GREENHOUSE GAS EMISSIONS TRADING IN EUROPE

CONDITIONS FOR ENVIRONMENTAL CREDIBILITY AND ECONOMIC EFFICIENCY

REPORT OF THE CEPS TASK FORCE
ON
EMISSIONS TRADING AND THE NEW EU CLIMATE CHANGE POLICY

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This report is based on discussions in the CEPS Task Force on Emissions Trading and the New EU Climate Change Policy, which ran from October 2001 until March 2002. Participants in this CEPS Task Force included senior executives from a broad range of industry – including energy production and supply companies, energy-intensive industries and service companies – and representatives from business associations and non-governmental environmental organisations. A full list of members and invited guests and speakers appears in Annex 4.

The members of the Task Force engaged in extensive debates in the course of several meetings and submitted comments on earlier drafts of this report. Its contents contain the general tone and direction of the discussion, but its recommendations do not necessarily reflect a full common position reached among all members of the Task Force, nor do they necessarily represent the views of the institutions to which the members belong.

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PREFACE

Emissions trading has been shunned for a long time by policy-makers in the European Union as an instrument of environmental policy. It was the Kyoto Protocol that put emissions trading firmly on the EU agenda for the first time. Ever since, discussions on implementing an EU-wide scheme have advanced at a rapid pace and, in the specific case of greenhouse gas emissions trading, the EU and some of its member states have gradually become a major reference point for this instrument.

The CEPS Task Force on Emissions Trading and the New EU Climate Change Policy focused on the specific case of greenhouse gas emissions trading in the European Union, notably in relation to the Commission's proposed Directive to establish an EU-wide emissions-trading framework by 2005. Members, who came from a very broad range of backgrounds, including industry – energy production and supply companies, major energy-intensive industries and service companies – business associations, environmental non-governmental organisations and other stakeholders, engaged in a sustained debate on how an EU scheme could fit into overall EU climate policy.

The Task Force met five times from October 2001 to March 2002. We invited representatives from the European Commission, national governments, business associations, consultancies and companies to present their activities, viewpoints and concerns. The presentations were followed by lively debates among the members whose names are listed in Annex 4. We soon realised that despite our highly divergent views, there was significant common ground. At our final meeting, we focused on this common ground, which is presented in the Key Messages and Recommendations and the Executive Summary at the beginning of this report.

I want to thank the members of the Task Force for their active and positive contributions throughout the meetings and editing of the final report. Although each member endorses the general content of the report, one should not conclude that all members subscribe to every sentence of the text.

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EXECUTIVE SUMMARY

The European Union (EU) has given substance to its commitment to reduce greenhouse gas (GHG) emissions not only by ratifying the Kyoto Protocol, but also by signalling its intention to adopt a package of policy measures to cut GHG emissions in all sectors (2.1.)[1] of the economy. The central element of the EU strategy to meet its Kyoto targets is a proposal for an EU-wide emissions-trading scheme establishing an emissions market across the European Economic Area (EEA) (2.1.1).

1. The value of emissions trading: Efficient markets and effective targets

Emissions trading is an innovative instrument that has been tried with some success both within and outside the EU. The most frequently cited precedent is the SO_2 trading scheme in the United States. Other schemes for the trading of GHG allowances have been initiated at national level – Denmark and the United Kingdom – and company level – e.g. by BP, Shell and DuPont. The proposed EU-wide scheme, however, is unprecedented because it is the first large-scale cross-border application of emissions trading.

Emissions trading does not in itself reduce emissions; instead it provides a mechanism by which emitters – factory operators, oil refineries, etc. – can identify the most cost-effective ways to reduce their emissions and thus factor carbon-reduction strategies into day-to-day business decisions (an often-overlooked advantage). Its *economic* advantage is two-fold: the market price of carbon is equal to the lowest marginal abatement cost amongst all controlled sources, thereby ensuring that the environmental goal is met at least cost. At the same time, the carbon price it generates creates long-term predictability for business, a crucial factor in efficient investment decisions. Thus, emissions trading goes beyond existing environmental policy – mainly seen as an inescapable overhead – by establishing a long-term and predictable price signal upon which to base investment decisions.

In order to create a market and initiate trading, there is a need to create scarcity, which in the case of GHG emissions must be done by a government decision to set targets. In cap-and-trade schemes, these targets usually are absolute (e.g. a fixed quantity of CO_2 emissions per year), whereas in baseline-and-credit schemes targets can either be absolute or based on energy efficiency improvements (4.1). This is among the most controversial elements of any emissions-trading scheme.

2. Crucial design options

The advantages of emissions trading will only materialise both if the emissions market is efficient and liquid and if the scheme leads to credible reductions in GHG emissions (3). Governments and market participants alike are interested in a market that provides both a predictable business environment and an agreed environmental outcome. In fact, both are mutually dependent (3.1.3). A predictable business outcome is necessary for a carbon price (short and long-term), which in turn will enable market participants to make efficient choices in the market (3.1.3). To secure these benefits, it is imperative that the market be designed properly from the outset.

[1] The numbers in parentheses, e.g. (4.1), refer to the section in the main report where the topic in question is analysed.

a) The architecture of the market

Allowances to emit GHGs are intangible assets that behave like property rights. Their value depends initially on the target and later on consistent and fraud-proof monitoring and verification procedures. Efficient markets require liquidity, which in return calls for a broad range of participants. Buyers and sellers are obviously essential, but no less important are the market-makers such as brokers, speculators or *arbitrageurs*. Emissions markets must not be restricted to just the "polluters" but should include the participants that are a feature of any normal market. Market-share requirements will reduce liquidity and thus the efficiency of the market. Market restrictions ultimately can annul the economic benefits of emissions trading (3.1.2) and market signals.

b) Cap-and-trade or baseline-and-credit?

The Commission's proposal chooses a cap-and-trade scheme. Such schemes typically cap company emissions by allocating absolute tonnes of allowances for pollutants. A company must ensure that it stays below its assigned cap, either by cutting emissions or by buying additional permits, whichever is cheaper. A company that reduces its emissions by more than the allocated cap can sell surplus allowances to other companies, at an agreed price. The alternative model is the "credit-based" scheme. Here, credits are created (i.e. "earned") when a company reduces its emissions below the level required by existing source-specific limits set by regulation or a negotiated agreement. Importantly, targets can be expressed in absolute terms (i.e. as absolute caps) or relative terms (i.e. as energy-efficiency or per unit of production targets).

Although there is no preference in economic theory decisively favouring either system, experience with credit schemes in the US show that cap-and-trade schemes tend to be simpler to manage and provide higher liquidity in the market, and hence higher efficiency (4.1). Credit-based schemes may be seen as a bridge to the point where industry will accept absolute caps under a cap-and-trade system. The UK scheme has mixed cap-and-trade and baseline-and-credit schemes, and a similar approach is being considered in France and the Netherlands (4.1).

c) Target setting and allocation: Two sides of the same coin

The most controversial design option concerns the method used to set targets and create scarcity. Whatever method is used, allocation leads to considerable distribution effects on the controlled sources, consumers and governments, i.e. there are winners and losers (4.2). The allocation methods being discussed in the EU are auctioning, grandfathering, benchmarking and updating (4.2). Each method has its advantages and disadvantages if evaluated against the criteria of economic efficiency, environmental effectiveness, equity (i.e. distribution effects) and political acceptability. Nevertheless, the choice between grandfathering or auctioning does not significantly affect the efficiency of the emissions-trading market in the medium and long-term.

None of these methods is perfect. In the end, allocation will be a political decision and a political balancing act.

- **Auctioning**, which requires each market participant to buy allowances, is potentially the most economically efficient method and is also theoretically the most environmentally effective (see 4.1 and Appendix 2). By and large, auctioning provides the strongest market signals to producers and consumers to reduce pollution, depending on other factors such as existing distortions in the allowance market. The main shortcomings of auctioning are that it diverts funds necessary for investing in emissions reductions and energy efficiency and introduces major uncertainty into the cost of staying in business. Consequently, it would be likely to have a major negative impact on the competitiveness of European industry, especially as long as EU industries' competitors (e.g. in the US and developing countries) do not face an equivalent target or any target at all (4.2.1). Implementation of the standard

remedy to address distribution impacts in the EU, i.e. the recycling of revenues, is problematic because the recycling of tax revenues is a competence that rests with the member states. Any attempt in the Directive to guide the recycling of funds might therefore require unanimous agreement in the Council of Ministers and could reduce the European Parliament's right of co-decision to a role of simple consultation (4.2.4). Auctioning might simply become a national option for member states seeking opportunities to further raise tax revenues.

- **Grandfathering**, whereby each market participant receives allowances for free based on its previous emissions, protects competitiveness, but it is potentially less efficient and effective than auctioning. Grandfathering might be considered to limit revenues for public finances if, as might occur, emissions trading replaced environmental taxation (4.2.2). Grandfathering is most credible when it takes account of early emissions reductions and current efficiency performance.

  Benchmarking is a specific form of grandfathering in which allowances are granted on the basis of a plant's technologies or techniques and their comparison to other plants. Benchmarking is theoretically the most equitable approach to allocation, since it is based on the actual state of technology applied, taking into account past investments. The main disadvantage is that benchmarking needs considerable current and historical data that are not always available across the EU, let alone in the candidate countries. Benchmarking depends on a commonly agreed specific point in time, for which data are available on a comparable basis. Whether benchmarking will become a widely used option in the future depends on the future availability of data (4.2.2).

- The **updating** approach bases allocations on a plant's existing activities but takes account of future needs, i.e. expansion. This is in contrast to grandfathering, where firms receive allowances irrespective of future activities. In reality, updating therefore comes very close to a relative target. The difference is that the overall cap in the emissions-trading scheme remains intact, thereby ensuring environmental effectiveness. The principal advantage is that it alleviates companies' fears, at least to some extent, that they will be prevented from expanding and that those companies that reduce production (for whatever reason) will benefit disproportionately. The most important disadvantage relates to its potential effects on economic efficiency. Allowances are allocated in proportion to output and may constitute an output subsidy; the more a company has produced, the more allowances, i.e. assets, it would receive. As with relative targets, if the amount of pollution is higher than it would be without the output subsidy, overall compliance costs would be higher than otherwise. Should updating be chosen as the method of allocation, the question arises of whether to create transparent and non-discriminatory methodologies of applying it in practice across member states or to leave this to member state discretion, subject to single market rules. There is a risk that different member states will apply data differently. Whether such methodologies can be developed is unclear at this date (4.2.3).

The other factor that determines the constraint that companies will face is the target (4.3). The proposed EU Directive suggests that target-setting should be undertaken by member states according to a number of very general variables that give a high degree of discretion to member states. There are fears that some member states might unduly favour their companies by setting overly generous targets, despite rules for notification and the EU's competition laws (3.2.2; 4.3.2). As a result there have been calls for "objective" target-setting using, for example, standard performance rate (SPR) indicators at EU level. Such an approach would undoubtedly both reduce the risk of distortions in the internal market and favour those that have done the most in the past to control their GHG emissions. Nevertheless, it is uncertain whether industry will be able to provide sufficient data to allow all governments to benchmark against an SPR (4.3.2).

Irrespective of which approach is taken in the end, target-setting will always involve an element of political bargaining. Even if the target is finally set on a relatively "objective" basis using SPR, additional flexibility is still provided by choices to be made relating to i) the baseline year, ii) the gases included and iii) sector coverage. Other elements that could affect the stringency of the target are the use of relative targets, the inclusion of the project mechanisms, banking provisions and fixed penalty rates (4.3.3).

d) Direct or indirect emissions?

Electricity generation can be included in an emissions-trading scheme either directly, where emissions from electricity generation are reported at the place of generation, or indirectly, where the emissions are recorded at the point of consumption. The proposed EU Directive has chosen the former whereas the UK has opted for the latter. Both systems have advantages and disadvantages (4.1.1). Indirect apportionment tends to be more complicated and undermines the consistency of the scheme. (Why should electricity be included indirectly and not, for instance, cement and glass companies, whose emissions could also be reported with the end user, e.g. the house owner?) Another drawback of indirect emissions is that the end-user is not responsible for the choice of fuel. The important thing is that the EU chooses a single system. The coexistence of the EU-wide system (as currently proposed) and the UK system could cause emissions to be counted twice or not at all.

e) Which participants?

The trading scheme's design must balance the priorities of simplicity and a sufficiently large market to provide the market with liquidity (4.1.2).

- **Small- and medium-sized enterprises (SMEs)** sometimes argue that they lack the capacity to deal with a complicated instrument such as emissions trading. This may be true in general but an SME's capacity and obligation should depend not only on its size but also on the characteristics of the emissions source, i.e. whether the SME operates a major on-site power plant (4.1.2).
- **Transport and the domestic/tertiary sectors** are not explicitly covered by the proposed EU Directive or by most likely national schemes. This is due partly to the complexity and potentially high transaction costs and partly to political sensitivity towards price increases in these sectors and inelastic demand. Only Norway has considered partially including transport and households (via heating fuel and electricity) in its trading scheme (4.1.2 and Box 4.1). The EU scheme could be kept simple initially, and extended later, but until then the non-trading sectors must bear an equivalent share of the burden of reducing emissions.
- **Combined heat and power (CHP)** is covered by the proposed Directive, but competing fuels (e.g. gas in condensation boilers) are not. As a result, a technology with a generally accepted lower environmental impact could lose market share. This could and should be rectified, for example, by exempting the proportion of fuel used in CHP plants for the heating market from the trading scheme (4.1.2).

f) The project mechanisms

Excluding the project mechanisms foreseen under the Kyoto Protocol (Joint Implementation, or JI, and the Clean Development Mechanism, or CDM) could lead to higher allowance prices than would otherwise be the case. The Commission justified their exclusion because of "outstanding issues regarding their environmental integrity" (especially the use of carbon sinks as CDM projects) but agrees that their eventual inclusion in some form is desirable.

The EU could include the project mechanisms either by applying the rules as agreed in the UNFCCC negotiations or by specifying separate rules for the EU-wide trading scheme, in

essence creating a separate "EU CDM" and "EU JI". The latter would imply different rules for trading internationally and within the EU. Should the EU decide that international rules are not sufficiently robust to allow for a credible emissions market to evolve, it would be able to make the case for additional requirements. Such requirements might feature, among others, the exclusion of credits arising from sinks projects from the EU emissions-trading scheme, given the uncertainty that still exists regarding their environmental benefits and permanence, and with the UNFCCC IPCC still to report on them (4.1.3).

