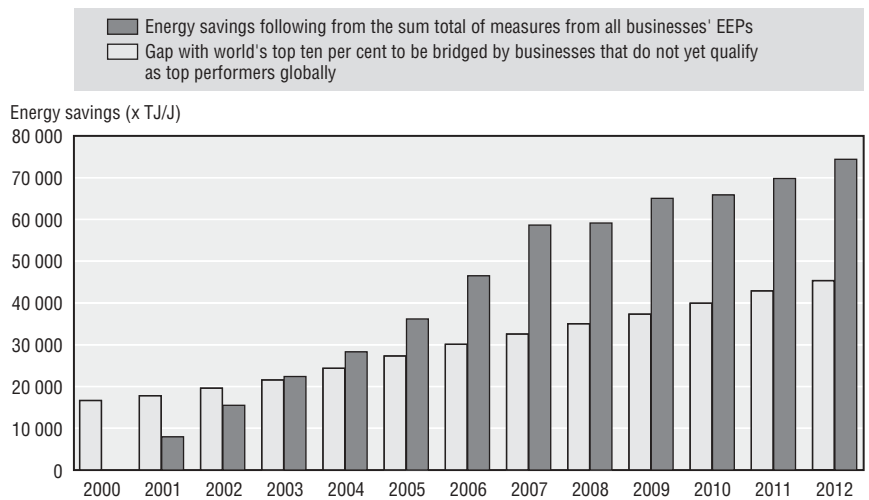
- Autonomous developments (such as technical developments or changes in the structure of sectors) often play an important role in improving environmental performance. Conversely, they render the feasibility of long-term aims uncertain.
- The most significant pitfall for environmental policy is formulating objectives without making clear how these can be achieved and what the consequences are.
- A cost-benefit analysis is important. Environmental objectives are often formulated as emission targets, but environmental benefits (*e.g.* in terms of the quality of the living environment) are usually not mentioned.
- If available policy instruments are not deployed quickly, environmental policy can lead to unnecessary costs.
- Environmental policies can be strengthened by expanding the use of policy instruments in line with market conditions, such as levies and tradable emission permits.
- It should be possible for the government to compensate groups suffering extreme hardship as a result of environmental policies.
- So far, the effects of multi-year agreements and energy-saving subsidies have been relatively limited.
- Regulations must be clear, verifiable and consistent.

The government has endorsed most of the CPB's recommendations; those conclusions played a prominent role in the policy formulated in NEPP 4. With respect to the comments on the multi-year agreements, it should be noted that they did, in fact, result in increased efficiency, but in retrospect, the impression is that the stakes could have been set higher. The government will not discontinue the use of covenants and multi-year agreements, but will evaluate these policy tools in the short term. The government would also like to address the recommendation to compensate groups suffering hardships. This type of compensation would not be in keeping with the principle of 'the polluter pays'. A better

solution would seem to be to set a reasonable period by which the required changes must have been accomplished."

Benchmarking Commission (2002) is an interim report on the Energy Efficiency Benchmarking Covenant that the Dutch Government concluded with industry 6 July 1999. In it, the energy-intensive industry pledges to be among the World leaders in terms of energy efficiency for process installations by no later than 2012. In exchange for this undertaking, the government has agreed not to impose any extra specific national measures governing energy conservation or CO_2 reduction on the participating companies. The participating firms are obliged to identify the Top Global Performers for more than 500 different processes, and to prepare Energy Efficiency Plans that per individual plant sets out the concrete measures to be put in place to make sure they will rank among the top ten percent. Close to 100% of all affected firms participate in the covenant, many of them already having among the highest rates of energy efficiency. Figure 4.5, which is based on the Energy Efficiency Plans having been prepared by February 2002, illustrates the energy savings that are *expected* up to 2012.

Figure 4.5. **Estimated energy savings due to the Dutch energy efficiency benchmarking covenant**



Source: Benchmarking Commission (2002).

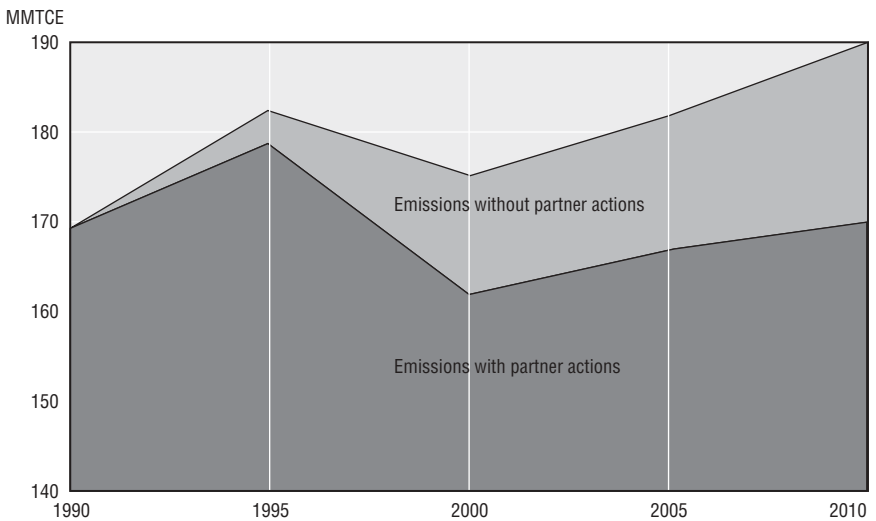
The interim report states that "Remarkably quite a few companies are implementing more measures than would be called for to hook up with the front runner or stay there". This is represented by the difference between the light and dark bars in the figure – and could be taken to indicate that the

covenant is not necessarily the "driving force" behind the foreseen measures. In other words, there is indication that a significant share of the measures to increase energy efficiency would have been taken anyhow.[14]

For some of the voluntary non-CO_2 greenhouse gas emission programs in United States US EPA (2002) includes graphs that indicate differences in emission levels with and without partner actions. As an example, Figure 4.6 illustrates the estimated differences as far as methane emissions are concerned, for the period 1990-2010. The methane partnerships include the Landfill Methane Outreach Program, Natural Gas STAR program and the Coalbed Methane Outreach Program. All of these programs provide technical, economic and regulatory information on emission-reduction technologies and practises, as well as tools to facilitate implementation of methane-reduction opportunities.

Figure 4.6. **Estimated impacts of programs to reduce methane emissions in United States**

Million metric tonnes carbon equivalent



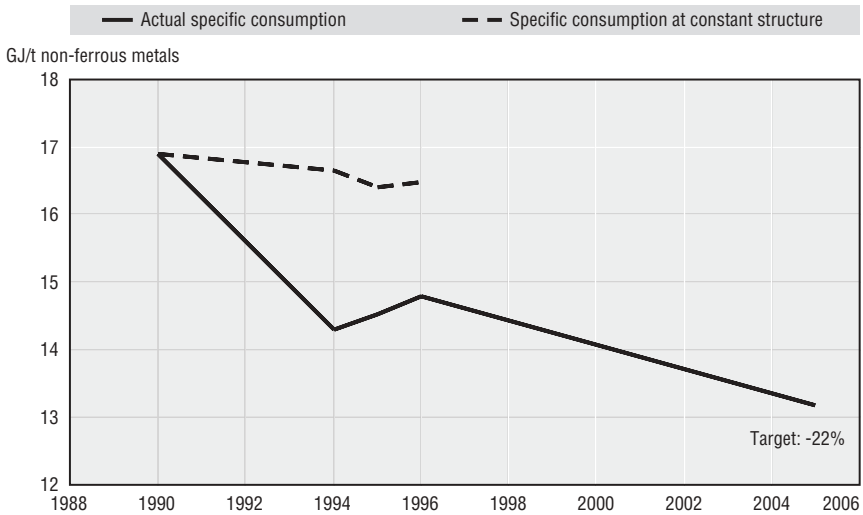
Source: US EPA (2002). *Note:* The vertical axis does *not* start at 0.

US EPA (2002) states that "These voluntary partnerships, *in conjunction with a regulatory program* to limit air emissions from the nation's largest landfills, reduced the national methane emissions to well below 1990 levels in 2001, and they are projected to maintain emissions below 1990 levels through 2010" (*emphasis added here*). The report does not spell out the relative contributions of the different policy measures, and does not discuss whether

some of the "partner actions" might have been undertaken even if no environmental policy measures had been in place.

Ramesohl and Kristof (2000) also looked at the declaration of the German industry on global warming prevention. They pointed out, taking the non-ferrous metal sector as one example, that "a structural analysis indicates that the majority of the indicated efficiency improvements result from intra-sectoral changes" [referring to previous studies by RWI, *c.f.* Buttermann and Hillebrand (2000)]. "Just by a simple breakdown of the non-ferrous metal branch into primary aluminium production and other non-ferrous metals, significant structural effects can be decovered" (sic!), "and the degree of target achievement of the non-ferrous metal sector drops from the reported 60% to some 10%" (see Figure 4.7).

Figure 4.7. **Specific energy consumption of the non-ferrous metals branch in Germany**



Note: The vertical axis does *not* start at 0. The curve labelled "specific consumption at constant structure" only takes into account changes in energy efficiency within the primary aluminium sector.
Source: Eichhammer (1998).

The German "Blue Angel" eco-label, which in this context can be seen as a "public voluntary program", was analysed by Hemmelskamp and Brockmann (1997). Looking in particular at emulsion lacquer paint, they conclude that products qualifying for the label increased its market share – beyond the underlying trend implying a general switch in demand from paints containing solvent to solvent-free paints. This took place in spite of a relative price increase for the types of paint that qualify for the "Blue Angel".

Hemmelskamp and Brockmann state that it cannot be assessed with certainty whether the increase in market share for the relevant type of paint was solely due to the label, but say that "it is evident that the Blue Angel is the main factor of the success story in our case study".[15]

Concerning the Australian Greenhouse Challenge, AGO (1999) states that "Based on qualitative indicators, it is clear that some of the abatement reported against a static efficiency baseline would have occurred in the absence of the Challenge. It is equally clear, from over half of surveyed organisations, that the Challenge played a significant role in stimulating abatement action".

The Voluntary Initiative on pesticides use in the United Kingdom is a formal agreement between the Government and the farming industry, with 28 (mostly process-related) targets to be achieved over a 5-year period.[16] It was launched as an alternative to a pesticides tax that also was – and still is – under consideration. Among the targets included is to develop "crop protection management plans", and to have 30% of arable land using these by 2006. The initiative was only started in February 2001, so it is too early to undertake a proper evaluation of its environmental impacts. However, The Stationery Office (2002) does provide a preliminary discussion of the scheme – as well as minutes of a Parliamentary hearing on the initiative held in October 2002. The report came to the following conclusions:

a) "The Voluntary Initiative has got off to a rather slow start. It has so far had little impact on farmers as much of the work done to date has involved preparation and groundwork. The Initiative is now beginning to be rolled out to farmers and the next year will be critical.

b) We are, however, very concerned that the Voluntary Initiative does not have within itself sufficient incentives to ensure the high level of take-up required. Nor, being voluntary, can it require farmers to change their behaviour. In addition, there is little emphasis within the Initiative on reductions in the use of pesticides and on encouraging alternative approaches.

c) On the other hand, it is too early to judge whether the Voluntary Initiative has been a success. We therefore consider that it needs to be given further time, and that at the end of 2003 a thorough and realistic appraisal of its success should be carried out.

d) But it is already clear that the Voluntary Initiative should represent only one aspect of a more comprehensive strategy towards reducing the environmental impacts of pesticides. Moreover, many of the activities within the Initiative would need to be carried out in any event as part of an overall strategy, and will depend for their effectiveness on the adoption of a joined-up approach.

e) The Government must therefore, as a matter of urgency, develop and publish a pesticides strategy. Such a strategy should show how different policy

instruments – including the use of fiscal instruments, a strong regulatory framework, the Voluntary Initiative itself, and cross-compliance with subsidy and assurance schemes – are to be used to complement each other and achieve a reduction in the environmental impacts of pesticides. (…)

f) We believe that fiscal instruments have an important part to play in such a strategy. They could provide, through hypothecation, far more resources than are currently available within the Voluntary Initiative. They could be designed to provide rebates to farmers who adhered to more stringent environmental guidance; and to discriminate much more heavily on products in relation to the extent of environmental damage they cause. (…)

g) (…)"

HM Treasury (2002) includes the following reference to the Voluntary Initiative:

> "The Government is committed to minimising the adverse environmental impact of pesticide use, consistent with adequate crop protection. A voluntary agreement on measures to reduce the environmental damage caused by pesticides was entered into by the industry and other stakeholders in April 2001. Provided this voluntary initiative is fully implemented, the Government believes it should be the most effective way of reducing the environmental impacts of pesticides and remains committed to this approach.
>
> Implementation of the voluntary initiative has been generally satisfactory. Good progress has been made in assessing the current approach of farmers to the use of pesticides and in the production of good practice guidance. However, more progress is required in certain areas. In particular, targets and measures of success for the initiative have not yet been finalised between DEFRA and the industry, and incentives for encouraging farmer participation are not sufficiently advanced. The Government values the work already completed by the signatories and will continue to press for more rapid progress. However, the Government is carrying out further work and analysis on a possible tax or other economic instrument, should the voluntary initiative fail to deliver its objectives within a reasonable timescale."

A few *econometric studies* of the impacts of voluntary policy approaches are available. One example is Khanna and Damon (1999), that used several econometric methods in order to disentangle the contribution of US EPA's 33/50 Program to the observed 54% reduction in toxic releases over the 1991-1993 period. According to Khanna (2001), after correcting for sample selection bias and effects of other factors on releases, only 28% of the reduction relative to the pre-program level could be attributed to the program. The rest

of the reduction in releases would have occurred anyway for other reasons, such as production changes, regulatory threats, etc.

King and Lenox (2000) also used a broad spectre of econometric tools to analyse the Responsible Care program in United States. Their findings are summarised in Table 4.2. The authors state: "Our data provide no evidence that Responsible Care has positively influenced the rate of improvement among its members. Indeed, we found evidence that members of Responsible Care are improving their relative environmental performance more slowly than non-members." (…) "Our research exposes the difficulty in establishing and maintaining industry self-regulation. Responsible Care has operated up to now without explicit sanctions for malfeasance. As a result, our data suggest, it has fallen victim to enough opportunism that it includes a disproportionate number of poor performers, and its members do not improve faster than non-members. Thus whatever the strength of the institutional forces that Responsible Care brings to bear on its members – and these forces appear considerable – they have not been enough to counteract opportunism. Since Responsible Care represents a leading example of self-regulation in the world, our findings highlight the difficulty of creating self-regulation without explicit sanctions."

Table 4.2. **Summary of King and Lenox' findings on the Responsible Care program**

Hypothesis	Finding
Formation and membership	
Hypothesis 1: Firms will more likely be members of the CMA and participants in Responsible Care when they have	
1) more production in the chemical industry	Strong support for all
2) production focused in chemicals	
3) better-known brand or corporate names	
Hypothesis 2: Firms will more likely be members of the CMA and participants in Responsible Care when they have	
1) higher levels of pollution relative to their industries	Strong support for all
2) operate in industry sectors with higher average levels of pollution	
Improvement	
Hypothesis 3: On average, firms that participate in Responsible Care will improve their environmental performance more than non-members in the industry.	Not supported
Hypothesis 4: On average, the chemical industry will more rapidly improve in environmental performance after the inception of Responsible Care.	Supported only for non-Responsible Care participants
Hypothesis 5: On average, participants in Responsible Care will improve their environmental performance less than non-members in the industry.	Weakly supported

Source: King and Lenox (2000).

Bjørner and Jensen (2002) present an econometric analysis of industrial energy demand in order to quantify and compare the effect of the Danish CO_2 tax, the related energy efficiency agreements and of subsidies given to investments in energy efficiency projects. They used a micro-panel database covering the majority of all Danish industrial companies over the period of 1983-1997. Thus, energy consumption could be followed over time for each industrial company.

The energy efficiency agreements have two opposing effects on energy use in the respective companies. On the one hand, the companies had to carry out certain activities, like realising proposed energy-saving projects from the energy audits described above, and to increase energy management activities. The effect of these activities was estimated be a 9% *reduction* in energy use in the companies concerned. On the other hand, companies with an agreement obtained a tax reduction, which *increased* their energy use. The increase in energy use in the affected companies due to the tax reduction was estimated to be 1-5%. Hence it appears that the agreement scheme resulted in a reduction in energy use overall. In other words, the agreement companies would seemingly have used more energy if they had not been offered the agreement, but just had paid the full tax.[17]

Bjørner, Hansen, Russell and Olsen (2002) used a model to quantify the effect of the Nordic "Swan" eco-label on consumers' choices among different brands of toilet paper, paper towels and detergents, over the period 1997-2001. They state that it "does appear that the Nordic Swan label has had a significant effect on Danish consumers' brand choices for toilet paper and detergents, corresponding to a marginal willingness to pay for the certified environmental label of 10-17% of price of the labelled products. Results are less conclusive for paper towels, but the environmental label appears to have had less influence on the brand choice for the user of paper towels."

Webber *et al.* (2002) present estimates of energy saving due to US EPA's Energy Star® program, a voluntary labelling program that *inter alia* promotes the use of energy efficient home appliances, computer equipment, etc. They conclude that "ENERGY STAR has already proven successful in its established programs, having saved 4.7 quads[18] of energy and prevented carbon emissions of 9 million metric tonnes in 2000 alone". They do, however, point out that "We did not account for the possibility of improvements in the efficiency on non-ENERGY STAR units over the analysis period…" and that "we may be crediting the program with savings that should be attributed to a general trend toward increasing energy efficiency. Accounting for this effect would certainly reduce estimated program savings, but was beyond the scope of this study." In addition they state that "the savings presented here include savings that might legitimately be claimed by other energy conservation programs".[19, 20]

4.5. Conclusion

The review above provides only a few examples where a voluntary policy approach is deemed to have contributed significantly to the fulfilment of a given target. In most cases, *factors other than the given voluntary approach seem to explain the major part of any environmental improvement that has taken place*. If this is correct, policy makers ought to consider carefully whether a voluntary approach provide sufficient "regulatory clout" to address today's – and tomorrow's – environmental challenges.

The material presented above does not provide sufficient evidence to give a generally valid answer to a question of whether or not "regulatory capture" has taken place. Each case would need to be considered separately, and the *real-life* alternatives for environmental policy makers to each voluntary approach should be taken into account.

The findings presented does, however, suggest that policy makers should – in hindsight – consider whether:

- they had a reasonably good understanding of firms' marginal abatement costs and the relevant marginal social damages at the time when the given voluntary approach was adopted;
- later developments might have altered either the marginal abatement costs or the value of the marginal social damages; and – hence – whether;
- the approach chosen still balances the marginal abatement costs and the marginal social benefits of environmental improvements in a satisfactory way.

A potential benefit of voluntary approaches from an environmental point of view, not discussed explicitly above, is that they *can* require less preparation to put in place than regulatory approaches. This would mean that one could start to address a given environmental problem more rapidly through voluntary approaches than if one were to go through all the preparations necessary to put in place *e.g.* new legislation or new taxes – which can be quite time-consuming, and demanding in terms of administrative resources.

On the other hand, the likelihood of a voluntary approach providing any environmental improvements beyond "Business-as-Usual" tends to depend strongly on their level of preparation – in developing a baseline to which developments can be compared, in quantifying targets, in designing monitoring mechanisms, in putting in place sanction in case of non-compliance, etc. And in any case, if a voluntary approach is adopted in order to be able to address a "new" problem as rapidly as possible, care should be given to *not* constrain a later introduction of other – possibly more environmentally effective – policy instruments.

Notes

1. "Marginal social benefits" should, of course, be given a broad interpretation, and include direct economic benefits as well as – much more difficult to quantify – an economic valuation of health improvements, mortality reductions, enhanced biodiversity protection, etc.
2. Cannon (2001) discusses the use of bargaining over environmental targets in the case of US Environmental Protection Agency.
3. See also Box 21 in OECD (1999).
4. *Cf*. footnote 3.
5. See also Boxes 6 and 13 in OECD (1999) and Ramesohl and Kristof (2000).
6. On 9 November 2000, a new Agreement on Climate Protection between the Government of the Federal Republic of Germany and German Business was signed. According to BMU (2000),

   "The Federal Government welcomes the extended and updated Declaration of German Business for the years 2005 and 2012. The Federal Government and German Business assume that the volume of emissions in 2005 will be reduced by an additional 10 million tonnes of CO_2 and by a further 10 million tonnes of CO_2 equivalents by the year 2012 as against the previous voluntary agreement. As long as the 'Agreement on Climate Protection between the Government of the Federal Republic of Germany and German Business' is successfully implemented and jointly developed further (…) the Federal Government will not take any initiative to achieve the climate protection targets through command and control measures. The transposition of EU law remains unaffected. The Government has decided against introducing a binding energy audit."
7. US EPA (2002) does, however, not spell out in detail what the targeted reductions compare to.
8. One should, however, keep in mind that saving of such a magnitude in general would be used to purchase other goods or services – which normally would entail significant greenhouse gas emissions. Such "rebound impacts" are endemic to any environmental policy where externalities are not internalised.
9. See also Boxes 12 and 22 in OECD (1999).
10. Assuming that no changes would take place in enterprises' emissions efficiency if the Greenhouse Challenge had not been in place cause the projected emission reductions to represent upper-end estimates.
11. It is not quite clear from their paper whether these estimates only include energy efficiency improvements that took place after the LTAs were introduced. If also improvements prior to the introduction are included in the estimates, the quoted contribution of the LTAs would be an over-estimate.
12. Since April 1987, the emissions of the power generating industry in the Netherlands are regulated via the *Decree Emission Requirements Combustion Installations* (Besluit emissie-eisen stookinstallaties, BEES). This footnote is added to the quote.
13. For a further discussion of this covenant, see also Immerzeel-Brand (2002).
14. Through the covenant, the firms have, however, obtained the commitment from government that no other national measures to increase energy efficiency or limit CO_2 emissions will be introduced. This is noticeable, not least because the covenant only includes an obligation related to *relative* CO_2 emissions, while the country faces an obligation concerning *absolute* emissions through the Kyoto Protocol. Hence, if production in the sectors covered increases, other parts of the

economy will have to abate more – or the country will have to purchase more emission permits in the international market.

15. For a recent theoretical discussion of eco-labelling schemes, see Greaker (2002).

16. Wu and Babcock (1999) provide a theoretical discuss the relative effectiveness of a voluntary program and a mandatory command-and-control regulation in the agriculture sector. The study assumes that the implementation costs of a mandatory policy always exceeds the implementation costs of a similar voluntary program – which need not necessarily be generally correct. They conclude that "The voluntary program is more efficient than a program that mandates adoption if and only if the deadweight losses of government expenditures under the voluntary program are less than the difference between private and public costs of government services plus the additional implementation costs of the mandatory program".

17. The estimated impact increase in energy use due the tax reduction was 5% in 1993 and 1995, but only 1% in 1997, when the tax reduction offered to participating companies was much smaller. In later years, the tax reduction has once again been increased, which would tend to add to the associated increases in energy use. It is underlined that the calculations here only take into account the specific tax concessions granted to firms participating in energy efficiency agreements. The impacts of the – much bigger – tax reduction granted to *all* firms that employ light or heavy industrial processes was not estimated.

    It is also interesting that Bjørner and Jensen (2002) found no statistically significant impact on energy use of subsidies granted to investments in energy-saving projects. Subsidies of up to 30% of investment costs used to be granted to certain projects with payback-periods longer than 2 years. The number of companies that at some point in time received subsidies [348 out of a total of 3762 companies studied by Bjørner and Jensen (2002)] was much higher than the number of companies being party to an agreement [60 companies in their study]. These subsidies have now been discontinued.

    In an otherwise critical evaluation of Danish environment and energy policies in the 1990s, Søbygaard (2002) finds the support for energy-saving investments in enterprises and the energy efficiency agreement scheme to have a *positive* net present value to society. Most other policy instruments used in this area were found to have a *negative* net present value. In these calculations, a value of 270 DKK (about 32 USD) per tonne CO_2 saved, and a 6% real interest rate, was – among other assumptions – used.

18. 470 trillion Btu.

19. As referred to above, one should also take into account that financial savings stemming from increases in energy efficiency would tend to be used for the purchase of other goods and services.

20. Banerjee and Solomon (2003) conducted a meta-analysis of 5 private and public US eco-labelling programs for energy efficiency – using consumer and manufacturer responses as criteria – and concluded that "government programs, in general and Energy Star, in particular, were much more successful than the private programs". Concerning consumer response to Energy Star, they wrote that "A Wisconsin phone survey asked respondents who displayed valid awareness and who had appliances in the last 12 months the extent to which the label was influential in their purchase decision. A total of 54% said it was somewhat or very influential. (…) However, another Wisconsin study of refrigerator shoppers found that approximately three purchasers in 10 reported having noticed the logo when making the purchase. Among those who did notice the logo, one in two reported to have been at least somewhat influenced by it in their decision (…)".

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5. Economic Efficiency of Voluntary Approaches

5.1. The issues at stake

Even if it was found that a given instrument has contributed significantly to the achievement of a certain environmental target, a number of questions related to economic efficiency of the approach ought to be addressed, including:

- Are marginal abatement costs equalised – implying that total abatement costs are minimised? And, closely related to this: are targets set in appropriate way?
- Are firms given (increased) flexibility to find less expensive abatement possibilities?
- Does the existence of a voluntary approach impact on the structure of, and level of competition within, an industrial sector?
- What are the impacts of the instrument on technology diffusion and technology development?

5.2. Are marginal abatement costs equalised?

To minimise *total* abatement cost, *marginal* costs of abatement should be equal among all contributors to the problem, *e.g.* among all firms and households that cause a certain type of pollution.[1] Equalisation of marginal abatement costs can be achieved by providing all polluters the *same incentive at the margin* to abate, whereas it would in general *not* be achieved if all polluters were asked to reduce their emission by the *same per cent*.

When using an economy-wide tradable permits system, one will automatically provide a similar abatement incentive at the margin for all polluters. This is the case regardless of whether the permits are auctioned or grandfathered at the outset, as long as they can all be freely traded. A grandfathered permit will then have an alternative value equal to the market price of the permit, thus providing a similar abatement incentive as a permit that would have to be purchased.[2] An economy-wide tax – with equal tax rates for all polluters – would also create identical abatement incentives for all polluters, and raise revenues, which for example can be used to reduce other, distorting taxes.[3]

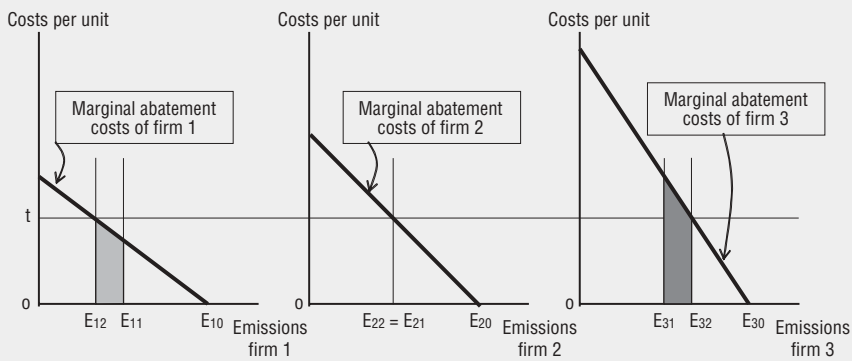
Box 5.1 compares the static economic efficiency of a simple – "unintelligent" – type of "command and control" regulation and an economic instrument, like a tax or a tradable permit scheme. Despite the simplicity of that example, any product standard, requirement to use a certain technology in the

production, or ambient environmental quality standard will typically in practice only address *some* of the sources of a given problem. It would be very difficult for public authorities to set standards in such a way that marginal abatement costs between *all* sources that contribute to the problem were equalised.[4, 5]

Box 5.1. **Static economic efficiency of economic policy instruments**

Figure 5.1 provides a simple illustration of the difference in economic efficiency between an equal percentage emission reduction requirement and of providing equal incentives at the margin. In this case three firms were polluting equal amounts at the outset, but the marginal abatement cost curve is steepest for Firm 3 – meaning that the costs per unit emissions abated rise most rapidly in this firm as emissions decrease.

Figure 5.1. **Static efficiency in pollution abatement**



If public authorities would like to see *total* emissions reduced 50%, they could for example require each of the three firms to halve their emissions, or they could introduce a tax t per unit of emissions. In this simple setting, the environmental impacts of the two approaches would be identical, as would the impacts on Firm 2. However, in the tax alternative, Firm 1 would increase its abatement effort, so as to lower emissions from E_{11} to E_{12}. Its abatement costs increase with the light-shaded area in the figure. Firm 3 would abate less than in the case of uniform emission reductions, so that its emissions increase from E_{31} to $E_{32,}$ and its abatement costs decrease with the dark shaded area in the figure. As the distance between E_{11} and E_{12} is equal to the distance between E_{31} and E_{32}, it is obvious that the cost decreases in Firm 3 are larger than the cost increases for Firm 1. This means that *total* abatement costs for society as a whole are lower when taxes (or permits) are used to equalise the marginal abatement costs between the three producers.

A voluntary approach will also typically *address only some of the sources* of a given problem. For example, in the Netherlands there are different "covenants" for a long list of different sectors, specifying reduction targets the sectors are to meet for a number of different pollutants. Similarly, in France there are agreements on abating greenhouse gas emissions between the Ministry of Environment and a range of different sectors, likewise in the United Kingdom (*c.f.* Section 12.3 below). Even if the reduction targets vary somewhat between sectors, it seems unlikely that they provide firms with similar abatement incentives at the margin.[6]

Among the cases studied in particular for this report, the Danish agreement scheme on energy efficiency improvements contained a mechanism that contributed to equalise the marginal abatement costs between the firms covered by the scheme: The efficiency improvement investments a firm was obliged to undertake in order to be granted a reduction in the tax rate under the CO_2 tax was linked to the estimated payback period of potential projects. A firm where the investment costs of many potential projects would be paid back within a specified timeframe would be obliged to undertake many such investments, while a firm where no profitable energy efficiency projects were identified would not have to make any investments. However, two factors reduced the economic efficiency gains from this mechanism: firms with "light processes" used to be obliged to undertake investments with longer payback-periods than firms with "heavy processes", and the tax-inclusive energy prices used to calculate the payback-periods differed between the two categories of firms, *c.f.* Box 3.2.[7]

Other multi-firm agreements, *e.g.* industry-wide agreements, seldom contain mechanisms designed to equalise marginal abatement costs between sources. Most frequently they leave it to the sector/firms concerned to decide for themselves how the abatement burden should be shared. The result of such internal negotiations will depend on the relative negotiating strength of each participant, which in turn – *inter alia* – will depend on how hard a given firm would be hit by potential sanctions if the targets of the approach were not to be met. However, a uniform percentage reduction target for each participant is not an unlikely outcome, as it could be difficult for firms to agree alternative burden-sharing schemes.[8]

Golombek and Moen (2002) discuss impacts on marginal abatement costs of firms of different sizes when a negotiated agreement is supported by the threat of taxes being introduced. They state that:

> "We show that although the threat of taxes may discipline the firms in the industry and lead to a reduction in emissions, these reductions in emissions are not cost efficient. More specifically, we show that large firms stand for a disproportionally large part of the reductions relative to small firms"...

> "Put differently, taxes work as a collective penalty because they are imposed if the agreement is not met. More emissions from one firm create a negative externality for the other firms as this increases the probability that taxes are introduced. Thus, the situation is similar to the well-known common-pool problem, and it follows that the marginal costs of own emissions (resulting from an increase in the probability that taxes are introduced) is greater for a large firm, than for a small firm simply because the tax base in larger".

In conclusion, there is a priory no reason to assume that voluntary policy approaches would serve to equalise marginal abatement costs, and hence minimise the total costs of reaching a given environmental target. On the contrary, the design of these approaches tends in general to make it likely that marginal abatement costs will (continue to) differ (significantly) between different polluters.[9]

5.3. Are firms given (increased) flexibility to find less expensive abatement possibilities?

A prime objective in many voluntary approaches is to provide firms with increased flexibility to meet obligations under existing "command and control" regulations. This was, for example, one of US EPA's motivations for launching Project XL, *c.f.* Box 3.4. To the extent this is achieved, total abatement costs would be *reduced* – compared to pre-existing policies – even if they are not *minimised,* as long as the marginal abatement costs are not fully equalised between all sources. The fact that, for example, Intel Corporation has entered into a new Project XL agreement after the expiry of the original agreement indicates that they place significant value on the flexibility these permits provide.[10]

However, the underlying problem is often the lack of economic efficiency endemic to the existing "command and control" policies. Alberini and Segerson (2002) state that

> "Of course, the cost savings from increased flexibility exists only if the alternative regulatory approach lacks flexibility, as has historically been the case in many countries (...). However, the move toward the use of performance rather than technology standards (...), as well as the increased use of market-based instruments such as marketable permits, implies an increase in flexibility even under mandatory approaches. To the extent that regulatory policies become more flexible and efficient, the cost saving from using a voluntary approach instead is diminished."

Consider, for example, the discussion of the need for frequent emission permit modifications for certain types of firms under the Clean Air Act in United States in OECD (2002b). The flexibility granted to *a few* firms under

Project XL – entailing considerable administrative costs, *c.f.* further discussion below – does enhance economic efficiency somewhat, but would it not be a better approach to modify current legislation, in order to provide increased flexibility for *all* firms affected? In other words, would it not be better to undertake a general revision of parts of existing regulations that are deemed to be rather inflexible, rather than using *a piece-meal approach*, granting special privileges to a limited number of firms?