The international rules on CDM are likely to become operational by the end of 2002. The EU would be free to set legitimate additional eligibility requirements for the project mechanisms. Should the international regime not materialise, moreover, the EU's scheme would represent a significant market for CDM credits and would reassure companies that projects are a safe investment (4.1.3).

The outlook for JI is expected to remain uncertain for the medium term. The EU could therefore propose an "early "EU JI", with restrictions if needed, for example limiting the mechanism to EEA countries and the candidate states of Central and Eastern Europe, until firm rules were agreed internationally and the international regime established. Companies would be free to choose between operating on the basis of firm rules of the "early EU JI" or the prospective rules of JI under the international regime, to come at a later stage. If extended beyond the accession states, for example to Russia, "early EU JI" could have the additional advantage of providing a potential incentive to Russia to ratify the Kyoto Protocol (4.1.3). Such an early EU JI would naturally have a set of EU-defined rules, which might differ from those of the UNFCCC for JI.

It should be noted that the EU's application of additional rules for allowing CDM and/or JI into the emissions-trading system could have implications for the effective working of these mechanisms, and possibly for future UNFCCC negotiations. Accordingly, such a step would need to be considered with care and would require clear justification. It would of course not affect the use of these mechanisms by EU member states according to the rules of the UNFCCC.

g) Gases

The Commission has limited – for the present – the proposed EU scheme to CO_2, because it considers that the other GHGs are difficult to monitor with comparable accuracy. In contrast, the UK and the proposed Norwegian scheme cover all six GHGs, and the internal BP scheme covers CO_2 and CH_4. In France, the existence of an N_2O tax means that that gas is measured. The real issue at EU level, therefore, is a lack of capacity in some member states. This could be addressed by amending the proposed Directive so that member states could include all six gases once they can show that measuring is assured, although different gas coverage in different member states carries the risk of distortions to competition. The European Commission should consider capacity-building in member states and accession countries with shortcomings in monitoring.

h) Banking

Banking, which allows participants to store unused allowances for future use, can lead to earlier reductions than would have occurred otherwise. Banking is also an effective tool to smooth the investment cycle for GHG-reduction measures and is therefore likely to reduce compliance costs. Allowing banking into the Kyoto commitment periods will tend to make governments less generous towards companies when allocating permits in the pre-Kyoto commitment period (4.1.5).

i) Penalties

Penalties can have two distinct functions. First, as a tool for enforcing compliance, the penalty must be high enough to deter non-compliance. Second, penalty rates can act as a safety valve against the risk of too high allowance prices. In this case the penalty needs to be fixed at a certain, relatively low level (as for example in the Danish case). While in the long run the integrity of the emissions-trading regime will only be maintained if compliance is ensured, a fixed penalty rate at a limited level, especially for the transition period towards an unknown instrument, can become an efficient tool to prevent emissions trading from damaging EU competitiveness. There is a danger that a price cap could reduce liquidity, however, because if it is set too low, the price cap might act as a disincentive for firms to trade (4.1.6).

3. How to get from here to there: A blueprint for translating national policies into an EU-wide emissions-trading scheme

Emissions trading, as proposed in the EU Directive is largely incompatible with existing environmental policies such as regulation, taxation and voluntary or negotiated agreements. For this reason, the introduction of emissions trading represents a fundamental systems change in environmental governance (4.4.1). As an inevitable consequence, the proposed Directive imposes very different costs on member states, sectors and market participants. Those member states that have done the most to meet their GHG emission-reduction targets under the Kyoto Protocol (the "early movers") risk having the highest adaptation costs because they would be forced to replace their existing climate policies with the new policy (3.2; 4.4). To address this risk, it might become necessary to allow for a transition period in which existing national policies are translated into an EU-wide emissions-trading scheme.

a) Participation in emissions trading must become mandatory according to a definite timetable.

To address the issue of different adaptation costs, it has been suggested that participation should be voluntary. It is true that a voluntary scheme, in which member states or companies could decide whether or not to accept a target and thereby become eligible for trading, would address the issues of different adaptation costs. It is difficult to see such how a voluntary scheme might work in practice, however. It takes supply *and* demand to drive a market. Assuming that the trading scheme were voluntary, those countries with low abatement costs would have little incentive to join a system with higher abatement costs, since net buyers domestically would have to pay a higher price than otherwise. Similarly, if decisions on whether to participate were left to sectors or firms, there would be little interest among the likely buyers. In such a seller's market, the economic advantages of emissions trading would be annulled (4.4.2). Nevertheless, there is case for very restricted and temporary opt-outs to allow for the "translation" of existing national policies into an EU emissions-trading framework. During this translation period existing national policies could be translated into an EU-wide emissions-trading scheme. Such a translation period, thus defined narrowly in comparison to the general concept of a "transition" period, has the advantage that it more directly addresses the issue of maintaining the momentum of existing national policies and eases the costs of adaptation, which will vary greatly across the EU. Still, there remains the risk that a transition period might prolong the period in which little action is taken, leading to higher emissions and raising the cost of abatement in the future.

b) A transition or translation period could see temporary opt-outs for sectors subject to equivalent and credible national carbon policies.

It is essential to handle opt-outs in a restricted way, i.e. to allow opt-outs only for those companies and sectors that can demonstrate comparable efforts to reduce GHG emissions.

Otherwise there is a risk of free-riding. In addition, those years where opt-outs exist would most likely be high-emissions years, making the later target more difficult and costly to achieve.

Opt-outs theoretically could be done by introducing enabling clauses at three possible levels: i) EU member state, ii) sector, and iii) company. All three options have serious negative effects that need to be weighed against the costs. Enabling clauses at member state level would most likely lead to different national carbon prices and therefore to disconnected national carbon markets in the European Union. Enabling clauses at sector or company level risk leading to distortions in the EU Internal Market and would need to be carefully aligned with EC Single Market rules and competition law (3.2; 4.4.3). Therefore, opt-outs should be conditional on demonstrating equivalent emissions reductions to satisfy Single Market constraints.

c) The length of the transition or translation period can be shortened by incentives for companies or sectors to join as early as possible.

The economic advantages of emissions trading constitute an incentive for companies to join an EU-wide scheme early on, especially if a clear date is set from which participation in the scheme becomes mandatory. There are a number of potential incentives that could induce sectors to join early on and thereby reduce the transition or translation period. These include decisions on the initial method of allocation, the coverage of greenhouse gases, the baseline year, sector coverage, price caps on allowances, banking into the Kyoto Protocol's first commitment period (2008-12), relatively low initial targets and the use of relative targets (4). Still, the credibility of the scheme demands that any such initial flexibility must give way to a clearly defined, transparent and mandatory scheme during the first commitment period (4.4.4).

On the other hand, monitoring, verification and registries and data collection in general to inform the choice for allocation – irrespective of which method is chosen in the end – should be mandatory from the earliest stage (4.4.4). Single-market rules imply that installations exempted from trading would need to show they are delivering comparable reductions.

Key Messages and Recommendations

I. Key Messages

The CEPS Task Force proposes that discussion of how to implement EU greenhouse gas emissions trading should focus on the following key issues:

1. Emissions trading does not in itself reduce emissions. Its advantage is that it can achieve an environmental target at least cost, thereby freeing up resources for additional environmental or other policy goals. Another effect is that the resulting carbon price creates long-term predictability for business, which is a crucial element allowing efficient investment decisions in carbon-reduction technologies and techniques. Its environmental benefit is that it sets a firm target, e.g. a cap, which the participants need to reach. Thus, emissions trading combines a high degree of cost-effectiveness with maximum environmental certainty.
2. Emissions trading would have very considerable distribution effects on companies, consumers and governments, however. This is why its introduction would be so difficult. These distribution effects are particularly reflected in allocation and target-setting. As in all policies with distribution effects, there is no perfect solution. A political approach is required that strikes a reasonable balance between the different interests. Nevertheless, once allocation is implemented, markets will start to work and can deliver both economic and environmental objectives within the given framework.
3. Like any market, emissions markets need liquidity, transparency, confidence and stability to function efficiently. In the emissions market, the need for market efficiency is even more pronounced given that investment decisions to reduce carbon will rest on the quality of the

long-term carbon price generated by the emissions market. Predictability of the long-term carbon-price is best served by as few restrictions as possible. The market particularly needs broad participation, primarily of sellers and buyers but also by "traders", e.g. speculators, *arbitrageurs* and market-makers. These participants buy risk, allow for long-term planning, smooth market volatility, involve financial services and report prices.

4. A trading scheme based on on-going voluntary participation is not likely to work. Such a scheme would lead to a market with an imbalance between sellers and buyers, thereby restricting the liquidity and, more generally, the efficiency of the market. There might be a case for a clearly defined "translation" period, during which time existing national policies could be translated into an EU-wide emissions-trading scheme. This concept of a "translation" period, defined narrowly in contrast to the more general concept of "transition", has the advantage of more directly addressing the issue of maintaining the momentum of existing national policies and easing the costs of adaptation, which will vary greatly across the EU. A more general "transition" period might risk prolonging the period in which little action is undertaken, leading to high emissions and thereby making abatement more costly in the future. Irrespective of which concept will prevail ("transition" or "translation"), some elements of voluntarism in the temporary changeover phase would be a tool to keep the drive of existing policies and reduce costs of adaptation. Any decision to allow participation in the trading scheme to be voluntary initially would be helped if it were combined with incentives for companies or sectors to join as early as possible. Such incentives could concern the initial method of allocation, the coverage of greenhouse gases, the choice of baseline year, sector coverage, price caps on the cost of allowances, banking into the Kyoto Protocol's first commitment period (2008-2012) and the targets or the use of relative targets per unit of production.

II. Recommendations

The CEPS Task Force has agreed on the following conclusions:

Market architecture

1. Participation should balance practicality and simplicity, recognising the need to create a critical mass through a sufficiently large market (4.1.2).

   a) The size of the company should not be used as the only criterion to determine participation. The capacity of an SME to participate depends not only on the company's size, but also on the characteristics of the emissions source (e.g. a large on-site power plant) (4.1.2).

   b) At the EU level, there is no simple way to include the transport or tertiary sectors in a trading scheme. For practical reasons, therefore, these sectors have to be excluded, at least initially (4.1.2).

   c) The proposed Directive might lead to a reduction of market share of CHP in the heat market. This might be rectified, for example, by exempting from the threshold for trading the proportion of fuel used in CHP plants for the heating market (4.1.2).

2. Participation in the trading scheme should be open to as many market intermediaries as possible (3.1.3).

3. The group has no single view on the use of the project mechanisms. Some participants feel that the project mechanisms should be included in the proposed EU trading scheme as soon as possible. Others expressed serious reservations concerning their likely environmental integrity, and regard the scheme as a measure to achieve domestic emissions reductions. The EU should base its approach on the rules as agreed in the UNFCCC negotiations to

avoid fragmentation of the international trading regime. Should the EU legitimately feel that international rules are not sufficiently robust, however, it would still be able to add guidelines to safeguard market efficiency and environmental integrity (4.1.3). For instance, it may make sense to allow only credits arising from emission reductions, rather than sinks, to be consistent with the aims of the emissions-trading scheme.

a) Rules for the CDM should be based on international rules as agreed within the UNFCCC negotiations, which are likely to become operational by the end of 2002. The EU would be able to set additional eligibility requirements, if there is a legitimate case to be made, for example, to avoid deflation of allowances or to safeguard environmental integrity (4.1.3).

b) As for JI, where the outlook for international rules is less certain, the EU could initiate an "early EU JI", which would be in place until firm rules were agreed internationally and the international regime established. Companies would be free to choose between operating on the basis of firm rules of the "early EU JI" or the prospective rules of JI under the international regime, to come at a later stage. "Early EU JI" could include accession states and could also be extended to the countries of the former Soviet Union, thereby offering the additional advantage of providing a potential incentive to Russia to ratify the Kyoto Protocol (4.1.3). As with CDM, the EU may insist on additional rules to safeguard the environmental integrity of the system.

c) For both JI and CDM, such additional rules could have implications for the effective working of these mechanisms and possibly for future UNFCCC negotiations, so such a step would need to be considered with care and would need clear justification. It would of course not affect use of these mechanisms by EU member states according to the rules of the UNFCCC.

4. As soon as measuring and monitoring can be ensured, the proposed EU Directive should include non-CO_2 GHGs (4.1.4).

5. Member States should allow banking into the Kyoto Protocol's first commitment period (2008-12). This would ensure that governments are likely to be less generous to "their" companies when allocating permits in the pre-Kyoto commitment period. Banking is also an indispensable tool to smooth the investment cycle for GHG reduction measures and therefore is likely to reduce compliance costs (4.1.5).

6. The integrity of the emissions-trading regime will only be maintained if compliance is ensured. A fixed penalty rate at a relatively low level, especially for the transition period towards an unknown instrument, can become an efficient tool to prevent emissions trading from damaging EU competitiveness. It is essential to strike a fair balance between what would be needed to prevent the system from becoming a disincentive to trade and what is required to avoid hurting European business (4.1.6).

7. It is preferable to include emissions from electricity directly, i.e. at the point of production rather than consumption, because it is less complicated to implement, especially with an integrated EU network and cross-border trade. The important thing is that the EU must agree on a single approach to be consistently applied at EU and member-state level (4.1.1).

8. Restrictions on trading volumes should be avoided, because they are detrimental to economic efficiency and market confidence, without adding to environmental effectiveness (3.1).

Allocation

9. Allocation should aim to maximise fairness and minimise costs (4.2).

10. The initial allocation should take into the account the fact that some competitors of EU industries are not subject to the same constraint. Once the carbon constraint is more widely distributed, perhaps also extended to the United States, the allocation principle could be adapted more universally (4.2).

11. Allocation must not punish "early movers", i.e. those who have done most in the past. Thus, grandfathering based on historical baseline emissions should be adjusted to take account of relative performance (4.2.1).

12. Auctioning is favoured by those who have argued in favour of taxing energy products, as a way of giving price signals to consumers (4.2.2).

13. Auctioning (and partial auctioning) has economic efficiency and single market advantages and may attract governments seeking extra tax revenues, but it would introduce uncertainties into the cost of staying in business, as well as diverting funds needed to invest in efficiency improvements and reducing emissions (4.2.2).

14. Benchmarking should be considered as a suitable instrument for allocation to take account of relative performance, provided the necessary data are available (4.2.2).