Obviously, any modification to the general legislation should preserve a high environmental standard – seeking to balance marginal social benefits and marginal social costs. One should in this respect keep in mind that if economic efficiency in environmental protection increased, a *higher* environmental quality could be achieved for a given total cost.

Possible reasons why a general revision of existing legislation is not undertaken even if the legislation is deemed "inflexible" can be a fear that such a revision would entail a lowering of implied environmental standards, or a fear that the revision process itself could be rather costly. Current policies are often based on hard-negotiated compromises between different interest groups, and starting to modify one or more elements of such a "package" *might* entail revisions having to be made to several other elements as well.

Cannon (2001) includes a detailed discussion of legal aspects of Project XL – using the Merck Pharmaceuticals agreement described above as an example. On the issue of site-specific *versus* general approaches to increase flexibility, he states *inter alia* that:

> "… the EPA has used the slack created by strong deregulatory currents on Capitol Hill and elsewhere to strategic advantage. It has traded politically devalued prescriptive requirements (technology-based requirements for BACT [*Best Available Control Technology*] and NSPS [*New Source Performance Standards*]) and procedural hurdles (separate PSD [*Prevention of Significant Deterioration*] permits for significant new installations and significant modifications) to achieve commitments to overall superior environmental performance. Other XL projects are similar in these respects; a number entail 'bubbling', as in the case of Merck, offering increased flexibility in return for plantwide environmental performance commitments." (…) "Through these bargaining ventures, the Agency has managed so far to take the reform initiative away from Congress, blunting efforts for potentially wider or deeper statuary reforms, while at the same time advancing its environmental mission (or at least being seen as still faithful to it).
>
> Congressional hearings on Project XL reflected the questions that commentators have raised about EPA's legal authority to carry out XL. But the focus of those hearings was not on whether the Agency should

> discontinue XL because of a lack of authority, but on whether Project XL should be codified as a formal variance procedure." (…) "Initially at least, the Agency resisted Congress' overtures to legislate Project XL (…).
>
> "The Agency's reluctant support for legislative change – even change that is designed to authorize a program the Agency has already initiated – is predictable in light of its interest in keeping control of the environmental agenda. In amending the Agency's statutes Congress may alter provisions in a way that EPA does not favor. The Agency might also resist such a change, or be only nominally supportive, because enactment would confer a political advantage on Congress and would detract from the Agency's ascendant role in the realm of environmental policy. As it is now, the Agency has considerable latitude to create and dispense flexibility. A statutory variance provision, which would define the circumstances under which variances might be granted, would change the default rulings under which bargaining now occurs and could limit the options that might otherwise be available in the current reinvention climate."

To conclude, voluntary approaches do in several cases seem to provide increased flexibility to firms compared to pre-existing policies – or compared to certain types of alternative instruments. However, it might be a better option to improve flexibility in the pre-existing instruments more in general. On the other hand, attempting to undertake more broad-sweeping reforms of existing command-and-control regulations that are found to be unnecessarily inflexible might entail significant political controversy – with *a priori* some uncertainty concerning the long-term environmental and economic impacts.

5.4. Are there impacts on the structure of an industrial sector?

There is a two-way link between voluntary approaches and market structure: The degree of competition in a certain sector can impact on the probability that a given voluntary approach is adopted – and on the rate of participation in that approach. At the same time, the adoption of a voluntary approach can affect the degree of competition within a given market.[11]

Alberini and Segerson (2002) point out that the "impact of the adoption of a voluntary approach on competition stems from a number of factors. First, to the extent that voluntary abatement increases firms' costs, it can lead to exit from the industry and hence to a reduction in industry size (…). In addition, voluntary approaches can be more effective if firms are allowed to cooperate or collude (thereby reducing free-rider incentives), but this collusion among firms can reduce competition (…). Finally, firms can use proactive adoption of voluntary environmental protection measures strategically to erect barriers to entry for other firms (…)."

To the extent a voluntary approach leads to reduced competition in a sector, efficiency of the economy decreases, and the social costs of environmental policy increase. As elsewhere, one should, however, compare such potential impacts with similar impacts that would follow from other types of environmental policy.

5.5. What are the impacts on technology diffusion and technology development?

The last issue related to economic efficiency that will be raised here is the impact different types of instruments might have on:

- diffusion of existing technologies; and
- development of new technologies.

The spread of existing technology and the development of new technology can lead to dynamic efficiency gains: the costs of abating pollution can decrease over time, as improved technologies are employed – to the extent that the costs of the development and diffusion processes are lower than the gains from using the improved technology. Voluntary approaches often include mechanisms that can promote the diffusion of existing technologies – between firms, from research institutes to firms, from firms to relevant public authorities, etc. For example, the energy audits that used to be part of the Danish agreement scheme on industrial energy efficiency (*c.f.* Box 3.2) could make participating firms aware of new technical options to enhance energy efficiency. In some cases, formal or informal forums for technology diffusion or exchange are established as part of an agreement scheme or a voluntary program. Also – concerning agreement schemes – the negotiating process in itself can cause exchanges of technological knowledge between parties involved.[12]

This does, however, not necessarily mean that voluntary approaches show a *superior* performance in this respect compared to other policy instruments that potentially could have been applied – in particular as concerns the incentives being provided to develop *new* technologies.[13] As is well known, a tradable permits system or a tax provides a continuous incentive for firms to apply existing technologies, and to develop new technologies, to reduce their emissions. That would enable them to increase their net sales of permits or lower the tax payments they otherwise would have to make.

The incentives to develop new technologies are in general much weaker when a "command and control" regulation or a voluntary approach is applied. The regulated firms would normally only receive small benefits from developing technologies that allowed emissions to be reduced beyond what is stipulated in a standard or an agreement. Lyon and Maxwell (1999) do,

however, suggest one potential benefit: A firm developing a new, more environmentally friendly, technology might be able to incite public authorities to *introduce stricter regulations on other companies*, reflecting the technology the first firm developed. As an example, they say "DuPont's voluntary acceleration of the phaseout of chlorofluorocarbons may have encouraged regulators to put additional pressure on other producers of CFCs." Nevertheless, the importance of similar incentives would in general seem small compared to the much *more direct* financial benefits firms can gain from further technology-development when tradable permits or environmentally related taxes are being used.[14]

Notes

1. Even if marginal abatement costs were not fully equalised, total abatement cost could be *reduce* compared a previous situation.
2. However, grandfathering leaves the "rents" related to the environmental policy with the polluters, which – through the foregone revenues – causes an efficiency-loss to the economy. See for example Fullerton and Metcalf (2001) or Goulder, Parry and Burtraw (1997) for a discussion on the significance of such rents.
3. A tax with different rates for different polluters *would not* equalise marginal abatement costs – but *would* capture some of the rents involved.
4. Contrary to what is the case for economic instruments, public authorities would have to know the abatement cost curves for all potential contributors to a problem – which in practice is impossible.
5. Newell and Stavins (2002) predict cost savings from using a market-based instrument relative to a uniform emission rate standard for controlling NO_x emissions from large electric utility boilers in the eastern United States to be 51%.
6. One argument used in favour of specifying equal reduction targets for different sectors is that, on the basis of "fairness", one should make sure that all polluters contribute "their part" to the solution of the problem. It is emphasised here that such equity-considerations have efficiency costs – and it is not clear that environmental policies are the best instruments to pursue such equity targets. It is further underlined that "command-and-control" regulations are also unlikely to equalise marginal abatement costs between polluters.
7. From 2000, the same payback period (4 years) apply for both light and heavy processes. It should be noted that the tax rates for *all* energy used in industrial processes are *much* lower than the rates concerning household usage and room heating (either in households or businesses).
8. Other types of burden-sharing agreements could be conceivable if compensatory payments can be made from firms that reduce emissions less than a given percentage to firms that reduce more.
9. Full equalisation of marginal abatement costs will generally *not* be theoretically optimal when the environmental impacts differ depending on the spatial location of the pollution sources. However, there is no evidence that the differences in marginal abatement costs under current voluntary approaches reflect such spatial differences.

10. A "Renewal of the Final Project Agreement" was signed on 9 January 2002, *cf*. Intel (2002a). It is, however, worth noticing that similar agreements have not been made concerning Intel's other manufacturing facilities.

11. See *e.g.* Brau and Carraro (1999) for a further discussion. They state, *inter alia*, that taxes are to be preferred when markets are (nearly) perfectly competitive, whereas VAs are better policy tools when markets are oligopolistic and fairly concentrated. Brau and Carraro (2003) extends the discussion, and provides examples of how the European Commission and some national competition authorities have resolved the trade-off between environmental benefits and competition-related economic costs concerning the adoption of voluntary approaches.

12. US EPA (2000) details a list of regulatory, policy and technology innovations attributed to Project XL.

13. For a further discussion of this point, see Sunnevåg (2000). He concludes *inter alia* that "… whatever advantages voluntary agreements have over the traditional regulatory approach with the use of differentiated performance standards, it is difficult to see that agreements will provide better incentives for innovation. Particularly poor incentives for innovation will result if the regulator requests renegotiation of the agreement with the arrival of a new technology that substantially changes marginal conditions".

14. Lyon and Maxwell (2003) point to the danger that the availability of an option of introducing a public voluntary program, where participation is stimulated by some sort of a subsidy, could undermine industry's incentives to undertake environmental improvement under its own initiative, *cf*. the quote included in footnote 11 (Section 12.6).

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6. Administration and Transaction Costs

There are, at least, two relevant dimensions concerning the administration or transaction costs of a voluntary approach, in particular a negotiated agreement:

- The costs of preparing and negotiating the agreement; and
- The costs of implementing the agreement.

Under both these dimensions, the costs to firms as well as public authorities are relevant. Krarup and Ramesohl (2000) summarised the implementation efforts of the various actors involved in the agreements on energy efficiency studied in the VAIE project as shown in Table 6.1:

Table 6.1. **Examples of indicators for the implementation effort of energy efficiency agreement schemes**

	Governmental Agency	Industrial Associations	Firms
Preparations	Design of frame conditions for the agreement scheme. Gather information about firm conditions. Checking energy audits etc.	Gather information about conditions in member firms.	Energy audits[1] Verification. Energy management.
Negotiations	Meetings and contact with firms or associations about the target setting.	Meetings and contact with firms and agency.	Meetings and contact with governmental agency and association.
Administration	Dialogue and guidance of industry. Revision of frame conditions for the agreement scheme.	Co-ordination of target achievement by member firms.	
Monitoring, enforcement and evaluation	Checking data from industry. Sanctioning. Evaluations. Revision of the scheme.	Data collection from member firms.	Data collection. Self-report.

1. Firms sometimes get (some) of their costs to the energy audits reimbursed. In Denmark, firms got a subsidy to cover some of their costs for audits, whereas firms covered by the Swedish scheme got a full reimbursement of their costs.

Source: Krarup and Ramesohl (2000).

6.1. Costs of negotiating the agreements

Blackman and Mazurek (2001) studied the costs of negotiating agreements under Project XL. They state that:

> "We find that the fixed costs of putting in place XL agreements are substantial, averaging over $450 000 per firm. While stakeholder

> negotiations are widely cited as the principal source for these costs, we find that they actually arise mainly from interaction between participating facilities and the EPA. Moreover, EPA management problems are perceived by our survey respondents as having inflated project development costs. Finally, we find that the key factor that explains differences in costs across XL projects is the scope and complexity of the project proposal. These findings suggest that Project XL favors large firms that can afford to pay significant project development costs, that EPA management problems must be resolved to reduce costs, and that there may be a significant economic bias against complex and innovative proposals – precisely the type of proposals that Project XL was designed to foster in order to improve the efficiency of the regulatory system."

For Intel and Merck, the cost to participate in Project XL was $588 000 and $706 000, respectively. These costs were considerably above the median and were due in part to the long duration of negotiations. Intel's XL negotiation took 17 months to complete whereas Merck's required 26 months. Watchdog group resistance may help to account for the long duration and high transactions cost of these agreements. However, Blackman and Mazurek (2001) found that costs for the most part were attributable not so much to the presence of outside stakeholders but instead to the difficulty of securing EPA's final approval of the Project XL agreements. In particular, the authors found that obtaining final approval from EPA over the negotiated outcomes was the most expensive portion.

Blackman and Mazurek also considered a wide variety of characteristics of the project proposal, the facility, the firm, and the negotiation process, to conclude that the complexity of project proposals drove differences in project development costs across firms. As Table 6.2 illustrates, costs were high for firms that submitted proposals that either involved emissions caps on multiple air pollutants, or multiple facilities, and low for firms that sought relief from hazardous waste reporting requirements.

An important caveat to these findings is in order: when EPA launched Project XL in 1995, the project development process was – according to Blackman and Mazurek (2001) – by all accounts ill defined and poorly managed. Over time, the EPA has taken a number of steps to mitigate these problems. As a result, some project development costs are lower today than they were for the respondents surveyed in the Blackman and Mazurek study. Indeed, a follow-up survey [Delmas and Mazurek (2001)] found that median cost to the more than 50 organisations that as of 2001 had negotiated Project XL agreements had fallen to $108 000. The drop may – according to OECD (2002b) – be due to refinements made to the program by EPA and/or to the fact that newer participants have proposed projects far less complicated (and costly) than those developed by Intel and Merck.

Table 6.2. **Project XL Proposal characteristics by cost category**

Project	Principal flexibility requested	Multiple facilities?	Principal environmental media affected by flexibility	Legal lever used by EPA to provide flexibility
		High-cost		
Imation	Emissions caps, permit pre-approval	No	Air	Site specific rule
Intel	Emissions caps, permit pre-approval	No	Air	Alternative permit
Lucent	Permit pre-approval	Yes	Air, water, solid and hazardous waste	Site specific rule
Merck	Emissions caps, permit pre-approval	No	Air	Site specific rule
Weyerhaeuser	Emissions caps	No	Air, water	Existing waiver mechanism
3M	Emissions caps, permit pre-approval	Yes	Air	Wanted site specific rule
		Low-cost		
Berry	Consolidated permitting	No	Air, water, solid and hazardous waste	Generally applicable interpretive statements
Hadco	Delist wastewater sludge	Yes	Water, solid waste	Existing waiver mechanism
IBM	Alternative wastewater treatment	No	Water	Determination of equivalent treatment
Molex	Delist wastewater sludge	No	Water, solid waste	Existing waiver mechanism
Osi-Witco	Deferral of new technology standards for hazardous waste	No	Air, water	Existing waiver mechanism

Source: Blackman and Mazurek (2001). Several of the chapters in Orts and Deketelaere (eds.) (2001) discuss legal issues concerning legal waivers EPA potentially could use for Project XL, see *e.g.* Cannon (2001) and Hirsch (2001).

It is also worth noticing that many proposals for Project XL agreements never resulted in a Final Project Agreement, despite considerable efforts devoted to their preparation. One such example that got a lot of attention concerned 3M's plant in Hutchinson in Minnesota. Marcus, Geffen and Sexton (2001) discuss this case, and they ask "Why was impasse the outcome of so many of the attempts to reach agreement under Project XL? We believe that there were numerous reasons:

a) The goals of Project XL were not clear and consistent; nor did various people in the different organisations involved understand them in a similar way.

b) The means, especially the legal ones, were not adequate to the task.

c) The activities of many participants from different organisations and different units in these organisations were not well coordinated.

d) The key participants did not anticipate many of the major barriers that developed and were not in a position where they could effectively deal with them.

e) Although trust grew among some of the participants, the overall level was not high enough for those engaged in the process to work together effectively.

f) External political conditions also impeded the efforts to reach an agreement."

The costs of preparing and negotiating the energy efficiency agreements in Denmark also used to be quite high. According to OECD (2002d), the administrative costs for the firms amount to between to 17 000 and 33 000 € on average for every firm. These costs covered expenses for energy audits and the verification of the audit reports, both costs which, to a large extent, were covered by the firms. For the agreements with two paper mills, the costs were 20 400 and 54 700 €. For the milk-condensing sector as a whole the costs were 53 000 €. The amount of time used to reach an individual agreement was estimated to be 100-200 hours per firm.

The costs of negotiating the first Pollution Control Agreements in Yokohama and Kitakyushu City were also quite high – according to OECD (2002c). Concerning the ARET program in Canada, OECD (2002a) states that the total cost to government of program development, from September 1991 to the issuance of the ARET Challenge in March 1994, was approximately $1 040 000. During this time, Environment Canada devoted limited person-hours to the initiative, amounting to less than two person-years. Concerning the agreement with the steel company Dofasco, OECD (2002a) indicates that the EMA "was relatively inexpensive to develop and implement. The single industry player as well as the minimal involvement of government after the Agreement was established all contributed to keeping the cost of the Agreement low for both the federal and provincial governments. The Agreement itself drew largely on existing regulatory and other requirements, and did not require extensive scientific study to establish environmental performance targets."

Regarding cases other than those studied in particular for this report Krarup and Ramesohl (2000) state that "the French and the German approaches" [*c.f.* Chidiak and Glachant (2000) and Buttermann and Hillebrand (2002)] "can be described as non-binding agreements without legally defined tasks, rules or sanction mechanism. They serve as stand-alone approaches, which intend to substitute other climate policy measures. The costs for the first stage of preparation and negotiation can be considered to be rather low, because an explicit preparation and analysis of potentials by the policy side did not take place, and negotiations were based on already available research findings and self-reported information from industry. After publication of the

first version of the German declaration in 1995, however, intensive discussions between industry and government prepared the updated version of 1996. In the French case, the particular negotiations for single branches were facilitated by an already defined 'standard voluntary agreement' which sets the principal guidelines and procedures for environmental agreements."

To conclude, the costs of preparing and negotiating an environmental agreement differ considerably from case to case, but in many cases – *for instance* if many different parties are directly involved, if the legal status of the agreement is ambiguous, and/or if detailed technical analyses of potential abatement options need to be carried out – the costs can be rather high. For simpler, perhaps less ambitious, agreements the costs can be significantly lower – but this could be to the detriment of the environmental effectiveness of the agreement. A pre-defined framework for negotiating the agreements – like that developed in France – might lower the "establishment costs" of new agreements somewhat.

6.2. Costs of operating the voluntary approach

OECD (2002c) indicates that the costs of operating the Pollution Control Agreements in Japan – once the first agreements were negotiated – have been rather low. The same has been the case in Canada, according to OECD (2002a). The US case study prepared for this report [OECD (2002b)] doesn't explicitly address this issue, but other available studies can indicate that operating costs for federal and state environmental authorities involved in XL projects are relatively modest – while some clear cost savings have been obtained by the firms involved due to the legal flexibility provided.

According to OECD (2002d), firms used in average 10-30 hours a year after the signing of an agreement to produce their progress-reports for the Danish Energy Agency. No complaints over the administration of the agreements were put forward by firms. The agreements did, however, give rise to a number of complicated administrative duties for the Agency and the Central Customs and Tax Administration, estimated to cost about 4 million € annually.[1] The two authorities had to co-operate in the administration of tax rebates when firms enter into agreements.

AGO (1999), which evaluates the Australian Greenhouse Challenge program, states that:

> "At the inception of the Challenge in 1995 the program had an annual budget of $591 000. Targets and expectations have increased since and in 1999 resources are currently $6 000 000 per annum.
>
> Involvement in the Challenge for industry has also been resource intensive, both in terms of time and finances."

Some voluntary approaches, like the Climate Change Agreements in the United Kingdom (*cf.* Section 12.3) requires separate metering of different parts of the electricity consumption of a given plant, as they are taxed at different rates. Such separate metering can be quite expensive, *c.f.* footnote 7 below (Section 12.3).

Again, to conclude, the picture varies from case to case. In most of the examples studied, the costs of operating the approach seem modest, but – as in a case where tax obligations would depend directly on the fulfilment of the conditions of the agreement – the operational costs of voluntary agreements *can* also be considerable.

Notes

1. It should be noted that this estimate also includes the costs of administrating the support scheme for energy efficiency improvements.

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7. Implementation Issues

7.1. Free-riding

Free-riding can occur when it is in the interest of economic agents not to contribute to an action because they can benefit from it without paying its costs. This is a major issue concerning voluntary approaches that involve more than one company. There is a significant risk that some firms will seek to achieve the benefits from the approach (*e.g.* avoid having a new tax or regulation introduced), while not undertaking any efforts to improve the environmental situation themselves. A few aspects of this issue will be briefly mentioned here.

Free-riding can be a problem from an environmental effectiveness perspective, as less abatement efforts, etc., might be made than when no free-riding takes place.[1] From an equity, or "fairness", point-of-view, free-riding is a problem, not least as firms that actually do their "fair share" of improvements risk loosing the benefits they expected to get if the overall target of the approach was not to be met.

In order to limit possibilities for free-riding – and thus strengthen the "fairness" and environmental effectiveness of a given approach – specific targets can be set for each individual company involved. This could, however, significantly reduce the economic efficiency of the approach, as the necessary information to set individual targets that reflect differences in marginal abatement costs would generally not be available. Hence, in order to limit the scope of free-riding, equal percentage reduction targets and similar for all firms would often be applied – which would be economically inefficient.

The setting of individual targets can increase the costs of negotiating an agreement, and monitoring of compliance can also become more costly. On the other hand, individual targets *can* in any case be required to secure a reasonable environmental effectiveness of the approach.

From an economic perspective, free-riding is in particular a problem when actors that *could* have abated emissions at low marginal costs avoid doing so. From this point-of-view, it is less of a problem if actors with high marginal abatement costs avoid taking action – but "cheating" will of course always represent a moral problem. In general, firms with high marginal abatement costs will have the strongest economic incentives to try to free-ride on the performance of other firms.

7.2. Third-party involvement

Participation of, for example, environmental NGOs in the negotiation and/or implementation of a voluntary scheme can have both positive and negative impacts.

On the positive side, such participation can help improve the environmental integrity of the approach, increasing the likelihood that targets set will go beyond "Business-as-Usual", and enhancing the chance that targets set will be met in practice. For the firms participating in a voluntary approach, involvement of environmental NGOs in the scheme can make it easier to get "credit" among the public for the efforts they make, demonstrating that they are not only trying to "green-wash" their otherwise unchanged behaviour. For example, Boyd (2002) indicates that such considerations was an important part of the motivation for the French construction materials company Lafarge's recent partnership with WWF on greenhouse gas emission reductions.

On the other hand, third-party involvement could for example complicate the negotiation of the targets of the scheme in question. This was, for instance, the case in the Canadian ARET programme described above, where the environmental and labour representatives eventually withdrew from the ARET committee due to disagreements with industry representatives over the priority being given to the *reduction versus* the *elimination* of targeted substances. Blackman and Mazurek (2001) did, however, as mentioned find that the high costs of negotiating the Project XL agreements were for the most part not so much attributable to the presence of outside stakeholders.

7.3. Monitoring

OECD (1999) stated *inter alia* that "Provisions for monitoring and reporting are essential for keeping track of performance improvements. They constitute the key to avoiding failure to reach targets. Monitoring should be made at both the firm level and the sector level in the case of collective VAs. In certain contexts, monitoring by independent organisations may be used."

If a given scheme should not incorporate careful monitoring of performance, no-one could expect an environmental outcome significantly different from what would have happened anyhow. Hence, proper monitoring is a necessary – albeit not a sufficient – condition for environmental effectiveness of the scheme. One possible approach is to rely on self-monitoring, but with verification of the methods used and the findings made by an independent third party. Such an approach is *e.g.* used for the climate protection declaration of German industry, where the Rheinisch-Westfälisches Institut für Wirtschaftsforschung was appointed to monitor the target achievements.

7.4. Sanctions for non-compliance

A distinction is sometimes made between binding and non-binding voluntary approaches, the difference being that binding approaches include sanctions in the case of non-compliance and are enforceable through a court's decision. Binding approaches are more likely to be environmentally effective than non-binding approaches – if non-compliance does not trigger any sanctions, any environmental improvements would have to rely on strong commercial/strategic interests of firms to demonstrate that they do actually alter their behaviour compared to "Business-as-Usual".

On the other hand, working out the details of an approach that is to be legally binding will be more demanding than to prepare a simpler, but probably less effective, non-binding approach. Hence, also in this regard there is likely to be a trade-off between the administrative costs involved and the environmental impacts that can be expected.

7.5. Evaluation, revision and adaptation

A voluntary approach is sometimes introduced as a "first step" when a new environmental issue is being addressed. Such approaches are also sometimes used as a means to overcome the feared loss of sectoral competitiveness within a scheme that taxes certain types of pollution. In both such – and other – uses, regular evaluations of the voluntary approach in question would be useful, to check if the approach chosen still makes sense. From this perspective, it is important that the voluntary approach does *not* constrain a later introduction of other – possibly more environmentally effective – policy instruments. That could happen if public authorities commit not to introduce other policy measures to address a certain problem as long as a negotiated agreement is in place.

Krarup and Ramesohl (2000) discussed issues relating to evaluation of voluntary approaches, and stated as follows:

> "The inter-relation between the policy process and the voluntary agreement's performance is twofold. On the one side, as indicated, the ambition of target setting determines the outcome. On the other side, the agreements in turn can serve as a tool for a policy search and learning process. Due to the analyses undertaken during the preparation stage of the agreement, to the implementation experience and the monitoring results, agreements can generate new insights and information concerning the possibilities and limits for energy-efficiency action in industry. In all case studies, positive effects of agreements on the policy-industry communication could be observed. However, learning needs to be operationalized by explicit action concerning the rules for evaluation, revision and adaptation, and sufficient capacities to perform the related tasks of analysis, assessment and preparation of proposals for modification."

By deciding *at the outset* on a system for evaluation, revision and adaptation of a given approach, one enhances the chances of learning and befitting from the experiences made, so that environmental effectiveness and/or economic efficiency of a given scheme can improve over time. Such a system should, among other things, include the collection of the necessary information that will allow later evaluations to take place.

Notes

1. Delmas and Keller (2001) discuss free-riding in the case of US EPA's WasteWise program. "WasteWise partners receive technical assistance, exchange information with other partners, and are publicly recognized. WasteWise partners are asked to register, set their own waste reduction goals and report on an annual basis their improvement." However, only about 20% of the more than 900 partners do actually report on their performance. The study found that "Later entrants report less than first entrants. The lax enforcement of the reporting requirements for first entrants may impact the behavior of later entrants. This may be reinforced by the difficulty of monitoring a growing number of free riders by the US EPA."

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8. Comparison of Voluntary Approaches and Tradable Permit Systems

Many voluntary approaches have aspects that are similar to tradable permits systems, and in some cases the total abatement obligation in a collective agreement is distributed between companies involved through various trading mechanisms. In the Netherlands, plans are underway to replace industry's covenant obligations concerning NO_x emissions with a new trading system. And, on the other hand, all baseline-and-credit schemes can be described as "voluntary approaches", as credits are issued to firms that achieve environmental performance beyond a set level.[1] This section aims to describe similarities and differences between the two types of instrument, and to discuss the usefulness of converting more voluntary approaches into trading schemes. Among the different types of voluntary approaches, focus is here in particular given to negotiated agreements.

8.1. The setting of targets

In principle, targets of the same "strictness" could be set for a negotiated agreement and a cap-and-trade (or allowance trading) scheme. In practice there could, however, be differences, as in general the target of a negotiated agreement is an issue for discussion.[2] Whereas more informal discussions (and public debate) also often will take place concerning the overall "cap" in a cap-and-trade scheme, it is likely that targets for negotiated agreements would tend to be less ambitious – because they to a greater extent *are* negotiated.

The situation is a bit different concerning baseline-and-credits trading systems. A "target" – more or less "negotiated" – can be set also for such schemes, but this will tend to be mostly a general reflection of the ambitions of the policy makers. As the "take-up" of the scheme among potential participants is voluntary, it is difficult to quantify an exact target in advance.

Another aspect of the target setting is also relevant: Whereas a negotiated agreement often will set separate targets for individual sectors (and even individual firms), *c.f.* Section 5.2 above, a trading scheme will typically have only one target for a larger group of sectors – or even for the economy as a whole. From an economic efficiency point-of-view this is beneficial, as the trading scheme then will tend to equalise marginal abatement costs across a larger group of participants.

8.2. The achievement of targets

Also in this respect, a negotiated agreement and a trading scheme *could* in principle be equivalent. A given target could be reached with both types of instrument. The probability of the target actually being met in either case will, *inter alia*, depend on whether or not there are any sanctions for non-compliance, and – if so – the strictness of the sanctions in place. For a non-binding negotiated agreement, the probability of actually reaching the target is lower than for most trading schemes, whereas binding agreements *could* perform equally well as a trading system.

One difference could, however, be important: With a generally broader coverage than some industry-specific negotiated agreements, a tradable permit system can include more low-cost abatement options that allow total abatement costs to reach the target to be lower. This seems to have been a relevant point as concerns NO_x abatement in the Netherlands, where some firms stated that they had no "cost-effective" measures to abate their emissions, *c.f.* Section 4.3 4.3 and Corus Staal (2001) and (2002). Being part of a broader permit trading scheme, firms with high marginal abatement costs could pay for abatement being undertaken elsewhere – where costs are lower. This is part of the explanation for the planned transformation of covenants into a NO_x trading scheme in the Netherlands.

8.3. Economic efficiency – Equalisation of marginal abatement costs

A trading scheme will "automatically" equalise marginal abatement costs across participating firms – if the permit market works well. Hence, in such a case – as already mentioned several times – a trading scheme is likely to have a higher economic efficiency than a negotiated agreement, where the coverage at the outset often is less broad, and where there is no automatic mechanism to equalise marginal abatement costs. On the contrary, if the practical implementation entails equal percentage emission reductions among all polluters, economic efficiency will *not* be achieved with a negotiated agreement.

The caveat mentioned concerning the functioning of the permit market should, however, be kept in mind. In some situations, such an assumption would not hold. If there are too few independent actors in the permits or credits market, one or more actor(s) will have significant market power, and could try to abuse his position. For example, if there is only company with a large low-cost abatement potential, this company could try to increase the market price of permits by not undertaking (part of) the potentially profitable abatement efforts and hold the associated permits back from the market. Depending on the price elasticity of the demand for permits, which in turn depend on the form of the abatement cost curve of other participants in the permits market, the firm in question could manage to increase it profits in such a way – at the expense of its competitors.

Section 12.4 below describes a voluntary approach that has replaced taxation of SO_2 emissions in Norwegian industry. It is of interest to note that the Confederation of Norwegian Industry at an earlier stage had proposed to introduce emission permit trading instead of taxation of these emissions. When industry took over "responsibility" for a significant share of the remaining SO_2 emissions in Norway, they did, however, chose to proceed with the "voluntary" approach as described below. Part of the reason for not returning to the earlier trading proposal is said to be a concern that the permit market could be too "thin" to function effectively, as the bulk of SO_2 emissions stem from a few plants belonging to still fewer separate companies.[3]

In a discussion of the economic efficiency of various environmental policies it should also be kept in mind that a voluntary approach leaves the scarcity rents associated with pollution limitation with the firms in question, *c.f. e.g.* Fullerton and Metcalf (2001). The same would be the case in a trading scheme based only on "grandfathering", whereas the auctioning of (some of) the permits in a cap-and-trade scheme would raise revenues that – *inter alia* – could be used to lower distorting taxes in the economy.

8.4. Technology diffusion and technological development

Many voluntary approaches include mechanisms meant to stimulate diffusion of existing abatement technologies, etc. This is – for example – the case in the US greenhouse gas emission programs described in US EPA (2002), and OECD (2002d) describes how the obligatory energy audits that used to part of the Danish agreement scheme on industrial energy efficiency could lead to diffusion of improved techniques and technologies. A trading scheme would normally not include such "explicit" measures to stimulate technology diffusion – which, by the way, can be costly, and have to be financed some way or another – but the value of a permit or credit would in itself give firms an economic incentive to seek out available abatement options.

Perhaps more importantly in the longer term, the permit or credit price will also provide an incentive – both for the firms directly involved and for others – to develop new technologies that can "free up" permits or credits at a later stage. In contrast, once a firm participating in a voluntary approach has fulfilled any individual obligation deriving from that, the firm no longer has any economic incentive to develop new technologies – that incidentally also their competitors might be able to benefit from.

8.5. Trading within voluntary approaches

The important similarities between voluntary policy approaches and tradable permits systems is illustrated by the fact that several voluntary approaches include *internal* trading or "bubble" mechanisms, for example

within a given plant for plant-specific approaches, or among several firms participating in a collective agreement. For instance, Intel obtained a single cap for its hazardous organic pollutants and could increase or decrease individual hazardous pollutants as long as the aggregate amount remained below its Project XL cap. In the case of the agreement on SO_2 and NO_x emissions reductions by the power generation industry in the Netherlands, SEP (the Co-operating electricity production companies) had, according to Brand (2000), for a long time sought to have SO_2 emissions in the sector considered as one "bubble" – instead of each plant having to undertake abatement efforts unilaterally. From an economic point of view, such provisions can clearly be beneficial.

8.6. Administrative costs and transaction costs

While a trading system always will require a significant administrative effort concerning the initial allocation of permits or the establishment of credits, the measuring and verification of environmental performance of participants – and to organise the trades as such – a voluntary approach *can* be set up in simpler ways. However, if few resources are devoted to the negotiation and implementation of a voluntary approach, the environmental impacts of the scheme in question is likely to be very modest, as it would be close to impossible for anyone to document whether or not firms take any steps beyond "Business-as-Usual".

Once a market for permits or credits is established – and has obtained a sufficient liquidity – transaction costs within a trading system should be low, *inter alia* because firms with high and low marginal abatement costs do not need to meet directly to be able make trades to mutual benefit.[4] Both categories of firm could, for example, simply contact a broker in order to buy or sell permits respectively. In a voluntary approach, it might be significantly more costly for individual firms to seek out low-cost options to fulfil their abatement obligations.