15. Likewise, updating allowances can provide flexibility to firms and thereby alleviate fears that an absolute cap might impede growth (4.2.3).

16. The EU Directive should give a clear indication of how allocation will be undertaken after 2007 (e.g. in Annex III to the Directive), to avoid introducing regulatory uncertainty that would hinder the investment needed to achieve emissions reductions and increase energy efficiency. Only a long-term predictable carbon price – expressed in the forward curve – will trigger the necessary investments in carbon-reduction technologies and techniques (3.1; 4.2).

Target setting

17. The decision on the allocation method should not be seen in isolation from target-setting (4.3).

18. The many variables in target setting (e.g. environmental performance in the past, the market situation and forecasts, a company's economic condition, the choice of baseline year, the inclusion of non-CO_2 GHGs) can offer flexibility that can be used to ensure environmental effectiveness while moderating the impacts on competitiveness (4.3.2).

19. Relative targets (and therefore baseline-and-credit schemes), especially during a transition period, are seen by some as valuable, because they recognise the need for companies to respond to the growth of the economy (4.3.1).

20. Non-trading sectors, notably transport and the domestic sector, should be subject to comparable measures to ensure a wide and even contribution to efforts of meeting targets once caps are imposed on the trading sector (4.1.2).

Translating national policies into an EU emissions-trading scheme

21. Although a trading scheme based on voluntary participation does not appear to be a desirable option, there is still scope for temporarily opt-outs for sectors during a changeover period in which existing national policies will be translated into an EU-wide emissions-trading scheme. Such a changeover (or "translation") period should address the issue of maintaining the momentum of existing national policies and ease the costs of adaptation for those who have credible policies in place (4.4).

22. A precondition for permitting any voluntary participation in the scheme is the certainty that at a given date, the trading scheme will become mandatory (4.4.3).

23. In any such temporary voluntary phase, governments may wish to increase the acceptability of emissions trading by offering incentives for firms to join. Such incentives, which could be related to targets, gases, baseline years, price caps or banking provisions, must nevertheless be compatible with the rules of the internal market and EC competition law (4.4.4).

24. On the other hand, transparent monitoring, verification and registries, and more generally data collection to inform allocation, should be mandatory from the earliest stages (4.4.4), and will serve as the basis for demonstrating equivalent emissions reductions to satisfy single market constraints.

CHAPTER 1
INTRODUCTION

The ministerial conference in Marrakech (COP7) in November 2001, confirmed the political agreement struck in Bonn the previous July to salvage the 1997 Kyoto Protocol following the US withdrawal of its support for the treaty earlier that year. COP7 led to the adoption of a set of agreements, the Marrakech Accords, that lays the foundation for a legally binding international climate regime. The Marrakech Accords offer the prospect that enough countries might ratify the Kyoto Protocol to bring it into force.

Irrespective of whether or not the Kyoto Protocol enters into force, the European Union has reiterated its declared policy to assume a leadership role in international negotiations. To this end, it made a formal political commitment to implement the objectives of the Kyoto Protocol, unilaterally if necessary. It lived up to its promise to provide international leadership before and during the difficult negotiations of COP6 (Part II) in Bonn and during COP7. It was much to the credit of the EU that the international community reached agreement despite the withdrawal of the US. Likewise, the EU has begun to give substance to its political commitment domestically, first by ratifying the Kyoto Protocol on 31 May 2002, and second by introducing a package of measures designed to allow the 15 EU member states collectively to meet the agreed target of reducing their greenhouse gas (GHG) emissions to 8% below 1990 levels by 2010.[2]

This package includes measures in such areas as the promotion of combined heat and power (CHP) and electricity from renewable energy, new energy efficiency standards and policies to reduce the environmental impact of transport. The centrepiece of the EU policy on climate change, however, is a proposal for a Directive establishing an EU-wide emissions-trading scheme. If adopted by the Council of Ministers and the European Parliament, the European Commission's proposal will lead to the establishment of a trading scheme that will come into operation by 2005 and will cover some 45% of total CO_2 emissions in the EU.

Emissions trading is an innovative environmental instrument that has been tried with some success, but never on such a scale as is being proposed by the European Commission. The most frequently cited precedent is the US SO_2 trading scheme, the world's first large-scale application of a "cap-and-trade" system for addressing an environmental problem. Other schemes for the trading of GHGs have been initiated at national level in Denmark and the United Kingdom and at company level in such firms as BP, Shell and DuPont. Implementation of an EU-wide scheme – which would potentially include all the countries of the European Economic Area (EEA) as well as the new EU member states after enlargement – would be unprecedented, however, representing the first large-scale, cross-border application.

Emissions trading does not in itself reduce emissions; it merely provides a market-friendly mechanism by which the emitters have much latitude in selecting the most cost-effective ways to reduce their emissions. A consequent and often overlooked benefit of this scheme is that companies are given an incentive to factor carbon-reduction strategies into their day-to-day business decisions. The economic value of trading is that it equalises the marginal cost of abatement among all controlled sources and thereby ensures the meeting of the environmental goal at least cost. At the same time, the carbon price that is generated by an emissions-trading scheme creates long-term predictability for business, which is a crucial factor in making informed and efficient investment decisions. Thus, emissions trading goes beyond existing environmental policy – where it is mainly seen as an inescapable overhead – by establishing a long-term and predictable price signal upon which to base investment decisions. The environmental value is provided by the great certainty of emissions trading: a cap-and-trade

[2] The Kyoto Protocol controls six GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

system, such as is proposed by the European Commission, sets an overall limit on emissions but leaves open the question of which sources will be abated. It is this target that provides the environmental benefit of the scheme.

This report assesses the dynamics of the EU emissions-trading regime both for the EU and its member states and for the international climate regime. In particular, the report seeks to identify the conditions under which an EU-wide emissions-trading scheme can deliver both on its economic and environmental promises. Emissions trading only makes sense if both environmental and economic objectives are met in a cost-effective way. The focus – a novel one, we think – is the market place. The report asks how the market can contribute to achieving both environmental and economic objectives and, by extension, how governments can support the emerging emissions markets.

Chapter 2 presents a short overview of the climate debate both within the European Union and internationally and how this debate might affect the EU's emerging emissions markets.

Chapter 3 focuses on "the market": how it is emerging, its workings and its dynamics. It shows that – given proper rules – environmental effectiveness and economic efficiency can go hand-in-hand. The second part of Chapter 3 analyses how emissions trading will inevitably interact with the EU internal market and how this might influence the linkages between trading within the EU and in third countries.

Chapter 4 essentially takes a "regulator's view" in analysing the major design options that are currently proposed and under discussion and draws conclusions.

The report is preceded by an Executive Summary and Key Messages and Recommendations, which present the main findings of the report.

A couple of appendices provide further explanation of the main issues, one distinguishing the different types of emissions trading in operation and the other analysing the difference between auctioning versus grandfathering. There is also a glossary of terms and abbreviations often encountered in the field of climate change. Finally, Appendix 4 supplies a list of members of the Task Force and invited guests and speakers.

CHAPTER 2
EMISSIONS TRADING AND EU CLIMATE CHANGE POLICY

The European Union's self-declared policy has been to assume a leadership role in the international climate change debate. At the Göteborg European Council[3] in June 2001, the 15 EU member states made a collective political commitment to implement the Kyoto Protocol, unilaterally if necessary, despite the US rejection of the treaty in March 2001. This pledge was followed up by the European Commission in October 2001, with the launch of a climate change policy package comprising three main elements:

- A proposal for the EU's ratification of the Kyoto Protocol in 2002,
- A Communication outlining ten specific actions to reduce greenhouse gas emissions and
- A proposal for a Directive establishing an EU-wide emissions-trading scheme to begin in 2005.[4]

Of these proposals, ratification was completed when the EU and the 15 member states simultaneously deposited their instruments of ratification at the United Nations headquarters in New York on 31 May 2002. Other measures are in the process of being prepared by the European Commission or, in the case of the proposal for a Directive on EU-wide emissions trading, are pending adoption.

2.1 The EU policy package

EU climate change policy is based on the European Climate Change Programme (ECCP), a multi-stakeholder initiative established in 2000 to identify cost-effective ways for the EU to meet its Kyoto commitments.[5] In its Communication of October 2001, the Commission highlights 12 of the 40-odd measures to abate GHG emissions that were examined in the ECCP's final report, published in June 2001. These measures, for which legislation will be formally proposed over the next two years, include the development of renewable energy sources, improved energy performance of buildings, energy efficiency standards, energy demand management, the promotion of CHP and measures to support a modal shift in transport from road to rail and water. The Communication prioritises cost-effectiveness, identifying many measures that could be executed for less than €20 per tonne of CO_2 abated and some at a negative cost. The Communication also includes certain measures such as the promotion of CHP and the development of biofuels that are potentially more expensive than €20/tCO_2 abated but could be more economically beneficial in the long-term, particularly when other benefits such as reduced local pollution are factored in.

2.1.1 Emissions trading

The cornerstone of the European Union's strategy to meet its Kyoto targets is a proposal for an EU-wide emissions-trading scheme. The proposed Directive aims at establishing a framework for a cap-and-trade emissions market that would operate across the European Economic Area (EEA), comprising the EU and Norway, Iceland and Liechtenstein, from 2005 onwards. In its first stage the proposed trading scheme would only cover CO_2 emissions from large industrial and energy installations. Such installations number between 4,000 and 5,000 across the EU and

[3] The European Council, consisting of the heads of government and state and the European Commission President, meets four times a year to provide guidance on the day-to-day management of the EU and to take strategic decisions.

[4] European Commission (2001a, 2001b and 2001c), respectively.

[5] European Commission (2001d).

are projected to account for about 46% of total EU CO_2 emissions in 2010.[6] The scheme would cover, in particular, electricity and heat generation, cement production and pulp and paper production; these sectors alone represent some 40% of total EU CO_2 emissions. The chemicals sector is not covered, partly because it is responsible for less than 1% of total EU CO_2 emissions and partly because the high number of installations (approximately 34,000 plants) would complicate a scheme that aims at simplicity. Nevertheless, 60% of all emissions from the chemical sector are covered indirectly through the inclusion of power generation (Stronzik and Cames, 2002, p. 14). Additional sectors include other energy (e.g. refining, coke ovens), iron and steel, glass, ceramics and paper and board. In 2004, the Commission will consider an extension of the Directive to more sectors and non-CO_2 GHGs. The proposal is currently under discussion in the EU Council of Ministers and the European Parliament, both of which must adopt the text for it to enter into force.

Under the Commission's proposal, each affected installation will require a permit to emit GHGs. These permits build on the permitting procedures that exist under the existing Directive on integrated pollution prevention and control (IPPC). The permits themselves are not tradable, but they are matched by tradable allowances that are allocated by the member state: if a company emits in excess of its permits, it must either purchase additional allowances to match the additional emissions or pay a penalty. The penalty rate is either €100 per tonne of excess CO_2 emitted or twice the average market price of an allowance during a predetermined period, whichever is higher. Banking is allowed and member states are free to decide whether to allow banking into the first Commitment Period of the Kyoto Protocol (2008-12).

During the pilot phase of the proposed EU-wide trading scheme in 2005-07, allowances will be allocated for free (this is known as "grandfathering") by each member state according to a national allocation plan. The plan must be approved by the Commission to ensure compatibility with EU internal market and competition rules. For the 2008-12 period, when the trading scheme is due to become fully operational, the Commission intends to specify a harmonised method of allocation, but this harmonised method has yet to be decided upon.

Significantly, this scheme will be independent of the Kyoto Protocol's International Emissions Trading (IET) scheme but is intended to be compatible with it.[7] Initially, credits from the Kyoto Protocol project mechanisms will not be tradable in the scheme, although the European Commission is expected to announce an additional proposal for a Directive covering this aspect soon.

The European Commission has based its proposal on a cap-and-trade scheme, the standard model for many tradable permit schemes. Such a scheme sets absolute emissions ceilings (caps) below which companies covered by the scheme must remain. To stay below the ceiling, companies can either reduce emissions through abatement measures or buy extra allowances on the emissions market; unused allowances can likewise be sold on the emissions market. Cap-and-trade schemes are generally regarded as having a number of environmental and economic advantages. In particular, the cap on emissions provides a high level of certainty. This certainty combines environmental assurance with relatively high degrees of stability and predictability, which are crucial elements to allow companies make informed investment decisions. Furthermore, if properly designed, cap-and-trade schemes tend to be the least complex trading approach to controlling emissions, with lower transaction costs than other trading schemes. These advantages notwithstanding, industry is sometimes opposed to a cap-and-trade approach because of the potential negative effects of absolute caps, which are sometimes seen as a

[6] Equivalent to 38 % of the EU's total GHG emissions in 2010, (European Commission, 2001d).

[7] According to Article 17 of the Kyoto Protocol, IET permits the transfer of parts of AAUs (see Appendix 3) between Parties to the Kyoto Protocol, but these AAUs will not be tradable under the proposed EU-wide trading scheme.

potential brake on economic growth and competitiveness. Another fear relates to the concern that allocating allowances by auctioning (as opposed to grandfathering) might transfer assets from industry to governments, thereby making investment more difficult.

The alternative trading model to cap-and-trade is based on resources or credits, the so-called baseline-and-credit schemes. Such a trading scheme is comparable to the Kyoto project mechanisms known as Joint Implementation (JI) and the Clean Development Mechanism (CDM), in which credits are created, i.e. "earned". In a baseline-and-credit scheme, a source earns credits when it reduces its emissions below the level required by existing source-specific limits set by regulation or a negotiated agreement. Targets can be expressed in absolute terms (i.e. as absolute caps) or in specific terms (i.e. as energy-efficiency targets). In Europe, major industries have negotiated agreements based on relative targets and are therefore reluctant to accept absolute caps. For this reason, credit-based schemes might be seen as a bridge to the point where industry will accept absolute caps and move over to a cap-and-trade system; indeed, the UK schemes combine cap-and-trade with baseline-and-credit features. Similar ideas are being discussed in France. For a more detailed discussion, see Chapter 4, section 4.1 and Appendix 1.

2.2 The international agenda

The Marrakech Accords of November 2001 at the 7th Conference of the Parties (COP7) translated into legal language the political agreement struck in Bonn in July 2001, when Parties settled the remaining controversial issues, such as compliance, the rules of the mechanisms and the use of sinks to meet the Kyoto targets (UNFCCC, 2001; den Elzen and de Moor, 2001). From an operational point of view, perhaps the most relevant decision of COP7 was to appoint the Executive Board for the CDM, which is in charge of making the CDM operational as soon as possible. This could happen as early as the end of 2002.