8.7. Conclusions

This section has highlighted some of the similarities and differences between voluntary approaches and tradable permit schemes. Table 8.1 provides a summary of the main findings. Several of the findings do indicate that it could be beneficial to convert existing voluntary approaches into some form of trading scheme, and that – in the case of new initiatives – a trading scheme would be preferable to a voluntary approach.

Table 8.1. **Comparison between negotiated agreements and tradable permit systems**

	Negotiated agreement	Tradable Permit System
Target setting	Targets could be set "too low" if they are up for negotiation.	Targets can in principle be set at "optimal" level by public authorities, but pressure groups are likely to try to impact on the decision.
Target achievement	Target should in general be met.	The probability that targets be met can be higher than for negotiated agreements, as trade will minimise total costs of achieving the targets.
Economic efficiency	Generally higher than traditional "command and control" regulations, but marginal abatement costs are (still) not equalised.	Trade will tend to minimise total abatement costs, regardless of initial quotas being grandfathered or auctioned. Any revenues raised though auctioning could be used to lower economically distorting taxes.
Sensitivity to market power	Not a special problem – although it could be difficult for public authorities to obtain "good" results in negotiations with firms that play a very dominant role in the economy.	A permit or credits market will not function well with too few independent participants. In such cases the market prices would not properly reflect marginal abatement costs for the society as a whole.
Technology diffusion	Many agreements include special provisions to promote this, like technical assistance programs. Such provisions can, however, be costly – and need to be financed.	The market price will provide firms with an incentive to seek out any low-cost abatement options.
Technology development	Firms have very limited incentives to develop new technologies once they have met their original obligations.	The market price will also provide an incentive both to the firms directly implicated and to other researches to develop new, cheaper, abatement options.
Administrative costs	Need not be very high – but if too few resources are spent, the environmental impact of the agreement is likely to be very modest.	A significant amount of resources is needed to prepare a trading scheme, including the baseline of any credit trading scheme or the initial allocation of permits in a permit trading scheme.
Transaction costs	It can be relatively costly for firms to seek out low-cost abatement options.	Once an efficient market is established, transaction costs could be low, as firms with high and low marginal abatement costs do not need to meet directly to be able make trades to mutual benefit.

Source: OECD.

Notes

1. For an in-depth discussion of US experiences with credit trading systems concerning NO_x emissions, see ELI (2002). The report concludes *inter alia* that "credit trading programs by themselves have inherently weak environmental integrity. Because states have not found objective tests for additionality of credit-generating projects, emissions credit systems are 'leaky', and hence may provide

credits for reductions that sources would have made anyway." In contrast, the report states that "Because of the emissions cap, allowance trading systems have very high environmental integrity, as trading can never raise total emissions; credit trading systems lack such integrity, and depend on the regulatory context and review of trading projects to assure environmental benefits."

The report does, by the way, also state that "Because of the inherent cap in non-attainment areas, and the increasing accuracy of emissions inventories and monitoring technologies, offset trading today can assure emissions reductions, whereas the LAER 'lowest achievable emission rate' rate-based technology requirements alone would actually allow slightly increased emissions. Eliminating the LAER requirement would not therefore affect the environmental results, but could significantly lower costs of compliance by allowing sources to achieve greater efficiency through offset trading."

2. In the Dutch covenants, targets were set separately by Parliament.

3. ELI (2002) indicates that a few companies generated the major part of the credits in the "Discrete Emission Reduction Credit Trading Programs" operated by six US states. Part of the reason for this is that there are considerable fixed costs in getting the credits verified and accepted, which only makes it profitable for firms with a large reduction potential to go through the process.

4. According to ELI (2002), 3 employees operate the trading element of the SO_2 cap-and-trade program of US EPA, under which 30 million allowances were traded in 2000, and over 1.2 million used by sources for compliance purposes.

PART II

Voluntary Approaches as Part of Policy Packages

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9. Introduction

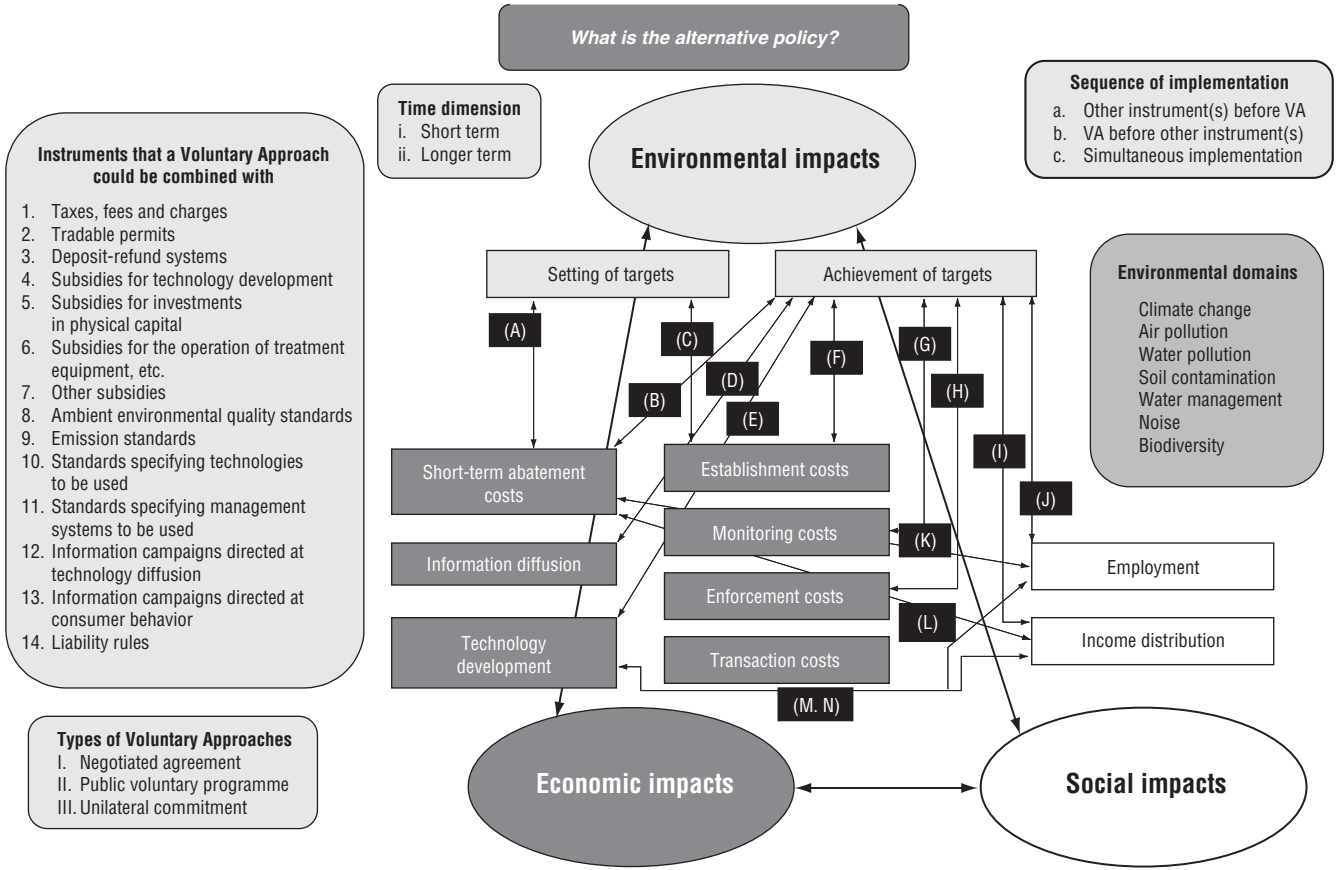
Voluntary approaches are very seldom used as "stand-alone" instruments – instead they tend to form part of policy packages involving one or several other instruments, like various types of "command-and-control" regulations, taxes, tradable permits, etc. The purpose of this part of the report is to discuss impacts of using voluntary approaches in such policy mixes, and – in particular – the *marginal* impacts of doing so: Which are the *additional impacts* of combining a voluntary approach with one or several other instruments? How does the fact that the approach is used in combination with one or more other instruments impact on environmental effectiveness, economic efficiency, administrative costs, etc.?

Figure 9.1 illustrates some of the impacts, links and considerations that in principle should be taken into account when discussing policy mixes. A question that should always be asked in the analysis is "*What is the alternative policy?*". In other words: to what is the relevant policy mix compared? To address the *marginal* impacts of combining a voluntary approach with other instrument, it will here normally be assumed that the alternative policy is "status quo", *i.e.* that everything is the same, except for the introduction of the voluntary approach in question. In some cases, the appropriateness of this assumption will, however, be raised, and alternative policy assumptions will also briefly be discussed.

From the point of view of promoting sustainable development, policy makers are interested in, *inter alia*, the environmental, economic and social impacts of different policy instruments and instrument combinations. The three oval shapes in the figure represent these dimensions. The rectangles with similar shading as the ovals indicate some relevant aspects of the three dimensions. *Some of* the of inter-dependencies between different aspects are represented by the thin arrows in the figure, marked by the letters (A) to (N), which will be briefly commented towards the end of this introduction.

The large box to the left in Figure 9.1 lists some of the various types of instrument that a voluntary approach can be combined with. A number of such combinations will be discussed in greater detail in later sections, with examples for current practises in member countries. For simplicity, the discussion will often look at impacts of combining a voluntary approach with *one* particular other type of instrument, but in practice it is frequent that three or more instruments are used to address a given target.

Figure 9.1 **Analysing the use of voluntary approaches in policy mixes**



The analysis should also distinguish between different types of voluntary approaches, as indicated in the lower left corner of the figure. Impacts of combining a negotiated agreement with a certain other instrument will generally be different than combining a public voluntary programme with the same instrument. As unilateral commitments by individual firms or industries often imply little involvement of public policy, such approaches will not be much addressed below.

The time dimension of the analysis is important: impacts of a given policy mix can differ significantly between the short term and the longer term – for instance if the incentives for technology development are altered by the combining of (more) instruments. Impacts of instrument combinations might also vary depending on whether the policies are meant to address climate change, local air pollution, waste handling, etc., as exemplified in the box on the right-hand side of the figure. For example, impacts on related technology developments *might* be more important concerning policies implemented to address climate change than for policies used to protect biodiversity.

Finally, the sequence of implementation can matter. For example, impacts of combining a tax and a voluntary approach will be different if a voluntary option is added to, or partly replace, a pre-existing tax than if a tax is added on top of a pre-existing voluntary scheme. The subsequent discussion attempts to highlight some of these differences.

We return now to the different aspects concerning the environmental, economic and social dimensions of Sustainable Development highlighted in the figure. Of particular relevance for this report is the extent to which using several instruments in combination affect the *nature of the links* that are indicated between different aspects in Figure 9.1.

One can first notice that *two* aspects concerning the environmental impacts have been singled out: impacts of the combination on the *setting of environmental targets* and impacts of the combination on the *achievement of a given target*. For example, replacing a pre-existing tax by a negotiated agreement could come in parallel with a softening – or a strengthening – of pre-existing targets in a given environmental domain. Such a combination of instruments could also have impacts on the actual achievement of a given target – due to the change in incentives for pollution abatement that the modification of policy leads to.

Seven different aspects of economic impacts have been identified in Figure 9.1: Short-term abatement costs, information diffusion, technology development, establishment costs, monitoring costs, enforcement costs and transaction costs. There can, of course, also be interdependencies between these aspects – but these will not be investigated further here. Two aspects of

the social dimension have also been singled out, namely impacts on employment and on income distribution.[1]

Both the setting of targets and the achievement of targets will be inter-linked with the short-term abatement costs, *c.f.* the arrows marked (A) and (B). If, for instance, the abatement costs are believed to very high, this could – and *should*, *c.f.* the discussion in Section 4.2 above – have impact on the targets set. Both the expected and actual short term abatement costs *can* impact on the degree of target achievement, and *vice versa*.

The strictness of the target set could have impact on the difficulties – and costs – of establishing a certain policy package involving a voluntary approach, *c.f.* the arrow (C). There could also be links between the resources spent on establishing a policy, and the actual achievement of the targets, *c.f.* (F). The target achievement would in this connection also be linked to the monitoring costs [*c.f.* (G)] and the enforcement costs [*c.f.* (H)]. If few resources are devoted to monitoring and enforcement, actual target achievement is likely to be relatively low.

A more long-term, dynamic set of links are related to (technology) information diffusion and technology development on the one side and achievement of environmental targets on the other side, *cf*. the links (D) and (E). It is, for example, *possible* that combining a voluntary approach with an information campaign, or with fiscal incentives for technology development, could lead to better achievement of the targets of the voluntary approach. One should, however, ideally still undertake a cost-benefit analysis of these measures to see if they merit implementation – and also consider whether other policy combinations could provide similar results at lower costs.

Environmental and social impacts are also related. Achievement of environmental targets can, for example, in some cases affect directly on the *sectoral* employment situation [*c.f.* (J)], for example within the fisheries, agriculture and tourism sectors.[2] Any employment impacts could in turn affect the income distribution, *c.f.* (I). On the other hand, changes in the income distribution could influence the ability to reach a given environmental target. Possible examples relate to the cleaning of sewerage and the collection of waste among poor people in low-income countries.

Finally, most – if not all – of the economic and social aspects of Sustainable Development are inter-linked. There can, for instance, be links between the abatement costs in the short run and both the employment situation and the income distribution, *c.f.* links (K) and (L) in Figure 9.1. Any impacts of a policy mix on technology developments can also affect both employment and income distribution [*cf*. (M,N)], etc.

The purpose of this report is not to give a comprehensive discussion of all the links between the environmental, economic and social dimensions of

Sustainable Development. Instead, the focus here is on how the use of policy mixes involving voluntary approaches might impact directly on some of the aspects of the three dimensions, and to consider if – and how – the nature of some of the links between them might be affected by the use of such mixes. We'll proceed by looking more in detail at a number of policy mixes involving voluntary policy approaches.

Notes

1. One could also, for example, have added health aspects under the social dimension. Health impacts will, however, be rather closely linked to the actual achievement of the environmental targets, already spelled out in the graph.
2. Environmental quality *could* also impact on the total employment situation, to the extent it influences the health situation and the ability to take part in the labour force.

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10. Voluntary Approaches Used in Combination with Environmental Permit Systems

In most OECD countries any major polluter needs an environmental permit to be allowed to operate. The permit might specify upper limits on the emissions to different environmental media (air, water, etc.) that can take place, often depending on characteristics of the recipient of the pollution. The permit can set upper limits on the absolute amounts of emissions over various time-spans, or on concentrations of pollutants during a short or longer period of time. A large polluter might also be given responsibility to keep pollution levels in a given recipient below certain thresholds.

Given the widespread use of environmental permit systems, very many voluntary policy approaches will in practice be part of a "policy mix" with such systems. In most cases, the sequence of implementation is likely to have been that a permit system already existed before a voluntary approach was launched. Before looking at some concrete examples, it can be useful first to briefly consider the impacts one *a priori* could expect from such combinations.

Looking at environmental domains or issues already addressed by the pre-existing permit system – which are the most relevant cases when discussing "policy mixes" – one would generally expect that the voluntary approach, at least from the point of view of environmental authorities, would *aim* to *tighten the existing targets*. Even if the targets set would be stricter than before, it is, however, not obvious that actual environmental achievements be improved. In order for companies to come forward and participate voluntary in a new, and more "ambitious", scheme, some combination of "carrots" or "sticks" would normally be required. Among possible "carrots" are various types of financial assistance, or promises of increased flexibility in how the targets are to be obtained. Some kind of public recognition – which can be used to position the firm as "environmentally friendly" *vis-à-vis* its customers – could also serve as a "carrot". Possible "sticks" include credible threats of introducing other mandatory instruments, like stricter standard, new taxes, etc.[1]

It can be useful to look at a comparison of two concrete examples where environmental permit systems and voluntary approaches have been combined, namely the Dutch covenants and Project XL in United States. Hirsch (2001) points out a number of important differences:

> "To begin with, most Dutch covenants seek to go beyond the scope of existing environmental regulation so as to achieve dramatic, new pollution reductions across a variety of regulated sectors. By contrast, Project XL agreements are pilot experiments that address environmental

problems that are already subject to regulation. They do not expand beyond the reach of existing regulation the way that most Dutch covenants do. We might think of this central difference between Dutch environmental covenants and Project XL as a difference of 'scope' between the two initiatives.

The approaches also differ in terms of the parties that the government chooses to negotiate with. In the Netherlands, the government primarily enters contracts with *sectors* of regulated entities. While it is true that individual Company Environmental Plans play a role in the covenants with heterogeneous sectors, they are preceded by a sector-wide covenant and must be negotiated within a framework set in the larger agreement. Thus, it is fair to say that the emphasis in Dutch covenants is on sector-based negotiations. In Project XL, on the other hand, the emphasis is on negotiations with individual regulated entities, primarily companies (…).