To enter into force, the Kyoto Protocol must be ratified by at least 55 countries, including countries representing at least 55% of 1990 greenhouse gas emissions in industrialised countries. The first condition has already been met, but the second one has been made far more difficult due to the withdrawal of the United States, which alone accounted for 34.2% of 1990 industrialised country emissions. The ratification by the 15 EU member states and that of the Central and Eastern European states – all of which are expected to ratify – will account for only for 24.2% of 1990 emissions. Following the ratification by Japan (representing 8.1% of 1990 industrialised country emissions) in June 2002, it is Russia, with 26.6% of the relevant emissions, that holds the *de facto* casting vote on whether the Protocol will ever come into force.

Should the Kyoto Protocol not enter into force, the EU will have to live up to its pledge to implement the Kyoto Protocol commitments unilaterally. But even if the Kyoto Protocol does enter into force, the international climate regime is likely to be disconnected, characterised by the co-existence of different approaches rather than a coordinated global effort to tackle climate change. Of course, the original UNFCCC always foresaw action according to "common but differentiated responsibilities", but the Kyoto Protocol assumed at least that the industrialised countries would share roughly comparable goals, including a legally binding target. Instead, the US withdrawal from the entire Kyoto process means that industry in the US will not face such a stringent carbon constraint as that in the EU, if at all. It is also possible that some other industrialised countries, such as Australia and Canada, will also decline to ratify. EU climate change policy will have to take account of the fact that European industry's major competitors will face a different carbon constraint.

CHAPTER 3
EMISSIONS TRADING IN THE INTERNAL MARKET: BASIC REQUIREMENTS FOR A FUNCTIONING MARKET

To date, emissions trading in Europe has occurred from the bottom up, i.e. through the largely uncoordinated evolution of various national and company schemes. In the absence of an EU-wide framework for emissions trading, different countries have chosen different design options for their national schemes. The result is a heterogeneous mix of schemes, as described in Table 3.1.

The European Commission's proposal for an EU-wide emissions-trading Directive attempts to harmonise the principal elements of emissions trading in Europe to create an efficient market across the EEA. Theoretically such a market could also be created by linking different national schemes (see Haites and Mullins, 2001), although this would raise a number of issues related to the EU internal market. Regardless of whether the EU emissions market develops from the bottom up via the linking of separate national schemes, or top down via central coordination, it is likely to offer lessons for the international climate regime.

3.1 What are efficient emission markets?

The promise of emissions trading lies in economic efficiency. This implies both the abatement of GHG emissions at least cost and a long-term and predictable carbon price, which ensures efficient investment decisions to reduce GHG emissions. A precondition for this economic efficiency to materialise is the proper functioning of markets, i.e. the absence of distortions. The following section attempts to consider what are the basic criteria that are characteristic of well functioning markets.

3.1.1 How markets develop

Historically, markets have developed naturally and on an ad hoc basis, with at first no universal standards. In the early trade of grain, for example, markets evolved locally, were characterised by local prices and were informed by subjective analysis. As a result, these markets were highly volatile and it was impossible to manage risk or make secure investments. The development of transport led to bigger markets, which (since market participants no longer had to meet face to face) increasingly required objective standardisation to build trust and liquidity. This was facilitated by the development of non-traditional market participants, such as speculators who added sophistication to the market and, consequently, both confidence and expectations.

Permit markets are somewhat different because they do not evolve on an ad hoc basis but instead emerge as a result of a specific government objective. In the case of emissions trading, the government aims to restrict the right to emit GHGs. This artificially creates a new set of assets (emissions permits are "quasi property rights") and is necessarily accompanied by rules on how these assets can be traded. Once the policy goal is defined and the assets are established, the permit market should in principle work like any other market. In addition, a successful permit market leads to extra benefits, including signals to direct investment and finance the development and diffusion of new technologies (e.g. by forward selling), risk management and the minimisation of transaction costs.

Table 3.1 Main features of European emissions-trading schemes (adopted or under discussion)

	Allowance trading	Credit trading		Allocation		Sector coverage (sectors' % of emissions)	No. of Gases	Participation	
		Absolute	Relative	Auctioning	Grand-fathering			Mandatory	Voluntary
Danish power sector	✓					Power (40%)	1	✓	
UK Emissions Trading Group	Mixed				✓	Industry, tertiary	6		✓
French EpE proposal		✓	✓		✓	Industry, transport**	6		
Norway*	✓			✓ (partly)	✓	Industry (30%) households, transport**	6		✓
Sweden (under discussion)	✓			✓					
BP target & trade	✓				✓	-	2	✓	
Shell STEPS	✓				✓	-	1	✓	
EU proposal	✓				✓ (during pilot phase)	Large industrial sources (45%)	1	✓	
				(left open until after pilot phase)					

* Proposal adopted by Parliament on 18 June 2002, although additional legislation is required before the scheme can enter into force. This legislation will also depend on the outcome of the EU emissions trading scheme, which will also have an effect on Norway.

** Under consideration.

Source: Adapted from Egenhofer (2002).

3.1.2 Criteria for efficiency of emissions markets

The promise of economic efficiency (i.e. least-cost abatement or a long-term price signal) will only occur if the following basic requirements are met.

1. *A commodity with an inherent value.* Emissions rights are intangible assets[8] that depend initially on a cap on emissions and subsequently on consistent and fraud-proof monitoring and verification procedures. This implies that the commodity must be sheltered from the risk of devaluation as might occur, for example, by an inflow of allowances from a questionable source. In order to make the commodity tradable, it needs to be expressed in terms of a common currency or a set of convertible currencies. The most straightforward currency for an emissions-trading market would appear to be tonnes of CO_2 equivalent (tCO_2e).[9] Ideally, there should also be standardisation of the commodity, although efficient markets can cope with a lack of standardisation through price variations, e.g. according to vintage, origin, etc.

2. *Liquidity.* Efficient markets require liquidity, which in turn calls for a broad range of participants. The first essential participants are buyers and sellers, but no less important are the traders – the speculators, *arbitrageurs* and market-makers. The traders buy the risk, allow long-term planning, smooth market volatility and get other parts of the economy (e.g. financial services)[10] involved in the market. This implies that an emissions-trading market must not be restricted to just the "polluters" but should include all the other participants that are a feature of any normal market.

3. *Transparency.* Markets depend on independent information to allow market participants to make informed decisions of whether to buy or sell. In other markets, this information typically comes in aggregate form from brokers, specialised news agencies and newspapers. A high number of market participants will also contribute to price transparency.

4. *Confidence and stability.* Market participants require stability and dislike frequent rule changes. The US SO_2 trading scheme, which has a 30-year regulatory regime, is perhaps an extreme example of the kind of predictability that market participants prefer. There should also be clarity as soon as possible about the interactions between the emissions market and other markets, such as those for renewable energy certificates. Given that the international climate regime will emerge only gradually, however, some changes in rules triggered by international negotiations will be indispensable.

5. *Risk management.* In order to enable market participants to manage risk – a key function of markets – there is a need for a reliable forward curve, i.e. a mechanism that allows the trade of future allowances at a predetermined price. This allows market actors to assess future opportunities or liabilities of transactions, for example. A successful market allows predictability for investment and thereby provides the certainty that allows business with long-term rates of return to make the best investment decisions, for instance whether to invest in new equipment to reduce emissions or to buy extra allowances. Such information facilitates decision-making and is therefore good for business. Incidentally, this forward curve provides governments with a reliable estimate of future carbon prices and therefore

[8] They behave like property rights in a market.

[9] Tonnes of CO_2 equivalent (tCO_2e) is the unit used by the UNFCCC. It is possible, however, that this currency will be redefined in the future as definitions are revised. For instance, the IPCC's estimation of the global warming potential (GWP) of a GHG over 100 years depends on scientific evidence, and the GWP definitions could change over time as scientific understanding improves. Like monetary currencies, the relative values of convertible emissions trading currencies can change over time. If the rules are clear, markets can accommodate such changes.

[10] For an overview of the financial services industry in emissions trading, see Janssen (2002).

the ability to predict the costs of future GHG emissions reductions. It is important to note that there is tension between a predictable forward curve and a trading scheme that is based on "learning-by-doing", which in reality amounts to a kind of voluntary approach. Although business might prefer a system based on learning-by-doing for such an innovative policy tool, it contradicts the establishment of real trades and their associated benefits.

6. *Standardised operation.* In order to speed up operation and lower transaction costs, markets need a standardised method of operation, i.e. clear market rules. Market rules usually come in the form of a standard contract and standard clearing and settlement procedures. Reporting and verification standards, compiled in a protocol or manual, for instance, would also facilitate such standardisation.[11]

3.1.3 Efficient markets and environmental effectiveness

An efficient market depends on a long-term stable business environment. Without predictability, markets cannot function properly, so participants in the emissions market will demand a stable or at least a predictable environment. At the same time, governments, citizens and environmental NGOs will demand that environmental objectives are met. By and large, these two priorities, i.e. efficiency and environmental effectiveness, are compatible and are even mutually dependent. Even if emitters and environmental NGOs might hold different views on the severity of the targets, the market prefers credible targets, which not only increase liquidity but also reassures governments and society that the trading process will lead to credible reductions in GHG emissions. This is a vital precondition for stability and a protection against frequent regulatory changes. In the end, however, target-setting is the job of the political process.

As an example of this convergence of interests, all stakeholders share an interest in safeguards against the devaluation of the commodity, such as rules on the use of allowances from untrustworthy sources, and in price transparency, which is necessary to obtain information on abatement costs. There is also at least a partial common interest concerning price caps on penalties: high penalties can be seen as necessary to ensure environmental effectiveness, and a price cap – if set too low – can be seen as a danger to liquidity and a disincentive for firms to trade.

Similarly, the respective proponents of market efficiency and environmental effectiveness are both sceptical about voluntary or "learning-by-doing" approaches. Such approaches are limited in their ability to create properly functioning markets and therefore might deny the advantages of emissions markets outlined above. Likewise, there is broad convergence on the relative merits of baseline-and-credit and cap-and-trade systems. In a baseline-and-credit system, permits are allocated in principle *ex post*,[12] which means that trading cannot really begin until the end of the compliance period (apart from some forward or derivatives trading). The effect of this is to restrict the market to emitting companies, with an overall negative effect on liquidity and volatility. In a cap-and-trade system, by contrast, permits are allocated *ex ante*. This has the double advantage of promoting emissions trading immediately, since allowances become available early on and increasing liquidity through the participation of non-natural traders, such as brokers and *arbitrageurs.* By way of example, the early US credit-trading schemes created

[11] For examples of greenhouse gas measuring, reporting and verification protocols, see the EpE *Measuring and Reporting Protocol (*www.epe.asso.fr*)* and the World Business Council for Sustainable Development/World Resources Institute *Greenhouse Gas Protocol*, http://www.wbcsd.org, http://www.wri.org. The Norwegian scheme for an offshore CO_2 tax initially used a 13-page manual, which, through revisions based on practical experience, quickly became very accurate.

[12] Baseline and credit systems can work with *ex-ante* allocations, although this would require an adjustment at the end of the period based on existing emissions.

political uncertainty regarding target-setting and verifications, leading to various changes in the regulatory environment (Godard, 2000).

One difference in opinion that might divide the market-makers from governments, citizens and environmental NGOs lies in the desirability of including "non-polluters" such as speculators and other market intermediaries in the market. Some stakeholders object in principle to the profit of non-polluters from "licences to pollute". Notwithstanding this objection, market intermediaries are important not only for efficiency but also to promote transparency and capacity-building. This is particularly important because there is a need for an infrastructure to develop such a new market.

3.2 The EU internal market: The horns of a dilemma

The bottom-up manner in which emissions trading has emerged so far in the European Union has naturally led to a heterogeneity of different emissions-trading schemes. It has fallen to the European Commission, as the EU's competition authority, to ensure that this does not undermine the functioning of the internal market. Should the EU decide to adopt the proposal for an EU-wide emissions-trading regime, such a "bottom-up" approach of *ex-post* scrutiny by the Commission as competition authority would be replaced by a mandatory and centralised EU-wide solution. This "top-down" approach has a number of legal and economic advantages, including higher certainty through *ex-ante* definition of design options, a lower risk of distortions to competition and potentially higher liquidity in the permit market. These conflicting approaches pose a dilemma for regulators.

3.2.1 Early action and the EU Directive

In the transitional period up until 2008, when the first Kyoto Protocol Commitment Period of 2008-12 is due to begin, the European Commission faces a potential dilemma. On the one hand, the Commission and the EU as a whole welcome early action, whether through national emissions-trading schemes like that of the UK[13] or through other, voluntary approaches such as the German *Selbstverpflichtung*. On the other hand, the Commission intends to establish an EU-wide scheme that will cover all member states from 2005, but this could mean a conflict between the mandatory EU-wide scheme and the existing national policies. This is because national initiatives would have to cease operations by 2005 or become fully compatible with the EU-wide scheme. The UK and Norwegian schemes are not compatible with the EU-wide scheme as it is currently proposed, but a decision to close those schemes prematurely would restrict the trading activity in these national schemes.

Thus, the future holds two distinct options. If the EU scheme becomes mandatory and prevails over national initiatives, as the current proposal foresees, national schemes will have to be adapted to the EU-wide scheme or be closed down. Prior to the agreement on the details of the EU Directive between the Council of Ministers and the European Parliament, it is impossible to say what "adaptation" would mean. On the other hand, if the EU scheme – once adopted – contains elements of voluntary participation, such as making participation voluntary or allowing participants to choose between trading and such other policy instruments as taxation, two questions emerge. The first is the role of EU competition policy. The second is how national schemes could be linked to provide the necessary liquidity in the permit market.

3.2.2 The role of EC competition law

A variety of national emissions-trading schemes could have a potential impact on competition within the EU's internal market. As the EU's competition authority, it is the European Commission's task under Art. 87 of the EC Treaty to examine the compatibility of national

[13] This does not apply to the Danish cap-and-trade scheme, which will end by 2004.

emissions-trading schemes (as well as other measures) with "fair competition". Member states must notify the European Commission of any emissions-trading scheme, and the Commission in return examines and either approves, blocks or asks for revisions of the scheme. The Commission is therefore likely to play a defining role in the development and implementation of emissions-trading schemes, particularly in the period before an EU-wide scheme is finally adopted. The final scheme *must* be in line with the EU's competition and internal market rules.

Box 3.1 When does state intervention becomes state aid?

Four criteria to be met simultaneously:

- There is evidence of an *advantage* to a company as a result of state aid, such as reduced costs.
- *State resources* have been given to a company. "Resources" include budget resources, grants, tax reductions or measures that involve a loss of potential resources to a state (such as selling something below market price). Any public body has the ability to grant such resources.
- The state's measure is *selective*, in that certain companies or certain productions benefit. If the measure did not distinguish between parts of the economy, it would not be a state aid but a "general measure". Selectivity can be in law but also in fact.
- The measure has an *effect on trade.* If a company exports, then a state aid will automatically have an effect on trade. Even if it does not export, however, the fact that it receives a state aid allows it to resist imports more easily. Case law in the European Court of Justice (ECJ) goes further: even if there is no trade, it impedes potential future development of trade.

To date, EU competition law has had little to say about the compatibility between emissions-trading schemes and state aid rules. The European Commission adopted new *Community guidelines on State aid for environmental protection* in December 2000, but they offer only limited indication on the compatibility of policies and measures with competition and internal market rules. The relevant text states only that "some of the means adopted by Member States to comply with the objectives of the [Kyoto] Protocol could constitute State aid but it is still too early to lay down the conditions for authorising any such aid."[14] Thus, it seems instructive to analyse the first two state aid rulings: the Danish CO_2 quota scheme and the UK emissions-trading scheme.

Case 1. The Danish CO_2 quota scheme

Denmark's emissions-trading programme began in April 2001. The scheme is limited to the electricity sector, which produces 40% of Denmark's GHG emissions – 30 $mtCO_2$ per year. The Danish scheme sets a decreasing ceiling over the years 2001-03 for the annual emissions of CO_2 – 22 $mtCO_2$ in 2001, 21 $mtCO_2$ in 2002, and 20 $mtCO_2$ in 2003. Emissions quotas are allocated to each emitter for free based on historical emissions (i.e. grandfathered), subject to certain rules that give preference to CHP emitters. On average, the quotas allocated represent 73% of historic emissions in 2001, 69% in 2002 and 66% in 2003, but the actual allocations range between 100% and 62% depending on the producer. The penalty for exceeding the quota is a fine of €5.40 per tonne of CO_2. There are 500 electricity producers in Denmark, but the scheme

[14] *Community guidelines on State aid for environmental protection*, Official Journal of the European Communities, 2 February 2001, Article 71. According to a background paper issued by the European Climate Change Programme, an earlier draft was more detailed and viewed that grandfathering, if limited to certain sectors or entities, would classify as state aid. ECCP Chairman's Background Document 3, "Fair competition and internal market issues", Brussels, 16 February 2001.

exempts small CHP producers and wind power, reducing the number of affected installations to just 15. Producers comply by changing their production methods, closing plants, buying quotas from other producers, or using unused quotas that have been banked from previous years.

The European Commission decided that the Danish CO_2 emissions-trading scheme constituted state aid for the following reasons:

1. The state gives an intangible asset (the quota) away for free. This is because the state foregoes revenues that would have accrued if it had auctioned the quotas, for instance.
2. The scheme is selective because it only affects the electricity sector.
3. The scheme affects trade, particularly considering the opening up of the European electricity market and the subsequent increase in cross-border trade of electricity.

Nevertheless, the European Commission decided to approve the Danish emissions-trading scheme. The reasons were that the scheme had already been launched and is due to end prior to the initiation of the EU-wide trading scheme. The large contribution of the power sector regarding total Danish CO_2 emissions (40%) was seen as justifying a selective scope. Nevertheless, it was decided that the allocation method – by grandfathering – constituted a barrier to entry for new entrants into the electricity sector. This was a theoretical problem only, since the scheme expires in 2004 and the planning process for a new power plant is longer than three years, but the Commission insisted on the principle that extra quotas be reserved by the state and granted to any newcomers.

Case 2. The UK emissions-trading scheme

The UK emissions-trading scheme includes incentives and allowances. The incentives are in the form of money in return for absolute GHG emissions reductions. "Direct participants", or companies that do not participate in the climate change agreements, can bid for these incentives in an auction. The allowances are tradable on the market and are allocated for free to companies participating in the climate change agreement when companies overachieve. All six GHGs controlled by the Kyoto Protocol are included. The budget for the incentive system is £43 million per annum: this incentive system is justified by the fact that companies must cover the additional costs of undertaking absolute reductions in GHG emissions.

The European Commission found that the UK scheme constituted state aid under the four criteria, including the provision of funds as an incentive to participate. As in the Danish case, the Commission argued that allocating the allowances for free constituted the granting of an intangible asset by the state for free.[15] Moreover, the UK scheme was found to be different from the Commission's proposed EU-wide scheme (for instance, the UK scheme is voluntary, it has incentives and its scope is limited). Still, the Commission decided to approve the UK scheme. First, the EU-wide instrument had not yet been adopted. Second, emissions trading is a good instrument in principle and well orientated towards competition. Third, the UK's was the first multi-sectoral trading scheme. Fourth, although it was different from the proposed EU-wide scheme, it could lead to an interesting learning effect. Finally, the bidding process limits the amount of incentive money available. The European Commission's decision was also guided by the fact that the UK scheme was limited in duration and the UK government was ready to accept links to wider schemes via mutual recognition.

[15] The UK government argued unsuccessfully that trading allowances were not state aid because they corresponded exactly to the amount of effort that companies would need to expend to reduce pollution. But ECJ case law says that exact correspondence between effort and aid is a kind of state aid; if it were not so, no measure would be state aid,

3.3 Linking different emissions-trading schemes

In theory, policy-makers could avoid the dilemma by forsaking a centralised, top-down trading scheme and attempting instead to link national schemes. Indeed, even if the Commission's proposal for a Directive were not adopted, such linking would occur anyway through normal market activity. Linked national schemes would share one advantage with a centralised EU-wide trading scheme – the market would increase in size and, consequently, in efficiency. Theoretically such linking could occur if the different schemes met basic minimal harmonisation requirements such as a standardised currency of exchange, harmonised enforcement mechanisms including a common penalty rate[16] and monitoring, reporting and verification rules including a standard registry.

Nevertheless, linking separate schemes is a second-best option to the centralised top-down approach advocated by the Commission. First, the lack of incentives for a trading scheme in a member state with low abatement costs to link with a scheme in a high-cost member state would cause the scheme to be dominated by buyers. In effect, this would amount to little more than a voluntary EU trading scheme with no uniform carbon price and with different methods of allocation and target-setting, which would create the risk of distortions to competition in the EU internal market (Chapter 4 deals with these issues in more detail). Second, EC competition law would play a very significant role in linked markets, so in effect the emissions market would remain centrally overseen by the European Commission in any case. Because the EU Directive provides more predictability than the *ex-post* application of EC competition policy, there is very little reason from an EU perspective to argue for the linking of national schemes over an EU Directive.

Nevertheless, even with the adoption of a top-down EU-wide trading scheme, linking different schemes will remain a significant issue for policy-makers and market actors alike. This is because the EU-wide scheme may need to take account of other schemes in the world, particularly if IET under the Kyoto Protocol materialises only slowly or not at all.[17] The Commission's proposal explicitly foresees the possibility of linking with similar trading schemes in other countries that are signatories to the Kyoto Protocol, such as Japan and, if it ratifies the treaty, Canada. The question will also arise of how to link trading schemes in Parties with trading schemes in non-Parties to the Kyoto Protocol, particularly the United States. There must also be clarity about how the EU-wide emissions-trading scheme will interact with International Emissions Trading.

Consideration of linking different schemes must take into account economic efficiency, environmental effectiveness and distribution effects.[18]

Efficiency. Linking different schemes would be undertaken mainly for reasons of economic efficiency. Linking schemes would allow a company in one country to transfer or acquire allowances that exist and circulate in other countries, jurisdictions or trading schemes. This would lead to larger markets and therefore lower compliance costs. Such linking is necessary because individual markets, especially in small countries, would not be large enough to provide liquidity. Linking would also expose trading schemes to each other and cause an exchange of learning and operational experiences. Problems of institutional incompatibility might arise but this could be avoided if the linking systems agreed on a common "currency", compatible registries and a similar level of monitoring, registration and verification.

[16] Ideally as part of enforcement there should be a common treatment of sinks, possibly based on best practice.

[17] If IET does not happen, the EU scheme might become the basis for a global scheme.

[18] For a detailed analysis, see Haites and Mullins (2001).

Effectiveness. The environmental integrity of the trading scheme, especially the extent to which it leads to a reduction in GHG emissions, might be jeopardised if differences in the design of linked schemes led to trade diversion. Typically such issues concern divergent levels of penalties, unequal enforcement of penalties and different banking rules. Different penalties in case of non-compliance could mean that non-compliance would happen in the country with the lowest penalty rate (a "race to the bottom"). Under certain circumstances in which the penalty acts as a price cap (see also section 4.1.6), it might be cheaper for a company to pay the penalty than to comply with the regulation. Although this effect can also appear in a domestic setting, it may increase in scale in linked schemes. If penalties are designed to ensure compliance and are set sufficiently high, as is the case for the proposed EU Directive, this risk might be purely theoretical. Different banking rules could also be a cause of trade diversion, although the market would be able to accommodate this as long as the allowance can be tracked, as is anticipated. If banking is not harmonised, differences in "bankability" will be reflected in the price of the allowances. An allowance with a long banking period should have a higher price than an allowance with a short one.

Equity. Equity, or redistribution concerns, could pose the single biggest obstacle to linking different national schemes. Those countries with low (marginal) abatement costs might have little incentive to join a system with higher abatement costs. Although net sellers in this case would benefit from higher allowance prices, potential net buyers in the country concerned would have to pay a higher price and therefore would lose out. In fact, the "linking-approach" would amount most likely to a voluntary trading scheme, which, as we analyse in Chapter 4, has very serious economic and internal-market consequences.

3.4 Linking the proposed EU-wide scheme to International Emissions Trading

It is commonly argued by business actors that the Commission's proposed EU-wide scheme should be fully open to permits generated under the Kyoto Protocol's flexible mechanisms, at least in the long run. Indeed, the UK scheme allows the import of AAUs, CERs, Danish allowances and permits from other trading schemes,[19] as long as such schemes are based in countries that are a Party to the Kyoto Protocol. This undoubtedly increases the flexibility for participating firms and, by extension, reduces costs. Nevertheless, the allowances created under any national trading scheme are legally and technically separate from AAUs and IET as permitted under the Kyoto Protocol, even if the same concept lies behind trading at the national or regional and the international level. One major challenge posed by linking trading schemes at the international level would be to ensure environmental integrity while at the same time making any linkage compatible with the rules of IET. Unfortunately, at this stage, IET rules are still unclear.

3.5 Emissions trading as a bridge to the US?

The absence of the United States from the global climate change regime is a major shortcoming both from an economic and environmental perspective. The US is the world's largest GHG emitter in both absolute and per capita terms. Even if the US withdrawal reduces the overall cost of compliance with the Kyoto Protocol for the EU economy, as indicated by some economic studies, the non-participation of the US is likely to cause competitive disadvantages to some sectors, notably the energy-intensive industries.

Moreover, companies on both sides of the Atlantic will face different regulatory frameworks. Under the rules as currently foreseen, for example, it will not be possible for a firm to import emissions-reduction credits from a subsidiary that is located in a country that is not a Party to the Kyoto Protocol. Companies will face different carbon prices, leading to conflicting price

[19] The first trade between the UK and Danish schemes occurred in March 2002.

signals for investment decisions. Technological innovation could also suffer, since a lower carbon constraint and consequently a lower carbon price would remove incentives for the development of new technologies.[20] Finally, there is whole set of unexplored issues regarding the relationship between the Kyoto Protocol and the WTO, including whether AAUs, ERUs and CERs are goods or services, or the possibilities of border measures. More practically, there is also the question of whether measures concerning the labelling and certification of energy efficiency would be compatible with the WTO Agreement on Technical Barriers. The Protocol explicitly and directly applies to firms' activities as well as government measures, while the WTO applies directly only to government. As a result, it is unclear how CDM/JI relates to the selective coverage of Foreign Direct Investment (FDI) in WTO and other bilateral agreements.[21]

Given that the United States is unlikely to re-enter the Kyoto framework under the current administration, it has been suggested that the US could be engaged through emissions trading. As long as the US does not accept a target, however, there is little scope for the US to participate in emissions trading. None of the options outlined in Box 3.2 seems likely to materialise at the moment and re-engaging the US appears to be rather a long-term policy objective.

Box 3.2 Options for trading with the US are limited

- *The US participates in the Kyoto Protocol, perhaps in the second Commitment Period (CP), 2013-17*. This seems unlikely for the foreseeable future, given President Bush's policy announcement that the US will rely on voluntary measures to control GHG emissions until 2012 at the earliest, and given that negotiations for the second CP are due to begin as early as 2005.
- *The Kyoto Protocol could be amended to allow trade under IET with non-Parties. such as the US.*
- *The US private sector could participate in IET via a "gateway" system to prevent net flows from one system to the other.* This last option is, theoretically, currently possible via a secondary market. The Kyoto Party would be allowed to sell credits to a non-Kyoto Party without restrictions, but the non-Kyoto Party would only be able to sell credits to a Kyoto Party if those credits were offset by an equivalent repurchase of "Kyoto" tonnes of CO_2. Other issues still have to be worked out, such as how the gateway would be maintained.
- *The US could operate a domestic or hemispheric scheme and offset the domestic price with trades with non-Annex B countries.* This would be independent of the Kyoto Protocol's trading scheme (IET), but eventually could lead to convergence with the Kyoto trading scheme.
- *If IET does not materialise, the EU could decide to open the proposed EU-wide trading scheme to allowances from the US and other non-Parties.*

[20] Buchner et al. (2001).

[21] Brewer (2002).