A third difference between the two approaches is that one employs 'regulatory' flexibility, whereas the other does not. As described above, regulatory flexibility is central to Project XL. It allows the program to achieve its main goals of reducing inefficiency and promoting innovation. Moreover, regulatory flexibility, and the cost savings that arise from it, provides the principal incentive for businesses to participate in the program. By contrast, environmental covenants in the Netherlands do not provide regulatory flexibility insofar as the term refers to the lifting of binding regulatory requirements (…).

This distinction, too, may reflect the 'scope' difference. One of the central motivations for Project XL has been to bring flexibility to areas already covered by rigid, command-and-control rules. To do this, it is necessary to lift these existing regulations. The Dutch covenants, on the other hand, generally go beyond the scope of existing regulation in order to map out new areas of pollution control (although some serve more to accelerate the implementation of existing legislation). Consequently, one would not expect them to come as often into conflict with existing standards (…)."

The Environmental Protection Agency in New South Wales, Australia, has developed an interesting combination of instruments, involving an environmental permitting system, a load-based licence fee for large emitters, and a set of load reduction agreements. These agreements grant polluters a temporary reduction in the licence fees if they undertake to reduce their emissions within a three-year period. The impacts of this policy mix are discussed further in Section 12.5 below, as the "voluntary" element in this case is more related to the licence *fees* than to the *permits* as such.

Given the many examples – and the great diversity – of combinations of environmental permit systems and voluntary approaches, it is difficult to

draw generally valid conclusions of their impacts. In fact, a major part of all the (quite substantial) literature on voluntary approaches does explicitly or implicitly deal with this type of policy mix. One often repeated finding is, however, that it is often very difficult to document that a given voluntary approach in practice leads to an environmental performance superior to what would in any case have taken place – *c.f.* the discussion in Chapter 4 above and the literature referred to there. Some economic savings due to increased flexibility have been found in several examples, and various information campaigns and forums of participants can enhance technology diffusion compared to traditional "command-and-control" regulation.

It is not clear whether adding a voluntary approach "on top of" a pre-existing environmental permitting system would make marginal abatement costs of different polluters *more equal than before*. This would *inter alia* depend on which firms participate in the voluntary approach. It is *possible* that a truly voluntary public programme – incorporating *e.g.* some public recognition of participating firms – would attract in particular firms with low-cost abatement options. If so, there would tend to be some equalisation of marginal abatement costs, compared to the previous situation.

The incentives for technology development are generally rather weak under a traditional environmental permitting system,[2] and it does not seem likely that they would be much strengthened by the introduction of a voluntary approach.

Notes

1. See, for example, Khanna (2001) and Lutz, Lyon and Maxwell (2000), Lyon and Maxwell (1999) and Videras and Alberini (2000) for a further discussion of firms' motivation for participating in voluntary policy approaches.
2. Mechanisms where there is a positive "shadow price" on the size of permitted emissions – like the Load-based licence fees in New South Wales – could strengthen such incentives significantly.

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11. Voluntary Approaches Used in Combination with Environmentally Motivated Subsidies

All subsidy schemes are by definition in themselves "voluntary", but the focus here is on schemes that combine subsidies and voluntary abatement schemes. It should also be kept in mind that certain types of subsidies for pollution abatement can contradict the "polluter-pays principle", as it is formally adopted by OECD member countries.

Depending on the definition of "subsidies" being used, there are several ways voluntary approaches and environmentally motivated subsidies can be used in policy mixes. One relatively common policy package is that some sort of subsidies to stimulate the development of environmentally benign technologies is used as a "carrot" to make polluters volunteer to abate their emissions.

Referring to Figure 9.1 above, the subsidies and the voluntary approach would then normally be introduced simultaneously. Presumably the combination of the two instruments would lead to more rapid, and more environmentally focused, development of new technologies than if the voluntary approach had been introduced in isolation. It is, however, more unclear what is the marginal impact in this respect of adding the voluntary approach to a subsidy scheme: it is *conceivable* that the obligation to take part in the voluntary approach to obtain the technology subsidy "biases" the selection of companies that apply for the subsidies, and leads to a slower progress than if the subsidies had been used in isolation.[1]

The environmental impacts of such policy combinations would, *inter alia*, depend on the extent to which the technology developments actually succeeds – and on the longer-term structural changes in the economy that the technology changes generate.[2]

In relation to the UK Emissions Trading Scheme, British authorities used a somewhat different approach to environmentally motivated subsidy allocation. Here a given amount of subsidies targeted reductions in greenhouse gas emissions directly – *i.e.* the subsidies were not given for *e.g.* technology development, etc. Companies were instead invited to participate in an auction, thus voluntarily committing to absolute levels of emission reductions at progressively lower prices. The Government's objective was to obtain the maximum level of reductions for the incentive money made available (£215 million over a five-year period). Thirty-four organisations bid successfully to join the scheme. Over the five years of the scheme, the participating companies have pledged to reduce their annual greenhouse gas emissions by more than four million tonnes of CO_2.[3]

In this case the approach cause firms to voluntary take on a legally binding emission reduction obligation beyond what was imposed by other regulations, in return for the subsidies they obtain. Through the auction mechanism the scheme should help find the cheapest ways to realise emission reductions, and thus stimulate economic efficiency.[4] The fact that the participating companies can use an emission trading mechanism to fulfil their reduction obligations should enhance economic efficiency of the scheme as a whole even more, *c.f.* Section 12.3 below for a further discussion.

Notes

1. Before passing a judgement on whether or not such a policy mix all in all is beneficial to the society, one should also take into account the disadvantages related to the financing of any subsidies. This is especially important where the "marginal cost of funds" – *i.e.* where the distortionary costs of raising an additional unit of tax revenue – is considerably larger than 1.
2. When promoting technology development in highly polluting sectors, policy makers should take into account that this could improve the competitiveness of these sectors, leading to increased production – and perhaps to an increase in overall pollution levels, even if emissions *per unit* in the sector decrease.
3. For more information on the UK Emission Trading Scheme, see DEFRA (2002a) and Kitamori (2002). Firms being party to the Climate Change Agreements related to the Climate Change Levy [cf. the next section] can also on certain conditions participate in the Emission Trading Scheme. Enviros (2003) indicates that 80% of emissions of firms participating in the Emission Trading Scheme were declining at the time of entry into the scheme. Over half of these were declining due to abatement activities, but a substantial proportion was due to declining business activity. They conclude *inter alia*: "Emissions trading markets are difficult to establish effectively through voluntary mechanisms. Mandatory enforcement with a wide number of participants provides a better basis for creating an efficient environmental trading market."
4. It is – as always – possible that some of the emission reduction measures being subsidised would have been undertaken anyhow, implying a "dead-weight loss" of the policy. Enviros (2003) indicates that this might indeed to some extent have been the case. This is, however, related to the subsidy scheme as such, not to the fact that it used in combination with a voluntary approach.

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12. Voluntary Approaches Used in Combination with Taxes or Charges

12.1. Introduction and background

Under a tax regime, firms' compliance costs are equal to abatement costs *plus* tax payments for residual emissions. A number of countries combine certain taxes or charges with voluntary schemes, where for instance some sectors are completely exempted from a tax – or pay lower tax rates than other sectors – on the condition that they "voluntarily" undertake certain abatement measures. Such arrangements are often introduced based on a fear that the international competitiveness position of the sectors concerned would be compromised it the firms in question had to pay the "full" tax rate. *If* this position was significantly weakened, plant closures could result, with subsequent transition costs related to capital losses and increases in unemployment, sometimes in regions with limited employment opportunities. Such repercussions *could* jeopardise the social dimension of Sustainable Development, *c.f.* Figure 9.1.[1]

The environmental effects of a tax will generally come about through the subsequent increase in the prices of the tax-bases in question, and the price elasticities of the tax-bases in question. The price elasticities will generally be different in the short run (when available technology options are given) and in the longer run (when changes in relative prices can trigger new technological developments). They can also depend on a number of other factors: Bjørner and Jensen (2002) used a large micro-panel database to estimate energy price elasticities in Danish industry, and found the average elasticity to be –0.44. This means that a 1% increase in energy prices would lower total energy demand in the sector 0.44%. They also found that the price elasticities depended on the level of the energy prices firms were facing at the outset. For firms at the 10% decile when ranked in increasing order according to energy prices they were facing, the estimated price elasticity was about –0.4. For firms at the median, the price elasticity was found to be about –0.6, while for firms at the 90% decile, the estimated price elasticity was about –0.7.

Bjørner and Jensen (2002) also found that the most energy-intensive firms tended to face the lowest energy prices at the outset – in part because they use relatively much of comparatively cheap coal, while firms with lower energy intensity have a higher share of (more expensive) electricity in their total energy use. With current prices for different energy products, the price elasticity is thus found to be lowest for the most energy-intensive firms.[2]

To the extent that the sectoral competitiveness arguments often used in favour of special tax provisions for energy-intensive firms are valid, infra-marginal price increases due to large tax increases could, however, also trigger plant closures that (obviously) would eliminate energy use at a given plant. It is doubtful that the price elasticity estimates presented above incorporate such impacts, as energy-intensive firms in Denmark (as elsewhere) have enjoyed special tax privileges all through the estimation period. Expected demand reductions in response to significant tax increases could, hence, be higher than what the presented estimates indicate.

The discussion above highlights the need for considering what would – realistically – be the alternative policy when discussing the impacts of combining an environmentally related tax or charge with, for example, negotiated agreements with some firms or sectors.

If the alternative policy was a flat tax rate for all relevant polluters, at the same ("high") level as used for some sectors in the combined policy, the introduction of a voluntary option for some polluters *could* represent a weakening of the environmental target and/or a lower degree of achievement of a given target.[3] Even if a negotiated agreement would oblige the polluters to abate emissions – and leave them increased financial resources to invest in pollution abatement, through the forgone tax revenue – it is not given that this would outweigh the emission reductions that "ordinary" price responses – and possible plant closures – under a "full tax regime" might have brought about.

Impacts on technology development could also be important: adding the voluntary option could – as mentioned – give the affected firms more financial resources to undertake research and development, but their incentives to actually achieve technology improvements – and their profits from doing so – could be severely reduced. When the "shadow price" on marginal emissions approaches zero, the firm has little incentive to find ways to reduce them. Over the longer term, this could have important environmental repercussions.[4]

If the realistic alternative to a voluntary approach is a much lower tax rate for the firms included in the voluntary approach than for other firms, the significance of the points above would be reduced accordingly.

In both cases – but to a varying degree – replacing a tax by a voluntary approach will induce a revenue loss for the government.[5] As discussed further by for example Fullerton and Metcalf (2001) and Goulder, Parry and Burtraw (1997), this revenue loss represents a significant efficiency cost. "Scarcity rents" created by the environmental policy are left with the private companies. Public authorities could, for instance, have used the revenues foregone to lower distorting taxes on labour income, thus stimulating employment.

Various types of administrative costs could increase with the introduction of a voluntary scheme. Most environmentally related taxes are relatively simple to administer, with – for example – the tax-bases being measured and revenues being collected at a limited number of oil refineries for most taxes on mineral oils. As for example demonstrated by the Danish agreement scheme discussed above, introducing a conditional tax reduction can significantly increase the administrative burden, both for public authorities and for the firms involved.

In all the cases discussed below, (higher) taxes can be seen as a – more or less credible *[cf.* footnote 4] – threat of alternative instrument use if the participants to a voluntary approach should not fulfil their obligations.

12.2. The energy efficiency agreements in Denmark

Various aspects of these agreements have been discussed in Part I above. It is reiterated that the agreements provided a relatively modest *additional* tax benefit to the participating companies *compared to* the very large tax reductions granted to any industrial firm that employ light or heavy processes, *c.f.* Table 12.1 below. However, a reduction in the tax rate for, for example, firms with heavy processes from 3.3 to 0.4€ per tonne CO_2 in 2000 is, of course, in itself substantive.

Table 12.1. **Levels of CO_2- and energy taxes in Denmark, 1996-2000**
Euro per tonne CO_2

	1996	1997	1998	1999	2000
Space heating[1]	26.7	53.3	80	80	80
Light processes					
– Without agreement	6.7	8.0	9.3	10.7	12.0
– With agreement	6.7	6.7	6.7	7.7	9.1
Heavy processes					
– Without agreement	0.7	1.3	2.0	2.7	3.3
– With agreement	0.4	0.4	0.4	0.4	0.4

1. The numbers represent the total energy and CO_2 tax rate for space heating. The CO_2 tax rate alone was 13.4€ each of the years 1996-2000. The Danish Economic Council (2002) evaluates Danish environment and energy policies in the 1990s. Based on a cost-benefit analysis, that study concludes that "the tax rate applied to the energy consumption by households and the energy consumption for room heating purposes by companies is too high. On the other hand, the tax on companies' energy consumption in manufacturing is too low".

Source: OECD (2002d), which was based on Finansministeriet (1995).

According to the findings of Bjørner and Jensen (2002), CO_2-emissions would have been higher if the agreement scheme had not been introduced, and companies had only paid the reduced rates for either light or heavy processes. As mentioned, it is, however, possible that their price elasticity estimates are biased downwards.

12.3. The Climate Change Agreements in United Kingdom

Some other concrete examples of combinations of taxes and voluntary approaches will be presented in the following, starting with the Climate Change Levy and the Climate Change Agreements in United Kingdom.[6] Before the introduction of the Climate Change Levy from 1.4.2001, energy-intensive sectors[7] were given the option to obtain an 80% reduction in the tax rate if they entered into agreements on improving energy efficiency or reducing carbon emissions.

Agreements have been made with 44 sector associations, covering 5 000 separate operators and 13 000 facilities. They have been negotiated with the relevant sector trade associations on behalf of the companies within the sectors concerned. Facilities identified in the agreements are eligible for the 80% tax discount until 31 March 2003. Eligibility for discount from 1 April 2003 will depend on whether the first targets set in the agreements have been met. The agreements span the period up to 2010, with "Review points" in 2004 and 2008, when the stringency of the targets will be considered again.[8]

The agreements set target both for sectors and for each separate facility. Some sectors use a common percentage reduction target for all facilities concerned, while other sectors have internally negotiated other ways of sharing the burden. If a sector as a whole fulfils its target, each facility in that sector is deemed to be in compliance. If a sector fail to meet its overall target, those facilities that have not met their own targets will loose the 80% tax discount for the next 3 years.

The fact that it is enough for the sector to meet the overall target for all the facilities to maintain their discount could – in isolation – stimulate "free-riding", where under-performing facilities try to benefit from abatement efforts at other plants. However, facilities that do better than required have the possibility to sell the surplus reduction into the UK Emission Trading Scheme. Hence, most likely each facility must make sure that they meet their own target.

For an analysis of the targets set in the Climate Change Agreements, see ETSU (2001). Concerning environmental impacts, ETSU (2001) states, *inter alia,* that:

> "The sector targets add up to a saving of around **2.5 MtC per yea**r, compared to the Business As Usual scenario. (…) This is a very satisfactory result, especially given the assumption of unlimited management time and capital availability used (…). It supports the qualitative assessment, namely that there must be step change in behaviour if the negotiated targets are to be achieved. This is the change which the climate change levy is intended to deliver.

> For reference, it is estimated that the price effect of the levy on its own, *i.e.* assuming the levy is in place with no negotiated agreements and associated discounts, would give rise to a saving of 0.25 MtC per annum."[9]

ETSU (2001) concludes: "In summary, every sector's target represents a significant improvement beyond 'Business As Usual'. The total target saving across all sectors is a satisfactory % of the pre-set benchmark which is acknowledged to be based on certain optimistic assumptions. Review points provide the opportunity to reassess those detailed issues where agreement was not achieved. Recognising these points, noting that the process was one of negotiation, and believing that in every sector a step change in behaviour will be needed to deliver the proposed targets, ETSU is of the view that the targets represent a reasonable basis for the climate change agreements."[10]

12.4. The Intention Agreement on SO_2 emission reductions in Norway

The combination of a negotiated agreement and the tax on sulphur content in fuels in Norway (*c.f.* Box 12.1) represents a case where seemingly the most realistic alternative policy was a reduced tax rate for industry. As it seems less costly for the firms to pay the tax than to abate emissions at the tax rate that *was* applied between 1999 and 2002, the replacement of such a tax by a negotiated agreement *could* lead to environmental improvements. Similar improvements could have been obtained by increasing the tax rate sufficiently to make it cheaper for firms to abate than to pay the tax, but that *might* entail significant social costs – to the extent statements about plant closures in PIL (2001) are correct.

The phasing-out of the (low, but positive) tax rate for the sectors concerned was – according to Ministry of Finance (2001) – expected to lead to a revenue-loss of about 50 million NOK, which corresponds to about 0.04% of expected revenues from ordinary taxes on income and fortune in Norway in 2002.