CHAPTER 4
DESIGN OPTIONS FOR EMISSIONS TRADING IN THE EUROPEAN UNION

One of the reasons for the great volume of discussion around emissions trading in the European Union is that the subject represents a very novel approach to controlling pollution. It is true that tradable allowances exist for pollution in other countries, notably SO_2 trading in the United States, and for other sectors in Europe, such as milk quotas in the European Union. Nevertheless, the proposed EU-wide emissions-trading scheme is unprecedented in its size and scope, controlling the emissions of a basic by-product of economic activity. For this reason, some observers have suggested that emissions trading represents a paradigm or a systems shift in EU pollution control, and that extra attention should consequently be paid to the details of the trading scheme. Some commentators and stakeholders also argue that, due to the great uncertainties that might be associated with emissions trading, participation should initially be voluntary.

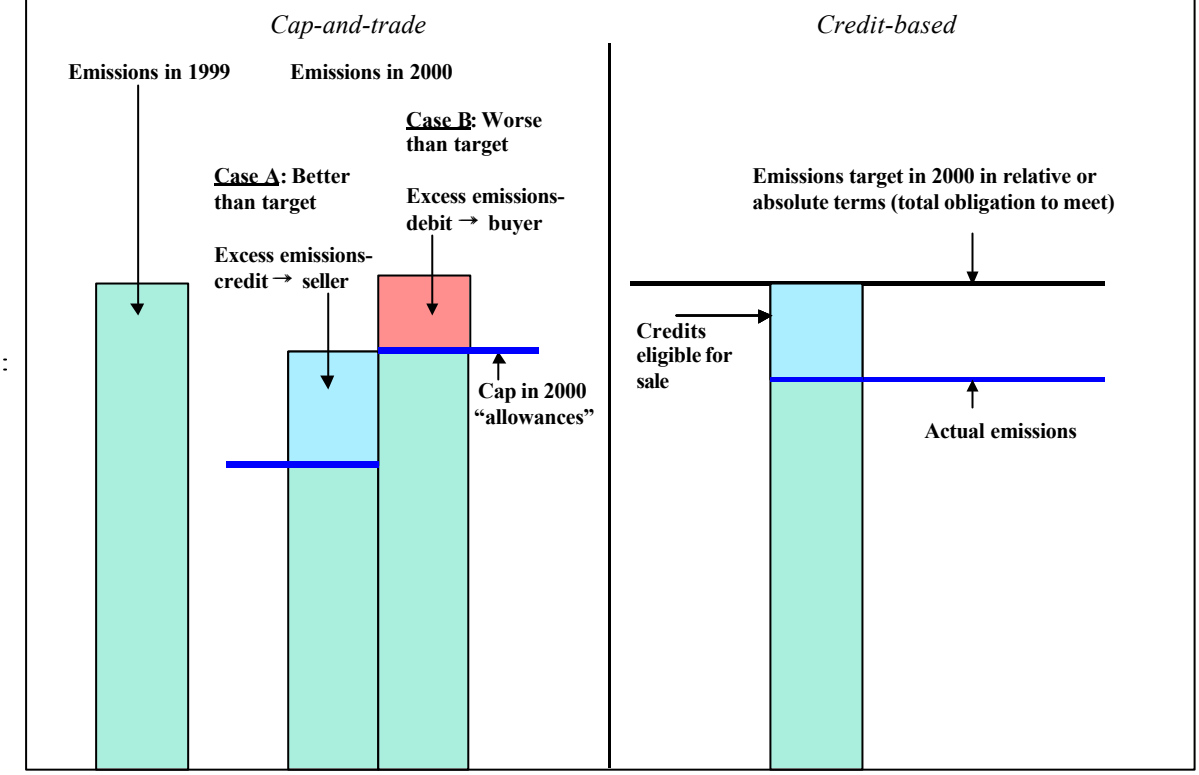
4.1 The concept of emissions trading: Cap-and-trade or baseline-and credit?

The theoretical literature suggests that the ideal tradable permit systems should be mandatory, allowance based (i.e. cap-and-trade), upstream (i.e. having effect at the point of fuel production or import), with allowances being auctioned and the proceeds recycled. Once in place, the trading schemes would replace other instruments. Evidence from the "real world" in Europe and the United States presents a somewhat different picture. There already exists a mixture of allowance-based, credit-based and hybrid schemes, most of which are mainly downstream (where the scheme has effect at the point of consumption). The allocation of allowances tends to be done by grandfathering, where allowances are allocated to companies for free based on their historical emissions. Auctioning is the exception rather than the rule, moreover, and it tends to cover only a small part of overall allowances, mainly to facilitate new entrants. The UK scheme is based on voluntary participation. There are pressures within the EU to allow for the extension of national climate policies based on other instruments such as voluntary or negotiated environmental agreements (NEAs). It is therefore useful to discuss the different design options and their possible influence on the economic and environmental outcome of the trading scheme.

In the cap-and-trade system, which is the standard model for tradable permit schemes, an absolute limit is placed on total emissions. Typically, each company's emissions are capped by the allocation of allowances for the controlled pollutants. Companies must ensure that they stay below these caps, either by reducing their emissions through taking action or by buying additional allowances, depending on which is cheaper. Companies that reduce their emissions below the allocated cap can then sell the surplus permits to other companies, if the price is right, or they may bank them for later use. The underlying premise is that emitters incur different costs in reducing emissions. If emissions allowances are tradable, emitters with low abatement costs can cut emissions below the cap and sell their surplus allowances to high-cost emitters, if the allowance market makes this attractive.

The alternative model is a so-called credit-based scheme. Here, credits are created (i.e. "earned") when an emitter reduces its emissions below the level required by existing source-specific limits set by regulation or an NEA. Importantly, targets in a credit-based scheme can be expressed in absolute terms (i.e. as absolute caps on emissions) or specific terms (i.e. as energy-efficiency targets). In Europe many major industries have NEAs based on relative targets and are therefore reluctant to accept absolute caps. As a result, credit-based schemes are sometimes seen as a bridge to the point where industry will accept absolute caps and move over to a cap-and-trade system (see also Appendix 1).

Figure 4.1 Property rights and trading potential for cap-and-trade and credit-based emissions trading schemes (an illustration)



Currently, various national initiatives adopt elements of both models. For example, the UK emissions-trading scheme (DEFRA, 2001) combines a cap-and-trade system with credit trading. This is because large parts of the UK industry had already negotiated voluntary agreements based on relative targets in return for a rebate from the Climate Change Levy, an energy tax. Similarly, the French trading initiative proposed by the business grouping Entreprises pour l'Environnement mixes absolute and relative targets from the outset in a credit-based system (EpE/MIES, 2000). In this case the main reason was the public perception that a cap-and-trade scheme would constitute a "license to pollute". Denmark (the first country to have an emissions-trading scheme up and running, which was launched in January 2001), Norway and Sweden have all opted for a pure cap-and-trade scheme. These decisions were motivated by the desire to guarantee both simplicity, a major concern to business, and certainty of reaching the target, the main priority for governments and environmental groups. The proposed EU-wide trading system is also based on a cap-and-trade system.

Although there is no theoretical argument in favour of either system, experiences in the US show that credit schemes tend to have higher transaction costs *in practice* (Klaassen, 1996 and Stavins, 2001). The main reason lies in the difference of allocation method. In a baseline and credit system, permits are allocated *ex post*. The US credit-trading schemes were characterised by political uncertainty regarding target-setting and verification, subsequently leading to successive regulatory changes (Godard, 2000). Political bargaining of this kind is largely absent in cap-and-trade programmes as well as in credit-trading schemes that are based on absolute targets, except for the initial political decision that sets the overall number of allowances. Although it is true that credit trading reduces the likelihood that governments will charge for the allocation of allowances, credit-based schemes imply that trading cannot really begin until towards the end of the compliance period, except for some forwards or derivatives trading.

Credit-based schemes also have the tendency to limit the market *de facto* to companies that emit GHGs, whereas cap-and-trade systems have the advantage of promoting trading immediately, since the commodity (the allowances) becomes available with allocation. A cap-and-trade scheme should also have more liquidity because it encourages the participation of non-natural traders such as brokers and *arbitrageurs.*

4.1.1 Indirect or direct emissions?

In the specific case of electricity generation, emissions may be apportioned either directly, where emissions are reported at the place of generation, or indirectly, where the emissions are recorded at the point of consumption. The proposed EU Directive has chosen the former while the UK has opted for the latter. The advantage of indirect apportionment is that emissions are recorded closer to the polluter (i.e. the consumer), which is more in line with the polluter-pays principle. In a system based on indirect apportionment, in addition, regulators can more readily decide for which sectors to include emissions from electricity. Under the indirect system, it can be decided whether to cover all electricity generation or simply the electricity that is used by the controlled sectors (e.g. industry consumers). In the case of direct emissions, such a distinction cannot be made. The disadvantage of indirect apportionment is that end-users are not responsible for the choice of fuel used to generate the power they consume.

The practical relevance of this question is demonstrated by the possible effect of the proposed EU Directive on the heating markets, where CHP would be covered by the proposed Directive but competing fuels (e.g. gas in condensation boilers) would not. The reporting of emissions indirectly would avoid such problems, although this specific CHP problem could also be resolved by exempting the proportion of fuel used in CHP plants for the heating market (Stronzik and Cames, 2002).

A disadvantage of indirect apportionment is that there is a need to assign an emissions factor for electricity, making the system more complicated. This is especially true for the European Union, where power is traded across borders but generation portfolios differ markedly. Ideally there should be different emissions factors for the different processes of generating electricity, which would require electricity to be certified and tracked. In contrast, applying an average emissions factor (e.g. the weighted average of emissions by a particular fuel mix) would annul the incentives for reducing GHG emissions in electricity generation by means of fuel switching, efficiency or the use of renewable energy sources, because all electricity, no matter how it is produced, would be counted on the basis of the average. Consequently, the power generator would have no incentive to move to less GHG-emitting fuels and technologies because the extra cost for the environment cannot be passed on in a liberalised market. Such lack of incentives therefore would need to be compensated for by government subsidies or other incentives. In contrast, direct apportionment provides the necessary incentives to power generators because they can pass on the additional costs as a function of their reduction commitments to their customers.

The indirect approach need not necessarily apply only to electricity. Emissions associated with cement or glass production or any other industrial activity could similarly be apportioned to the end user. The emissions from the cement industry, for instance, could be apportioned to the construction industry or even house owners (see Stronzik and Cames, 2002). This would move emissions trading very close to the point of consumption.

In any case, the question of apportionment must be resolved by a common approach across the European Union. The simultaneous existence of different trading systems – i.e. the EU-wide system as currently proposed and the UK system – would cause emissions to be counted twice. Governments must choose a single system, and the above analysis suggests that direct apportionment of emissions is both more practicable and provides better incentives to abate GHGs.

4.1.2 What participants?

The designers of the trading market must strike a balance between creating a sufficiently large market and remaining practical and simple to minimise transaction costs. The Commission's proposal for a Directive approaches this question by limiting the trading scheme to six sectors: electricity production, iron and steel, cement, glass, ceramics, and paper and board. In general, combustion plants of less than 20 megawatts are excluded. Likewise, the chemicals industry is only covered indirectly, via on-site power plants that are larger than 20 megawatts. In all, the proposed Directive would cover about 46% of total CO_2 emissions in 2010, or about 40% of all EU GHG emissions.

Small- and medium-sized enterprises (SMEs)

Small- and medium-sized enterprises (SMEs) sometimes argue for their exclusion from the trading scheme because of a lack of capacity to deal with such a complicated instrument. Although in general this may be true, the argument needs some qualification. It is true that transaction costs are usually absolute: for large economic entities with economies of scale, transaction costs may constitute a small part of the decision whether to participate, but for small companies the same transaction cost may be prohibitively expensive. On the other hand, the participation of small economic entities is desirable for reasons of both efficiency (e.g. increased liquidity) and effectiveness. Moreover, the results of a simulation study for a trading scheme in the German state of Hesse suggest that transaction costs depend less on the size of the company than on the characteristics of the emissions source, particularly whether the SME operates a major on-site power plant (Hessen, 2001).

Transport and domestic/tertiary sector

CO_2 emissions from transport and households are especially significant. Transport-related emissions are expected to account for approximately 28% of the EU's total CO_2 emissions in 1998 and are expected to grow by around 50% between 1990 and 2010.[22] Households accounted for 11% of EU emissions in 1990, although this percentage is not expected to rise over the next decade.[23] Buildings (including residential and the tertiary sector) accounted for 40.7% of the total energy consumption (a proxy for CO_2 emissions) in 1997.[24] Most future growth in CO_2 emissions will come from transport, which is projected to grow by 31% above 1990 levels under a business-as-usual scenario. Apart from the transport sector, only emissions from the service sector, which accounted for just 4% of 1990 emissions, are also expected to increase between now and 2010 (by 14%).[25]

Neither transport nor the domestic/tertiary sector is covered either by the proposed EU Directive or by most of the national schemes that have been proposed or discussed. This exclusion is explained by a mixture of political sensitivity towards price increases for transport and household energy bills, the complexity of these emission sources, potentially high transaction costs and inelastic demand, especially in households. Still, the Norwegian government might take a different approach to partially cover transport and households by including heating fuel and electricity in the Norwegian trading scheme, which in the long run intends to cover about 60% of all of Norway's GHG emissions. In a relatively small market such as Norway, including transport and households can increase the size of the market significantly.

[22] European Commission (2001b, p. 14).

[23] European Commission (2001d, p. 6).

[24] European Commission (2001e).

[25] European Commission (2001d, p. 6).

Although emissions from the domestic/tertiary and the transport sector can in theory be included (see Box 4.1 for the case of transport), the need for simplicity suggests that it might be more appropriate to exclude these sectors initially from the EU-wide system, especially given that system's very wide scope across at least 15 countries. Nevertheless, extension of the scheme to include these sectors could be possible at a later stage if both the technical difficulties and the political sensitivities are better analysed. In the meantime, it is important to ensure that non-trading sectors bear an equivalent burden.

Box 4.1 Options to include transport in an emissions-trading scheme

Six basic options to incorporate transport in an emissions-trading scheme have been identified. Options 1-5 assume a cap-and-trade scheme, whereas option 6 relates to a baseline and credit scheme.

1. Production/import. Fuel *producers and importers* must surrender the necessary allowances. This is generally referred to as an "upstream" scheme and would not be compatible with the proposed EU Directive, which is a "downstream" approach targeting the point of consumption. To be adopted in the EU, an upstream scheme would require approval by unanimity in the EU Council of Ministers, because it reduces significantly the scope for national energy policies.[26]

2. Wholesale. Fuel *wholesalers,* e.g. for transport and heating fuels, must cover their fuel sales by allowances, as has been discussed in Norway. Such a scheme might be compatible with the currently proposed EU Directive, but it might also fall under unanimity in the EU Council of Ministers.