The "environmental fund" set up by the Federation of Norwegian Process Industries is an interesting mechanism to promote cost-effective abatement measures. To finance the fund, the firms concerned have committed to pay a "fee" at a rate equal to the previous tax rate of 3 NOK per kg SO_2 emitted. The resources of the fund will be used to finance abatement measures on the sites where they will contribute the most to reduce emissions, until the targets of the Intention Agreement have been reached. Under certain conditions, the fund can force measures to be taken, even if the firm in question would oppose them, if the fund provides full financing of the given project.

Box 12.1 **Norway – Reduction of sulphur emissions from industry**

In Norway a tax on the sulphur content of fuels has been in place for many years, covering at present about 27% of all SO_2 emissions in the country – with a tax rate of 17 NOK per kg SO_2. From the outset, emissions from refineries, from the use of coal and coke, and the use of mineral oils in the petroleum extraction activity on the continental shelf, and from supply-ships of this activity, was not covered by the tax. In 1999 these emission sources were included in the tax, with a reduced tax rate of 3 NOK per kg SO_2.

However, from 1.1.2002 emissions from refineries and from the use of coal and coke (largely in industrial processes) were once again completely exempted from the tax. In return, the Federation of Norwegian Process Industries had signed an "Intention Agreement" with the Ministry of Environment, [*cf*. Ministry of Environment (2001)] committing to reduce SO_2 emissions 5 000 tonnes by 2010, and to prepare a plan on how emissions could be reduced in a cost-effective way a further 2 000 tonnes. Together this would sum up to an amount equal to the total emission reductions Norway expects to have to make to fulfil its obligations under the Gothenburg protocol of the UN ECE convention on Long-range Transboundary Air Pollution, capping total Norwegian SO_2 emissions at 22,000 tonnes from 2010.

Studies undertaken by the Norwegian Pollution Control Authority [*cf*. SFT (2001)] indicate that the most cost-effective measures to reduce SO_2 emissions in Norway can be found in the process industry. In 1999, firms in this sector emitted more than 16 000 tonnes of SO_2, compared to total Norwegian emissions of about 29 000 tonnes.

The Federation of Norwegian Process Industries states that the 3 NOK per kg SO_2 was not environmentally effective, as it was cheaper for firms to pay the tax than to install cleaning equipment that would be required to reduce emissions, *cf*. PIL (2001). This is confirmed by the findings of SFT (2001), where all potential abatement measures (with one exception) were found to have a marginal cost of 4.1 NOK or more per kg SO_2 abated. The major share of the cheapest measures to reach a 7 000 tonnes emission reduction in total was found to have marginal costs of between 8 and 13 NOK per kg SO_2 abated. The Federation further stated that if the tax rate had been set so high that it would be profitable for the firms in question to install the cleaning equipment, the firms would not survive.

The "Intention Agreement" is not legally binding for the two parties. Until the measures covered by the agreement have been implemented, by 2010 the latest, the ordinary environmental emission permit system will be the main policy instrument addressing the emissions from the sources concerned. According to Ministry of Environment (2001), the pollution control authorities will seek to design future emission permits in such a way that industry can fulfil their obligation by joint measures.

Box 12.1 **Norway – Reduction of sulphur emissions from industry** *(cont.)*

The process industry has – based on a legally binding "implementation agreement" involving all the firms that used to pay the lower tax rate – set up an "environmental fund", organised as a self-owned foundation, and financed by contributions similar to the previous tax payments. Before the end of 2003, an "action plan" for how the Intention Agreement is to be fulfilled shall be developed. The resources of the fund will be used to – fully or partially – finance development, implementation and operation of abatement measures and other measures suitable in the pursuit of the targets of the implementation agreement, including support to closure of activities that leads to lasting emission reductions. Measures are to be implemented where they will contribute the most to reduce emissions, until the targets of the Intention Agreement have been reached. Consideration will also be given to where emission reductions will contribute the most to improve local air quality. In general, measures will be supported based on applications from the participating firms. If not enough applications should be made to reach the targets of the Intention Agreement, a site might be instructed to undertake a measure financed by the fund.

12.5. The Load Reduction Agreements in New South Wales, Australia

Pollution control authorities in the Australian state of New South Wales have developed an interesting policy package to address a broad spectre of pollution issues, *c.f.* Box 12.2 for further details. Instead of issuing environmental emission permits more or less for free, like it is done in most countries, the largest polluters are obliged to pay a fee related to the size of the permitted emissions of various pollutants. The size of the fee also depends on characteristics of the recipient in question, meaning that a given unit of emissions cost more in area where the marginal damage can be expected to be highest. To provide a stronger incentive to abatement emissions, polluters that commit to reduce their emissions within a three-year period will – from day one – only have to pay the amount they would have been obliged to if they had already achieved the agreed emission reduction.

It is worth noticing that the price incentive to abate is not much reduced in this case, as the reduction in the Load-based Licence Fee is only to be given for a three-year period, and it only concerns the difference between actual emissions and agreed emissions. During the period, the polluter must find measures to reduce emissions on a lasting basis. At the same time, the somewhat lower tax payment might have some impact on polluters' financial ability to undertake emission-reducing measures – but the reductions achieved so far seem relatively modest.

Box 12.2 **New South Wales, Australia – The Load-based Licence Fee and the Load Reduction Agreements**

The Protection of the Environment Operations Act 1997 sets out which activities are required to be licensed by the New South Wales Environmental Protection Agency. The Load-based Licensing scheme operates via the *Protection of the Environment Operation (General) Regulation 1998,* which sets out the licence fees for these environment protection licences. Licensees pay an administrative fee at the beginning of each year. Ten per cent of the largest activities licensed by the EPA with potential to cause environmental harm are also required to pay pollution load fees. After monitoring for pollutant emissions during the year, the annual load of assessable pollutants is reported in an annual return. Pollutant load fees are paid within 60 days of the end of the licence fee period in accordance with the pollutant loads emitted – the lower the emissions, the lower the fee.

A number of incentives are provided to industry to consider ways to improve their environmental performance. A weighted load discount is available under certain conditions where a licensee reduces the harmfulness of the emissions but not necessarily the actual load. For example 100% fee savings can be obtained for sustainable re-use of effluent.

Load Reduction Agreements (LRAs) are a voluntary incentive for licensees to reduce fees preparing to reduce loads in future. LRAs provide immediate fee reductions for licensees willing to commit to future reductions of assessable pollutant loads. Load fees are paid based on the future "agreed" load rather than the current 'actual' loads during the term of the agreement. Money that would otherwise be paid in fees can then be used for investment in improving environmental performance. LRAs may be for a maximum period of four years, giving licensees up to three full years to upgrade operations and a final year to show they have permanently reduced pollutant loads to an agreed lower level.

As the agreement is voluntary, the nature of the abatement works to be undertaken is at the discretion of the licensee. Only a general description of the nature of the works is provided to the EPA.

The Load-based Licensing scheme commenced on 1 July 1999. A four-year phase-in plan gradually introduced the new licence fee structure, allowing industry time to adjust to the new arrangements. The first year of the scheme industry was required to monitor and report their pollutant loads, but no fee was payable. Consequently the first LRAs have been entered to apply from the second year of the scheme as load fees became payable.

Box 12.2 **New South Wales, Australia – The Load-based Licence Fee and the Load Reduction Agreements** *(cont.)*

By September 2002, 19 licensees had entered an LRA, with anticipated fee savings of more than 7 million AUD. Local councils, who operate sewage treatment systems, have entered the majority of agreements. This is the most common activity that is required to pay load-based fees. The difference between the actual load and the agreed load is the pollutant load reduction. For these 19 agreements this includes more than 1 865 tonnes of water pollutants and 1 650 tonnes of air pollutants.

To enter an agreement, the licensee completes an application form providing a description of the works, the time period for the agreement and nominates the agreed load for each pollutant to be included in the agreement along with an estimate of their current loads. Generally it is the initiative of the licensee to consider an agreement, but the EPA may suggest that an LRA be considered where appropriate.

The completed application form is reviewed by EPA operations staff and details are transferred to a draft agreement ready for signatures. During this stage the EPA will discuss the agreement with the licensee and verify the agreement details to check it is within the legal scope permitted. Agreements are signed at a senior level of the EPA and then provided to the licensee for their signature. The relevant environment protection licence is also varied at this time to link to the agreement.

By focusing on the end result for lower emissions rather than on close monitoring of the works to be undertaken one has avoided the need for annual reporting against milestones, resulting in saved administrative effort for both the licensee and the EPA.

The first agreements entered still have a couple of years before expiry, so it is too early to determine whether the industry will achieve greater or less emission reductions than planned. However, according to Stace (2002), regular discussions with licensees through licence reviews and other communication provide a mechanism to discuss the agreement progress informally, and no licensees have yet indicated that they will be unable to meet their goal. It is up to the licensee to consider the extent of emission reductions they are going to achieve, but EPA encourages the licensee to consider realistic goals. Load fees are calculated on the lowest of the actual, weighted or agreed load. So in any year of the agreement including the final year, where the annual load is less than the agreed load the licensee pays less. If an agreed load was not to be met, fee savings provided are to be repaid with interest at the end of the agreement period.

Box 12.2 **New South Wales, Australia – The Load-based Licence Fee and the Load Reduction Agreements** *(cont.)*

The agreements allow the licensee to enter for one or more pollutants as appropriate. So a sewage treatment plant may consider phosphorus removal technology and later enter a second agreement to reduce nitrogen or prepare for sustainable reuse and reduce loads of all pollutants emitted to water.

Load-based Licensing has only been operating for 2 years but has, according to Stace (2002), already lead to emission reductions with many licensees having commenced environmental improvement works earlier than may have ordinarily occurred. Load Reduction Agreements have also provided a financial incentive for licensees to commit to lower loads and for industry manage the licence fees payable.

12.6. Conclusions

Both the energy efficiency agreements in Denmark, the Climate Change Agreements in the United Kingdom and the "Intention agreement" on SO_2 emission reductions in Norway have – to a significant degree – been motivated by a wish to prevent close-down of industrial companies that could have taken place if "full" tax rates had been applied. It seems unlikely the agreements provide environmental benefits beyond what "full" tax rates would have done, but, in the case of Norway, it seems that the previous *reduced* rates applied to certain industrial sectors were too low to have any significant environmental impact – at least in the short term.[11]

It seems that by combining taxes and a voluntary approach in these cases policy-makes have tried to avoid having to make trade-offs between the environmental, economic and social dimensions of Sustainable Development.[12] It remains to be seen whether such trade-offs *can* be avoided in the longer term, as – for example – more ambitious climate policies are being put in place.

For the Load Reduction Agreements in New South Wales, the competitiveness issue seems to have been of less importance, as the most important polluters under the scheme are local councils, who operate sewage treatment systems. They hardly face competition from other actors.

It seems clear that the introduction of negotiated agreements to supplement or replace tax payments for certain sectors can entail a considerable administrative burden, both in terms of negotiating the targets and concerning monitoring and enforcement of the obligations.

As stated in the beginning of this section, under a tax regime, firms' compliance costs are equal to abatement costs *plus* tax payments for residual

emissions. When firms can avoid paying for any residual emissions by taking part in a voluntary scheme, impacts of the policy on the production costs of these firms will be limited. A wish to limit such cost impacts – especially for firms facing stiff international competition – is exactly one of the reasons for which the tax relief is given. However, to the extent the firms *could* have shifted any cost increases on to their customers – through increases in the prices of their products – applying a voluntary approach looses out on any impacts on the demand for products that cause pollution in their production. In many cases, such demand changes *can* provide an important part of the environmental benefits from using economic instruments.[13]

Notes

1. The size of any such transition costs can be of particular relevance if the country in question is a "front-runner" in addressing a particular environmental problem, implementing policies that go beyond any internationally agreed targets, but where it can be expected that other countries will follow suit within a reasonable period of time. If this is the case, it could be undesirable for the "front-runner" to close down facilities that were likely to be competitive once other countries have followed suit. When the policy "only" aims to fulfil a given internationally agreed target, economic efficiency arguments would, however, favour giving all sources the same abatement incentives.
2. Søbygaard (2002) used long-term own-price elasticities from Statistic Denmark's EMMA-model. For households and room heating these were –0.15 and –0.54 respectively for electricity and fuels. For process usage in industry, the elasticities were –0.25 and –0.35 respectively for electricity and fuels.
3. This is in particular so concerning *absolute* targets, as opposed to targets expressed *per unit* produced. Due to the (assumed) negative impacts on the competitiveness position of the most affected sectors, application of "full" tax rates *could* lead to a number of plant closures, with related emission reductions. [*cf.* OECD (2002f) for an in-depth discussion related to the steel sector.] Emissions per unit of GDP, or per unit of output in an industrial sector, are also likely to decrease somewhat, as the most emission-intensive plants are likely to be strongest "hit" by a tax. However, as both the numerator and denominator would decrease, the impact on such a quotient would be smaller.
4. The importance of this point would be diminished *if* the firms believe there is a credible threat that full taxes would be introduced if stated targets were not to be met. As described in Part I, there are, however, several examples of environmental targets of voluntary approaches not being met, without strict alternative regulation being introduced. *If* a "full" tax rate really would induce a strong negative impact on the competitiveness of a given sector – and/or if policy makers strongly *believe* it would do so – the affected firms might believe that it is unlikely that strict alternative regulations be introduced, regardless of whether or not they fulfil their obligations under a negotiated agreement.
5. The size of the revenue loss would be inversely related to the environmental improvements in the tax case.
6. See DEFRA (2002b) for additional information.

7. Energy-intensive sectors are defined as those that are subject to existing UK PPC Regulations [*cf.* The Stationery Office (2000)], largely similar to the sectors that are covered by the European Unions Integrated Pollution Prevention and Control Directive. There are ten major energy intensive sectors (aluminium, cement, ceramics, chemicals, food and drink, foundries, glass, non-ferrous metals, paper, and steel) and thirty-four smaller sectors, including – perhaps somewhat surprising – also textile and semiconductor production and in-store bakeries at supermarkets.

8. Where an energy-intensive installation uses less than 90% of the energy within a site, the facility which is covered by a Climate Change Agreement must be sub-metered so that the energy used by the facility is known accurately, *cf.* DEFRA (2001). The cost of this metering has to be borne by the companies concerned. Costs may be in the region of £1000 to £5000 per meter, possibly more where the energy supply arrangements are particularly complicated. In some sectors that require more metering, such as motor vehicles, the eligible activities are already sub-metered so there is no additional cost. In other sectors, such as supermarkets and aerospace, a programme of installing sub-meters was agreed. One sector, the master bakers, was concerned that the costs of installing meters in small bakeries would outweigh the benefit of the 80% levy discount on their relatively small energy consumption. Both the supermarkets and master bakers sectors have *over a thousand sites* with activities which are eligible to be covered by an agreement and where additional metering is required if they are to be included in an agreement. This is one reflection of the considerable administrative costs negotiated agreements can entail.

9. The statement concerning the price effect of the levy could be an under-estimate. The estimated figure was based on an average price elasticity, with an *explicit assumption that no plants be closed down*. Application of the full rate of the climate change levy would likely have led to some plant closures in the most energy-intensive sectors in the period up to 2010, and to larger emission reductions than 0.25 MtC per year. However, an objective of the climate change policy in UK is to achieve emission reductions without putting the industrial basis of the country at risk.

10. It should be noted that ETSU was responsible for negotiating the sector agreements on behalf of the UK Government. ACE (2001) criticises the calculations concerning the impacts of the agreements, stating that the "Business-as-Usual" energy efficiency improvements was likely to be higher than ETSU assumed, based *inter alia* on efficiency improvement forecasts published by the UK Department of Trade and Industry and by the European Commission.

    de Muizon and Glachant (2003) provides a close examination of the combination of the Climate Change Levy, the Climate Change Levy Agreements and the UK emissions trading system. They conclude that the performance of the policy mix would not be affected by the absence of the agreements.

11. It is conceivable that if a tax at the (low) rate of 3 NOK per kg SO_2 had been in place over a longer period of time, new technological options would be developed that would be cheaper for the firms than paying the tax. The fee payments to the "environmental fund" maintain this incentive for technology development.

12. Lyon and Maxwell (2003) compare an emission tax and a public voluntary program, where participation is stimulated by some sort of subsidy. They conclude:

    "The most important lesson of this chapter is that public VAs typically arise from weakness, not from strength. They should not be regarded as some new and superior policy instrument. Rather, they should be viewed as a limited tool that

may be useful in settings where more powerful policy instruments are infeasible. Indeed, policy makers should approach VAs with caution, since their very availability may increase industry resistance to the use of more powerful regulatory tools. This resistance increases because the hope of obtaining a subsidy (through a public VA) strengthens industry's resolve to fight traditional regulatory tools of taxes and standards, which impose direct costs on the industry.

There is a second risk associated with the increased use of public VAs by policy makers. Just as they may undermine more stringent regulatory tools, they may undermine industry's incentives to undertake environmental improvement under its own initiative. Instead, industry may prefer to wait until government offers a 'carrot' before agreeing to improve its environmental performance. Industry may have incentives to preempt the imposition of a tax or standard, but it does not want to risk preempting a handout."