3. Vehicle producers. Allowances must be surrendered by *vehicle producers*, based on the level of emissions the vehicle will cause according to its performance and life span. Although this would provide direct incentives to vehicle producers to improve the fuel efficiency of vehicles, manufacturers might see the approach as too rigid a constraint on output growth. There is a further question about whether vehicle producers can be made responsible for their products' emissions.

4. Service providers. Allowances must be surrendered by *service providers* (e.g. railways, bus operators, airlines, etc.) while for private cars, allowances would need to be surrendered by the driver or owner. The advantage is that service providers have a direct incentives for fuel efficiency. Service providers might object to such constraints as a potential curb on growth, however, whereas private car owners might see this choice as amounting to a quota on driving. Such a system might also be very complex with high transaction costs.

5. Users. All transport *users* must surrender allowances to use transport services. This would effectively amount to carbon budgets for all individuals and/or firms that use transport. Such a system would be certain to be politically sensitive and difficult to implement. It would also be complex, notably in relation to measuring and monitoring individual carbon budgets.

6. Baseline-and-credit approach focusing on vehicles. Vehicles that out-perform an existing fuel efficiency standard could obtain credits based on the assumed life cycle of a vehicle. Such a scheme should theoretically accelerate the diffusion of more efficient vehicles. A baseline-and-credit scheme focusing on transport users is currently being explored by the French industrial grouping Entreprises pour l'Environnement (EpE). The US Environmental Protection Agency (EPA) has introduced a similar programme for a number of pollutants.[27]

[26] "…measures… " that are "significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply" are according to Art. 175 of the EC Treaty subject to unanimity in the EU Council of Ministers and withheld from co-decision with the European Parliament.

[27] An example of a credit-trading programme (of a voluntary nature) with mandatory performance standards is the averaging, banking and trading provisions of the emissions standards for a variety of pollutants caused by heavy-duty truck and bus engines in the US. The programme, which was established by the US EPA, foresees that avoided emissions due to better-than-legally-mandated performance

4.1.3 The project mechanisms

The Commission's proposal does not foresee the inclusion of credits from the project mechanisms CDM and JI, as established under the Kyoto Protocol (see also Appendix 1). The Commission bases its preference on "outstanding issues regarding their environmental integrity", especially the use of carbon sinks as CDM projects, but agrees that their eventual inclusion is desirable. Critics have argued that since it is assumed that marginal avoidance costs in countries that are likely to host CDM and JI projects are lower than in the EU, excluding the project mechanism is likely to lead to higher allowances prices than would otherwise be the case.

As the exclusion of the project mechanisms is, according to the European Commission, only temporary, the real issue is how to achieve their inclusion while maintaining environmental integrity. This is a question that relates to substance (e.g. the definition of the project mechanism), procedure and timing.

Regarding *substance,* there are two ways to include the project mechanisms. First, the EU could apply the rules as agreed in the UNFCCC negotiations. Second, the EU could specify separate rules for the EU-wide trading scheme, in essence creating a separate "EU CDM" and "EU JI". Creating *separate* CDM- and JI-style projects would entail different rules for trading internationally and within the EU. Should the EU decide that international rules are not sufficiently robust to allow for a credible emissions market to evolve, however, it could still add additional requirements if there is a case to be made.[28]

Regarding *procedure* and *timing*, the Commission has stated that it will propose a new, separate Directive to include the project mechanisms in the trading scheme; the Directive would be proposed separately so as to avoid contentious debates that could delay the adoption of the proposal for an EU-wide trading scheme. In the case of CDM, conditions for inclusion should be based in principle on international rules as agreed in the UNFCCC, which are likely to become operational by the end of 2002. The EU would be free to set legitimate additional eligibility requirements for the project mechanisms. Once the international trading system is in place, the EU could review its additional requirements in the light of those rules. Should the international regime not materialise, moreover, the EU's scheme would represent a significant market for CDM credits and would provide sufficient certainty to companies that projects will represent a safe investment.

For JI, the situation is more complicated because the outlook for JI is expected to remain uncertain for the medium term. In the meantime, important questions such as the recognition of baselines have yet to be resolved. The EU could therefore propose a "early EU JI", again with restrictions if there is a case to be made for them. Companies would be free to choose between operating on the basis of the firm rules of the "early EU JI" or the prospective rules of JI under the international regime, which will emerge at a later stage. "Early EU JI" could include accession countries, and it could also have the advantage of providing a potential incentive to Russia to ratify the Kyoto Protocol, thereby almost certainly bringing the Protocol into force. This would be along the lines of the proposed Green Investment Scheme (GIS), a Russian

standards for engines can be credited for averaging, banking or trading (BAT provisions). Here, averaging means that credit offsets for engines manufactured during the same year whose emissions are better than the performance standard. The objective is to make credits fungible with other trading programmes by 2004 (Stavins, 2001), thereby combining mobile and stationary sources and providing incentives for improved fuel efficiency.

[28] Some members of the Task Force additional rules, including but not necessarily limited to the ongoing exclusion of sinks projects, citing concerns over the environmental benefits and permanence of such projects. Others argued for the prompt inclusion of the mechanisms with few additional rules beyond those applying under the UNFCCC.

proposal to allow investments in Russia in exchange for AAUs, even in advance of the Kyoto Protocol's first Commitment Period (2008-12). Under this proposal, the sale of Russian surplus AAUs would be made conditional on the recycling of the revenues into domestic projects in Russia that lead to equivalent GHG emission reductions (Korppoo et al., 2002).

4.1.4 What gases?

At present, the proposed EU scheme is limited to CO_2. The reason for the Commission's more restrictive approach is that it believes that the other gases are difficult to monitor with comparable accuracy. The industrial gas SF_6, for instance, has a global warming potential (GWP) 24,000 times that of CO_2. The Commission's proposal leaves open the possibility of further gases being included through an amending proposal. Such an amending proposal would fall under the EU's "co-decision procedure", which gives the European Parliament and the Council of Ministers joint say in whether a Directive should be adopted. A lighter procedure would be to allow the emissions-trading Directive (once adopted) to be amended to cover non-CO_2 gases. Such an amendment could be done by a process known as "Comitology", in which an administrative act is passed by a regulatory committee comprising representatives of member states' administrations and chaired by the Commission).[29] It is unlikely that the European Parliament, which opposes Comitology on grounds that it undermines the Parliament's power of co-decision, would accept such a procedure, however.

This exclusive coverage of CO_2 contrasts with the UK scheme and the proposed Norwegian scheme, both of which cover all six GHGs. The internal BP scheme covers CO_2 and methane, and France has a N_2O tax, meaning that this gas is measured there. Thus, there seem to be no structural issues related to measuring and monitoring of at least some of the non-CO_2 GHGs, and in fact the problem seems to be a lack of capacity in some member states. This could be addressed by amending the proposed Directive so that member states can include all six gases if they can prove that measuring is ensured. There is a risk that different gas coverage in different member states will cause distortions to competition, however, especially if non-CO_2 GHGs were regulated in some countries (at member state level) and not in others. An EU Directive incorporating all six gases in principle could serve as an incentive to move towards adequate monitoring in those member states where this is not yet the case. In the meantime, the European Commission should consider capacity-building measures for those member states with shortcomings in monitoring; such measures should also be implemented promptly for the accession countries.

4.1.5 Banking

One of the lessons of the US SO_2 scheme (see Box 4.2) is that banking of permits can lead to earlier reductions than would have occurred if it had not been allowed. Banking encourages early reductions by allowing participants to store unused allowances for future use. Banking not only encourages early reductions and over-compliance but also gives companies flexibility in the timing of their investments to abate GHG emissions, because it is an effective tool to smooth the investment cycle with greenhouse gas emissions reduction measures and therefore is likely to reduce compliance costs. For banking to work, allowances must remain valid over a long period of time. To allow banking and make banked allowances valid into the Kyoto Protocol's commitment periods would give an incentive for governments to be less generous to "their" companies when allocating allowances in the pre-Kyoto commitment period. With banking, governments must hand out assigned amounts to any company that banked permits during the years before the Protocol's first Commitment Period (2008-12). In this way, banking would go some way towards addressing the concerns discussed above in section 3.2 that different

[29] For an overview on the role of committees, see e.g. Pedler and Schaefer (1996)

companies in the Internal Market would be treated differently (see also Egenhofer and Mullins, 2000).

Box 4.2 The effects of banking in the US SO_2 trading scheme

Evidence from the SO_2 emissions-trading scheme in the US suggests that banking led to earlier reductions than would have occurred if banking of permits had not been permitted. For example, in 1996, those units affected by SO_2 caps emitted considerably less than their collective emissions limits foresaw. The US EPA attributes these "excess" reductions to banking allowing participants to garner the benefits of over-control through the storage of unused allowances and by assuring that those allowances will retain their compliance value in the future. It is likely that companies banked allowances in anticipation of more stringent emissions targets and higher costs in the future. The EPA concludes: "Although banked allowances will delay the full effect of the emissions cap on SO_2 until 2010, the early reductions of emissions may provide greater health and environmental benefits than would have occurred without banking" (Dudek et al., 1997). Some 8.3 million units were allocated for the 1996 compliance year. They emitted a total of 5.4 million tonnes of SO_2, which was approximately 35% below the 1996 allowable levels. See the EPA Acid Rain website (www.epa.gov/airmarkets). It is important to note, however, that banking is uncontroversial under the US Clean Air Act, which has allocated permits to companies for 30 years.

Source: Egenhofer and Mullins (2000).

4.1.6 Penalties

Penalties can have two functions. First, they can be a tool for enforcing compliance in which case, the penalty must be high enough to act as a credible deterrent for non-compliance. Second, penalty rates can act as a safety valve against the risk of too high prices for allowances. In the latter case, the penalty needs to be fixed at a certain, relatively low level. An example of such a scheme is the Danish cap-and-trade scheme, whose penalty rate is set at approximately €5.40 to limit the effect on the competitiveness of the controlled Danish firms vis-à-vis their competitors in the Nordic electricity market.

While in the long run the integrity of the emissions-trading regime will only be maintained if compliance is ensured, a fixed penalty rate at a low level, especially for the transition period towards an unknown instrument, can become an efficient tool to prevent emissions trading from damaging EU competitiveness.[30] There is also a danger, however, that a price cap could reduce liquidity, because if set too low, it might act as a disincentive for firms to trade. The proposed Directive has not considered the possibility of price caps for penalties and sees penalties purely as a means to enforce compliance.

4.2 Allocation of allowances

Setting the initial allocation of tradable allowances is the most controversial aspect of any cap-and-trade scheme. The literature generally identifies two principal ways of doing this. The first is *auctioning*, which requires each market participant to buy allowances. The second is *grandfathering*, in which each market participant receives allowances based on its previous emissions. A sub-set of grandfathering is *benchmarking*, in which allowances are granted on the basis of a plant's technologies or techniques and how these compare to other plants. More recently, a third allocation methodology has been proposed – *updating* (NERA, 2002). This describes the constant revision of the allocation based on a plant's current and future activities.

[30] The issue of price caps is well established in the climate change literature, e.g. Kopp et al. (1999); McKibbin and Wilcoxin (1997); and Hourcarde and Fortin (2000). Although in theory, of course, if the target is accurately set, a cap on penalties should not be necessary because the penalty would never be applied (since it should always be cheaper to comply by buying permits).

The concept does not prescribe any specific methodology to be used to assess current activities and future needs.

None of these three methodologies is perfect if evaluated against the criteria of economic efficiency, equity and political acceptability. All methodologies will result in advantages and disadvantages of various kinds and, most of all, in distribution effects between economies, sectors and consumers. The key is therefore to strike a reasonable balance between sometimes conflicting interests.

4.2.1 Auctioning is most efficient but comes at a price

Economic theory favours auctioning as the most efficient method of allocation for a number of reasons. Most importantly, a trading scheme based on auctioning has, economically speaking, three effects. The first is the *technology effect*, by providing an incentive to substitute carbon-intensive technologies with carbon-saving ones (e.g. wind instead of coal to produce electricity). The second is the *output effect*, which relates to the fact that due to the price effects, demand for energy, for instance, will go down. The third is the *revenue-recycling effect*, which states that the proceeds from auctioning should be used to lower other taxes. All three effects will only occur if permits are auctioned. If permits are grandfathered, only the technology effect and the output effect will occur (Sterner and Azar, 2002; see also Annex 2 for a more detailed economic analysis).

Auctioning would also benefit installations that emit fewer GHG emissions, such as electricity from renewable energy sources or nuclear power, or that have done most in the past to reduce their emissions, since such early movers would have to buy fewer allowances.[31] At the same time, auctioning leads to a price for allowances and therefore carbon, and it should thereby facilitate the functioning of the trading market, at least initially. Auctioning has the further advantage of providing both equal access to allowances and transparency in the granting of allowances. This advantage makes auctioning especially suitable for the EU internal market. Due to its high degree of transparency, auctioning would avoid the risk of distortions to competition in the internal market, by avoiding delicate negotiations on how many allowances are allocated to each firm, or how to treat new entrants.

The main disadvantage is that auctioning can be seen as the equivalent of a tax, albeit one whose rate would be fixed by the market. NERA (2002) estimates that auctioning could cost European industry around €30 billion. This has two consequences. First, a considerable amount of money would change hands from industry to the treasury[32] and thereby could deprive industry of funds that are needed for research and development and investment in general in carbon-reduction technologies and techniques. As was shown in the earlier chapters, one of the advantages of emissions trading is that it creates a predictable long-term outlook for business, which is crucial to trigger investment to deal with climate change, although this advantage depends on the actual capacity of companies and financial institutions to raise funds. Second, those industries exposed to international competition with firms that are not subject to a similar carbon constraint would suffer. Consequently, some industries oppose auctioning for the same reasons for which they oppose a tax, since this would annul the benefits of emissions trading. To avoid adding extra costs to companies by auctioning, it has been argued that revenues from the auctioning could be recycled to firms. That way, auctioning would in principle be made revenue-neutral by equivalent reductions in other taxes. This requires the "earmarking" of government revenues, however, and parliaments are often reluctant to accept earmarking

[31] The actual benefit will depend on the carbon price, however.

[32] This is comparable (although not necessarily in quantitative terms) to the auctions for the UMTS licences (Universal Mobile Telecommunications System, or "third generation" mobile communications system).

because it reduces their scope for influencing the budget. Earmarking taxes also increases government intervention and might even reduce transparency, one of the cited advantages of auctioning.