13. In technical terms, firms seldom face a completely elastic (horizontal) demand curve. This issue is discussed in greater detail in OECD (2002f).

It is *possible* that an agreement made with an entire industrial sector could have a greater chance of leading to cost increases – and related desirable demand impacts – than agreements made with individual firms.

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13. Voluntary Approaches Used in Combination with Emission Trading Systems

Voluntary approaches can be integrated with emission trading systems in three ways that will be discussed in turn below:

- adherence to tradable permit systems can be voluntary;
- tradable permits can be used as a means of allocating responsibilities within an industry-wide negotiated agreement; and,
- emission reductions agreed to under voluntary agreements can be used as a means to allocate permits in a grandfathered tradable permit scheme.

13.1. Voluntary adherence to trading systems

To a certain extent, all baseline-and-credit schemes can be described as "voluntary approaches" to environmental regulation. Credits are issued to all firms which achieve emission reductions below a set amount, such as the level of emissions that would prevail under a regulatory system. They can then sell these credits to firms that have emissions in excess of regulated emission levels. In both cases, involvement is voluntary. Low-cost abaters are not "required" to create credits, and high-cost abaters are not "required" to purchase them. In effect, the efficiency gains provided by the tradable permit system are the carrots which provide the incentive for firms to volunteer to be involved in the system.

However, in a cap-and-trade scheme the situation is quite different. If the permits were auctioned, no firms would be likely to volunteer to be involved in the absence of a regulatory threat or a financial inducement. In the case where permits are grandfathered, the question is significantly more complicated. It is also more policy-relevant, since a number of countries have introduced – or are introducing – voluntary cap-and-trade schemes with grandfathered permits.

Allowing voluntary participation in cap-and-trade schemes based upon grandfathered permits can be a means to increase economic efficiency of abatement. However, voluntary trading schemes are characterised by strategic behaviour and financial uncertainty. Unlike under a mandatory cap-and-trade scheme, the firm does not know what the ultimate "cap" will be, since this depends upon how many (and which) firms volunteer. More significantly, it must try to predict the ultimate permit price – which is the key factor in its evaluation of whether it makes sense to volunteer or not – without knowing how many and which firms are likely to volunteer. In order to make an informed

choice, each firm must estimate: A) probabilities of adherence for other firms; B) other firms' emission levels; and, C) other firms' marginal abatement costs. Depending upon the system used for the allocation of permits between the firms, it is quite possible that no firm will choose to volunteer.

In effect, each firm faces a different benefit and cost schedule depending upon which other firms are involved. In some cases the net benefits will be positive and in some cases they will be negative relative to the case where they continued to adhere to some existing regulatory regime. It is possible that the distribution of costs and benefits is such that no firm will volunteer, even if it would be in their collective interest to do so.

This can be seen in Table 13.1. For instance, in the cell that is shaded Firm 1 will be a net beneficiary if Firm 2 also volunteers, perhaps because it will receive a relatively large allocation of permits and/or has relatively low abatement costs in comparison with Firm 2. However, if it is Firm 3 which volunteers then it will face costs, for the opposite reasons. This is shown in the cell directly below. As such, with a reasonable degree of risk aversion, all three firms may well choose to remain under the regulatory scheme, rather than volunteer for the tradable permit system. It is important to note that this can be true even if the overall net benefits for both firms are positive in all cases, including the case in which all firms participate. There is a "prisoners' dilemma", in which firms are unlikely to adopt a strategy which is in all thei interests.

In many instances, however, voluntary adherence is only an option for a sub-set of firms, with most firms being mandatory participants. This is the case with the US EPA's SO_2 Allowance Program. In addition, under another section of the Clean Air Act Amendments, firms or households are able to earn credits by volunteering to retire older high-emitting motor vehicles [see Solomon (1999)]. It is also the case with Pennsylvania's NO_x Allowance Retirement Program, which is mandatory for fossil fuel powered electric generating plants, but voluntary for others [*c.f.* Stavins (2001)]. Similarly, under

Table 13.1. **Incentives for adherence to voluntary tradable permit schemes**

	Firm 1	Firm 2	Firm 3
Firm 1	X	Positive Negative	Negative Positive
Firm 2	Negative Positive	X	Positive Negative
Firm 3	Positive Negative	Negative Positive	X

Source: OECD.

the Californian RECLAIM program, it is possible for mobile sources and small point sources to volunteer to become involved [see Nash and Revesz (2000)].

To a great extent allowing for voluntary adherence for some firms while preserving a core of firms for which the cap-and-trade programme is mandatory simplifies the decision for the firm, since if the number of potential "voluntary" firms is small relative to the number of "mandatory" firms, the permit price can be taken as given. In such cases, the firm need not be concerned with the three factors mentioned above, but only its own calculus of costs and benefits. This also means that the regulator faces less uncertainty about the likely number of firms that are to be involved.

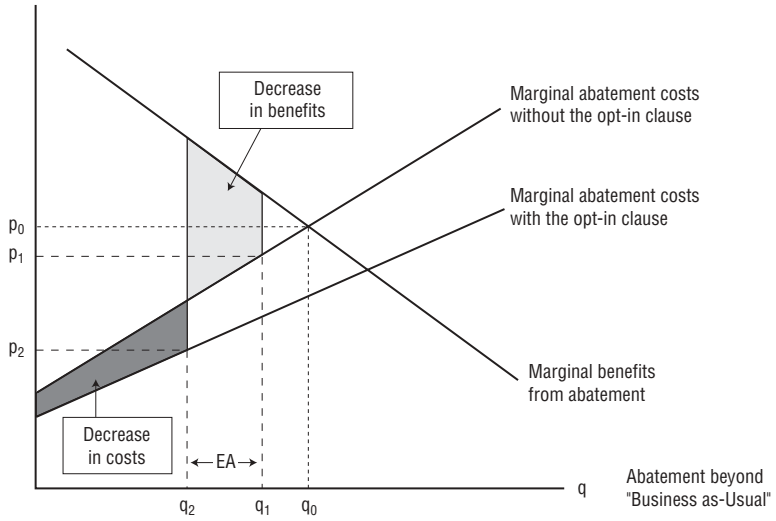
However, even in such cases voluntary adherence to a trading scheme can raise concerns. Most importantly, depending upon how the grandfathered permits are allocated, such a scheme might encourage "adverse selection". If the permit allocation were based upon historical emissions (or some variant), those firms that would be most likely to volunteer would be precisely those firms that have since undertaken abatement even in the absence of the programme.

The case of the SO_2 Allowance Program in United States is instructive. Between 1996 and 1999 the percentage of emissions that were attributable to "opt-ins" was between 12% and 13%.[1] However, Montero (1999) found that this "substitution" provision of the program tended to be taken up by the power plants which, by doing so, were grandfathered emission permits far in excess of what would have been their "Business-as-Usual" emissions. These plants had already – for economic reasons – reduced their emissions significantly between the base year used for permits allocations (1988) and the start of the program (1993).

Figure 13.1 illustrates the impacts of including a voluntary "opt-in" possibility in a tradable permits program, and the problem related to "adverse selection" among the volunteers.[2] In the figure, which is taken from Montero (1999), it is assumed that – due to imperfect information or political constraints – the abatement effort at the outset is set at q_1, where marginal (environmental) benefits from further abatement are higher that the marginal abatement costs.[3] Introducing the "opt-in" possibility has two separate impacts:

- A number of firms with "Business-as-Usual" emissions lower than the corresponding number of permits they would achieve chose to "volunteer" to participate – while firms that had increased their emissions since the base year would tend not to participate. This is the adverse selection problem – that reduces the environmental effectiveness of the scheme all in all, causing the abatement effort to decrease by an amount equal to the "excess allocations" (EA), from q_1 to q_2.

Figure 13.1. **Costs and benefits from voluntary compliance in a tradable permits system**



Source: Based on Montero (1999).

- Some firms will also "opt-in" because they have low abatement costs. This will shift the marginal abatement curve down.

Whereas it is given that the environmental effectiveness of the trading scheme as a whole decreases with the "opt-in" possibility, it is unclear whether total "welfare" decreases or increases. That depends – in this simplified context – on the relative size of the light and dark shaded areas in the figure, which in turn depends on, for example, the slope of the marginal costs and benefits curves, on the number of "excess allowances" and on how much the marginal cost curve shifts downwards. In his econometric study of the opt-in provision, Montero (1999) found that the net welfare effect was likely to have been negative. He also found that an increase of one standard deviation in the firm's allocation of permits relative to actual emissions increased the probability of "volunteering" from 32% to 84%.

Moreover, McLean (1997) estimated that the opt-in provision was responsible for a large share of total administrative costs of the programme:

> "… phasing in the participation of sources can complicate administration and undermine achievement of emission reduction goals and has been perhaps the most serious flaw of the SO_2 allowance program. Two types of problems can occur: *a)* with interconnected electric utility grids, participating sources can shift electrical load to nonparticipating sources whose emissions could increase and undermine the emission reduction

goal, and *b)* if sources in a particular region are allowed to voluntarily participate while others in the same region can chose not to participate, there is a risk of allowances being earned by the voluntary participants and used by other participants in lieu of reducing emissions, while the nonvolunteering sources increase their emissions and cause a net increase in emissions.

Administrative mechanisms to compensate for these problems can be complex and are of limited effectiveness in ensuring the environmental integrity of the program. The 'substitution' and 'reduced utilization' provisions employed in the SO_2 allowance program have been litigated and revised, and have become the most complicated administrative parts of the program. For example, complex allocation formulas had to be developed for substitution units (those Phase II units that volunteered to participate in Phase I) to prevent creation of large numbers of excess allowances. Further, in determining compliance of the Phase I units, it is necessary to review significant amounts of information on most of the 2000 Phase II units (to ensure that load shifting does not undermine intended emissions reductions). Approximately 75 per cent of the cost of developing and implementing the permitting provisions of Title IV and at least one third of the cost of developing and operating the allowance tracking system, or about $6.6 million, can be attributed to the complexity of Phase I. In retrospect, all affected sources should have been included from the outset in Phase I with emissions limitations tightened in Phase II to accomplish the goals of the program."

13.2. Emission trading as elements of voluntary approaches

Rather than voluntary adherence being elements of tradable permit programmes, in some cases emission trading may – as mentioned in Chapter 8 – be the vehicle through which firms meet their commitments in voluntary approaches. These would, of course, only be relevant for approaches which are negotiated at the industry or sector level. Moreover, in most cases the trading (if it can even be labelled as such) is implicit.

For instance, in the Australian Greenhouse Challenge, aggregate agreements can be struck between the Australian Government and an industry association, on behalf of its members. The agreement describes the actions to be taken and the emission forecasts for the member companies [*c.f.* AGO (1999)]. These actions and forecasts are the outcome of negotiations between these companies. To a great extent, therefore, the agreement can be considered as a springboard towards a voluntary tradable permit system, with industry serving as a "bubble" and the firms negotiating "off-sets" internally.

In the Australian case, it does not appear that any of the agreements resulted in formal trading schemes. However, under New Zealand's "negotiated greenhouse agreements" (NGA's) the government has explicitly allowed for the use of "trading" mechanisms within collective agreements. Firms are encouraged to consider "intra-signatory trading, bubbles, and offsets" between those signatories which are under-complying and those which are over-complying with the terms of the agreement.[4]

In other cases industry itself has initiated discussions concerning the introduction of formal trading as a means to reduce negotiating/bargaining costs which can plague industry-level voluntary agreements. This is for example the case concerning the agreement on SO_2 and NO_x emissions reductions by the power generation industry in the Netherlands. SEP had, according to Brand (2000), for a long time sought to have SO_2 emissions in the sector considered as one "bubble" – instead of each plant having to undertake abatement efforts unilaterally, and this was in the end agreed to in the covenant.

13.3. Accounting for voluntary approaches in permit allocations and baseline estimation

An important additional point relates to the treatment of "voluntary" commitments in the determination of permit allocations. There have been extensive discussions in different programs about the extent to which reductions achieved through voluntary approaches should be included in the allocation of permits or in the evaluation of the baseline. To a certain extent, this relates to the ambiguous legal status of different types of voluntary approaches. There is a significant difference between the case of firms that volunteer to reduce emissions through a negotiated agreement under threat of a regulatory backstop, and firms that co-operate amongst themselves without the government playing an active role.

In the proposed Swiss programme for the reduction of CO_2 emissions, a large number of firms have negotiated commitments with the government to reduce their emissions. It is envisioned that permits will be issued to firms on the basis of these commitments by 2010, with a pilot trading programme envisioned for 2005-2007. These permits will be freely tradable between firms.[5]

In the latter case the inclusion of voluntary reductions in the calculation of the permit allocation or the baseline may be controversial. One criticism of "pure" grandfathering has been that it is biased against firms that have been "early movers", investing in abatement above and beyond regulatory requirements prior to the year (or years) which are used as the basis for the allocation of permits. This is obviated by the use of modified grandfathering,

such as the allocation on the basis of the maximum level of emissions that could have been emitted by firms, while still being in compliance.

For instance, in the CEC (2001) it is stated that "the target set under the [negotiated] environmental agreements can serve as a useful basis for the allocation of allowances by Member States". This would, however, be politically difficult to achieve if the scope of the permit trading scheme is broader than the scope of the pre-existing agreement since firms which were not party to the agreement would benefit. More generally, this raises the issue of "moral hazard", making it exceedingly difficult for governments to negotiate agreements with firms in future due to the possibility of this affecting future permit allocations.

These ambiguities are even more important in credit-and-baseline schemes, where credit creation is affected by the choice of the baseline. In the case where voluntary commitments *are not* considered part of the baseline, the firm will create more credits than in the case where voluntary commitments *are* considered part of the baseline. In some cases, the distinction may result in a switch from the firm being a net seller to become net buyer of permits.

In the Canadian Pilot Emission Reduction Trading Program, Trading Rule 2.4.3 states "an emission reduction is surplus if it is not otherwise required of a source by current regulations or other obligations (*e.g.* a voluntary commitment)". The precise meaning of a "voluntary commitment" was to be elaborated by a special Task Team. In their deliberations it was proposed that one required element for a "voluntary commitment" was that it included a "negotiated agreement between an organisation and the government and/or ENGO's such as a Memorandum of Understanding" [see Humphries (2000)].

13.4. Conclusions

The benefits of combining tradable permit systems with voluntary approaches depend crucially upon what element of the regime is voluntary. Including "voluntary" emission reductions in the permit allocation method in a grandfathered cap-and-trade system would penalise "early movers", hence such a scheme has few merits. Including voluntary reductions in the baseline of a baseline-and-credit scheme would have even more significant consequences in terms of incentives for discouraging future abatement efforts by firms.

Effectively, in both cases the regulatory authority would have decided "ex post" to convert a voluntary scheme into a mandatory scheme. In one case this is reflected in initial permit allocations and in the other cases it is reflected in the possibilities for credit creation. This may increase the economic efficiency of the program, but is better understood as a reflection of the inadequacies of voluntary approaches than as a case for their use in combination with tradable permit regimes.

The use of tradable permit schemes by firms within negotiated agreements is surprisingly rare. Considering that many such agreements involve significant bargaining costs which would be avoided by a tradable permit system, the potential benefits of adding a trading mechanism "on top of" a voluntary approach could be important. However, the trading scheme would depend upon tight monitoring and enforcement, attributes that are rare in most voluntary agreements. A firm would not want to buy a permit from a competitor unless it could be certain that it represented a real property right. However, when satisfactory monitoring and enforcement are present, a strong case could be made for the government serving as an "honest broker" in order to help firms set up credible trading schemes.

Voluntary adherence to tradable permit systems potentially has a more important role to play. While an entirely voluntary scheme is unlikely to result in many adherents for the reasons discussed above, using voluntary provisions to expand the coverage of the trading scheme *may* increase economic efficiency by bringing in firms with very different abatement costs. However, the danger of adverse selection must be confronted. This can only be done by ensuring that the permit allocation mechanism does not grant "excess permits" to firms that can then volunteer for the programme. For a given number of permits being issued to the "mandatory" firms, the inclusion of "voluntary" firms with "excess permits" would lower the market price of permits and reduce the environmental effectiveness of the *whole* scheme.

Notes

1. For more details on the SO_2 Allowance Program, see *www.epa.gov/airmarkets*.
2. Enviros (2003) indicates that adverse selection can also have been a problem among direct participants in the UK Emission Trading Scheme.
3. This assumption is not due to the "opt-in" possibility, but it affects the relative size of the costs and benefits of this option.
4. Intervention by Murray Ward (Department of the Prime Minister and Cabinet, New Zealand) at the IEA/EPRI/IETA workshop "Greenhouse Gas Emissions Trading: Domestic and International Issues", 17-18 September 2002.
5. Intervention by Ms. Andrea Burkhardt (Swiss Agency for the Environment, Forests and Landscape) at the IEA/EPRI/IETA workshop "Greenhouse Gas Emissions Trading: Domestic and International Issues", 17-18 September 2002.

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