4.2.2 Grandfathering: More equitable, less efficient?

In contrast to auctioning, which inevitably adds costs (in absolute terms) to industry, grandfathering, where allowances are allocated for free, has the advantage of addressing distribution and competitiveness effects as well as continuing to allow firms to invest. This is the reason why the majority of emissions-trading schemes has in practice been done by grandfathering.[33] This may be particularly relevant for the specific case of the proposed EU Directive. Most of the trading population consists of industries that compete internationally and whose competitors in the US, for instance, are subject to a less stringent carbon constraint, if at all. Although the literature on the connection between environmental regulation and the relocation of firms remains inconclusive, relocation of firms as a possible result of different climate change regimes cannot be ruled out. Grandfathering may therefore be a useful negotiation tool to deal with this potential threat.

Grandfathering has a number of disadvantages, however. In addition to its economic problems, which were described in the previous section on auctioning, grandfathering also poses a potential problem to public finances if it displaces revenues from environmental taxation. This is why finance ministries might prefer auctioning to grandfathering, particularly if revenues from ecological taxes are used to reduce social charges. The experience in Europe suggests that finance ministers might not be willing to give up receipts from environmental taxation to the benefit of emissions trading. In the UK, companies that had agreed to energy efficiency targets are only entitled to a partial rebate (80%) from the Climate Change Levy. Similar plans with partial rather than full reimbursements are being considered in France and Germany.

"Historical grandfathering", i.e. allocating allowances to firms based on their past emissions minus a uniform percentage, would benefit those who have done the least in the past. Still, grandfathering can be organised in a way to avoid punishing early movers, for example by building into the allocation a technical factor for climate-friendly technologies.

A specific form of grandfathering is *benchmarking*, which might – in theory – be the most equitable approach to the allocation of allowances. In benchmarking, allocation is based on the actual state of technology applied, taking into account past investments. This minimises the risk that those firms that have done most to reduce their GHG emissions will be penalised. Benchmarking needs considerable current and historical data to ensure both an equitable and environmentally effective outcome, however. These data are available in some member states (e.g. the Netherlands) but less so in others. It is also hard to see how such a system could work in an enlarged European Union of up to 27 member states. Benchmarking could be an option in the future, depending on the availability of data.

4.2.3 Updating: Target-setting linked to economic growth?

The updating approach bases allocations on a plant's existing activities but takes account of future needs, i.e. the expansion of a firm. This is in contrast to grandfathering, where firms receive allowances irrespective of possible future activities. In reality, therefore, updating approaches a relative target, but the difference is that the overall cap of the emissions-trading scheme remains intact, thereby ensuring environmental effectiveness. The margin for updating relates to changes of relative market shares of different firms operating under the scheme. The principal advantage of this method is that it at least partially answers companies' concerns that

[33] This is at least what the literature suggests. See e.g. Joskow and Schmalensee (1998); Tietenberg (2001); Burtraw et al. (2001); and NERA (2002).

the trading scheme places a cap on their ability to expand and that those companies that reduce production will benefit disproportionately. Thus, updating might be a particularly suitable instrument for the initial period.

Nevertheless, there are disadvantages to the updating method, of which the most important relates to economic efficiency. If allowances are allocated in proportion to a firm's output, the output effect (the incentive to reduce carbon by cutting output) is reduced, if not negated, because the free allocation of allowances to an expanding plant would amount to an output subsidy. This is similar to the problem associated with relative targets, which can also constitute an output subsidy since the more a company produces, the more valuable allowances it receives (see section 4.3.1 below). As with relative targets, total emissions are higher than without the output subsidy, which means that overall compliance costs are higher than they would otherwise be.

Although updating would ideally be based on an agreed methodology, in reality it would always involve an element of negotiation. This will be more pronounced the more decentralised the allocation. Should updating be chosen as the allocation method, there would be a need to create transparent and non-discriminatory methodologies to apply it across member states to prevent different member states from interpreting the data differently. Whether such methodologies can be developed is unclear at this time.

The similarities between updating and NEAs – particularly its flexibility – make updating attractive to business, although there is also a risk of perpetuating the process of target-setting. For auctioning and grandfathering, in contrast, the politically sensitive allocation process is generally settled with the initial allocation. In the US SO_2 scheme, the allocation was settled for the duration of the programme for 30 years. In addition, the need constantly to revise targets means that updating tends to have higher administrative costs, and the experience of NEAs suggests that the negotiations linked to updating would require high and costly transparency requirements and stakeholder involvement. To make NEAs more credible, both governments and industry have in many cases strengthened monitoring and reporting requirements, third party verification, increased transparency and stakeholder participation when negotiating an NEA (ten Brink, 2002). A similar development can be expected for updating should this method remain credible in the long run across the EU.

4.2.4 Allocation: A political balancing act

Considering that none of the three allocation methods is perfect, the following general conclusions can be drawn. The choice between grandfathering and auctioning does not significantly affect the efficiency of the emissions-trading market in the medium and long-term, although it might negatively affect the environmental effectiveness as a result of the output subsidy effect and the resulting higher compliance costs. The size of this effect is questionable, however, given existing distortions due to inefficient taxation or market power in the allowance market. Nevertheless, auctioning generally provides stronger signals to reduce pollution to both producers and consumers.

The choice between the two will mainly have distribution effects on the regulated sectors, consumers and governments. Auctioning of all allowances under the proposed EU Directive would amount to a transfer of approximately €30 billion from industry to governments. Auctioning is therefore likely to lead to "stranded costs" and damage the competitiveness of European industry, especially since some of its main competitors are not subject to a similar carbon constraint. The standard remedy to address distribution impacts, the recycling of revenues, is problematic to implement in the EU context for legal reasons. A decision at EU level to require the recycling of revenue might require unanimous agreement in the Council of Ministers (according to Art. 175 of the Treaty of the European Communities) and reduce the European Parliament's role from one of co-decision to simple consultation. This is something to

which both the European Parliament and a number of member states are opposed. Still, individual member states would be free to recycle if they wished.

Auctioning has the further advantage of being highly compatible with internal market rules due to its high degree of transparency. Auctioning would avoid the risk of distortions to competition in the internal market because it would not require delicate negotiations over how many allowances would be allocated to each firm or how new entrants should be treated. Irrespective of the allocation method chosen (grandfathering or auctioning), a number of permits must be withheld to accommodate new entrants, either by reducing the allocated permits of existing participants or by reserving a part of the initial permits for newcomers. The latter method is used in the US SO_2 trading scheme, where the reserved permits are auctioned annually.

Benchmarking, a specific form of grandfathering, is theoretically the most equitable approach to allocation since it is based on the actual state of technology applied, taking into account past investments. The main disadvantage is that it requires considerable current and historical data, which are not universally available in the EU, let alone the candidate countries. Whether benchmarking will become a real option in the future depends on the future availability of data.

Updating tends to be less efficient than either auctioning or grandfathering, partly because it would have higher administrative costs and higher compliance costs due to the output subsidy effect. Updating can provide more flexibility to firms and thereby alleviate fears that emissions trading would place a cap on growth. The experience of NEAs implies that the use of updating as an allocation methodology in the EU would lead to increasing transparency requirements and stakeholder involvement.[34]

4.3 Setting the target

No less controversial than deciding how to allocate scarce allowances is the method of creating scarcity, i.e. choosing the level at which to set the initial targets. Allocation and setting the target are two sides of the same coin and as such must be considered at the same time.

4.3.1 Relative or absolute targets?

A first issue is whether targets should be absolute, i.e. based on a cap on total emissions, or relative, i.e. based on emissions per unit of output. Cap-and-trade schemes can in effect only function on the basis of absolute targets, but baseline-and-credits schemes can accommodate both relative and absolute targets.

The ability of baseline-and-credit schemes to accommodate relative targets more easily may constitute an advantage, particularly given the fact that a great majority of NEAs in Europe are based on relative targets (ten Brink et al., 2002). Baseline-and-credit schemes therefore have a potential to become a bridge to move from NEAs to emissions trading (Egenhofer, 2002) and thereby reduce the costs of transition to an economy governed by emissions trading.

It is argued sometimes that relative targets are less restrictive on economic growth than absolute targets, which are sometimes seen as a cap on the ability of the economy to expand. This does not necessarily need to be the case, however. Although absolute caps do in theory impose an absolute restriction on the amount of GHGs emitted, their effect on a company's growth depends on both the severity of the cap itself and the allowance price. The cap in return is dependent on the level at which it is initially set as well as the digression (indeed, an increase in the number of allowances is at least theoretically possible) and the baseline year. The allowance price will be influenced by the size and liquidity of the allowance market, including whether

[34] For a more detailed analysis regarding the effects of the three allocation methods and their effect on the efficiency of trading and product markets respectively or tax distortions and differences arising from using distinct metrics such as input, output or emission based, see NERA (2002).

allowances can be obtained from outside the EU (through the use of the project mechanisms, for instance). To minimise risks of ever-rising allowance prices, one possibility would be to set an initial penalty at a fixed level (say €20 or €30), which would in effect act as a price cap on allowances. This has been done in the Danish scheme, where the penalty rate has been set at approximately €5.40.

Although relative targets may remain attractive to industry, especially in times of high growth, the situation may be reversed in times of slow or negative growth, since efficiency improvements are mainly linked to investment. If such new investment does not take place, targets would most likely not improve. More recently, the economic literature has also indicated that relative targets in fact constitute an *output subsidy*, as recently outlined in a study by the finance ministry of the Netherlands (Koustaal et al., 2002). Relative targets can lead to perverse incentives such as the production of unnecessary product units, because of the subsidy inherent in the allowance. This requires, as a consequence, higher permit prices – and therefore higher overall costs – for relative targets than in the case of absolute targets. The real effects may not be as high as the theory suggests, however, given existing distortions due to inefficient taxation or market power in the emissions market.

Absolute targets are often preferred because they bring a greater certainty regarding the final emissions. The UK experience revealed that the UK government prefers cap-and-trade schemes, which provide better assurance of meeting the agreed target. On the other hand, uncertainty due to the ever-increasing emissions from the transport and household sectors is most likely to be higher than any uncertainty caused by relative targets for the industrial sector. Other governments may value the potential risk of overshooting due to relative targets differently. In any case, the level of uncertainty for an emissions-trading scheme would be the same as for voluntary agreements based on relative targets. If the public and governments can accept relative targets for voluntary agreements, there is no reason why they should not also accept them for emissions trading.

In conclusion, relative targets could be combined with baseline and credit schemes, and both combined could ultimately play an important role in a transition period towards emissions trading. Baseline-and-credit schemes that are based on relative targets could smooth the transition from NEAs to emissions trading. Whether this is feasible will depend, however, on whether baseline-and-credit schemes with relative targets would be compatible with an adopted EU-wide emissions-trading Directive. Whether such schemes can live up their expectations remains to be seen. To date there is no major experience (to the authors' knowledge) of credit-and-baseline schemes in the EU, although there is some to come in the UK.

4.3.2 Target-setting and the internal market

Setting the target depends on many more variables. The proposed Directive mentions (in its Annex III) the following principles that should inform target setting: i) targets should be consistent with the EU burden-sharing agreement; ii) targets should be consistent with existing national trajectories; iii) the technological potential should be taken into account; iv) reductions as a result of other EU Directives (e.g. on electricity from renewable energy sources) should be excluded; v) allocations of allowances should not be in excess of expected requirements; vi) there must be provisions for new entrants; vii) early action should be acknowledged; and viii) transparency and public consultation will be required.

These principles are very general and give a high degree of discretion to member states, however. The some worry therefore was that some member states might unduly favour "their" companies by setting easy targets. To some extent, these concerns are addressed by the notification provisions of the national allocation plan (as required in Art. 9 of the proposed Directive). Furthermore, EC competition law (see above, section 3.2.2) requires *ex-ante* notification, providing a well established instrument by which the European Commission

ensures that national legislation does not distort competition within the internal market or create trade barriers. The EC state aid provisions provide the Commission with a further powerful and proven instrument to ensure that member states do not unduly favour their own industries.

Nevertheless, there have been calls for an "objective" or more centralised system for target-setting using, for example, standard performance rate (SPR) indicators at EU level to set the target for each industry. Those industries that perform better than the industry average would be set a target that is above their current output, whereas those that perform below the industry average would be set a harder target, requiring them to reduce GHG emissions or buy extra allowances. Such an approach would undoubtedly reduce the risk of distortions in the internal market and favour those companies that have done most in the past to reduce their emissions, but there are still questions regarding the availability of the necessary data to make such a system operational. Data of a sufficiently high quality to determine an SPR seem to be available or will be in the near future, but it is not clear whether industry would be able to provide sufficient data to allow governments to benchmark their performance against an SPR.

4.3.3 Target-setting is multifaceted

Irrespective of which approach is taken in the end, there will always be an element of political bargaining regarding target-setting. Even if the target were set in the end on a relatively "objective" measure such as an SPR, additional flexibility would still be provided by decisions relating to the baseline year, the gases included and the sectors covered. Other elements that would affect the stringency and thereby the burden of the target include the use of relative targets, the use of the project mechanisms and banking provisions, and the use of a fixed penalty rate to act as a safety valve against the risk of too-high allowance prices and to alleviate fears that emissions trading damages EU industrial competitiveness. All these elements are discussed elsewhere in the report.

When discussing and deciding on targets it will be unavoidable that the various parameters that influence the stringency of the target will be part of the bargaining between governments and industry. For this reason, a focus on allocation and target-setting alone is too narrow. Any discussion requires, for the full perspective, an assessment of the impact of other parameters discussed above.

4.4 Voluntary participation

The case for a voluntary trading scheme is based on the argument that emissions trading represents a paradigm shift in EU economic regulation, and that this shift will be expensive. Since the costs of transition are likely to differ from member state to member state, sector to sector and even firm to firm, it is argued, member states, sectors or even firms should be free to decide whether to participate or not. Otherwise, in the case of a mandatory scheme, the difference in transition costs would lead to distortions to competition.

If this argument is to hold true, we need to consider whether introducing a cap-and-trade scheme indeed constitutes a systems change and whether emissions trading is by and large incompatible with regulation (i.e. emissions or technology standards) and taxation as well as NEAs that are based on relative targets.

4.4.1 Emissions trading – A paradigm shift?

Combining regulation with emissions trading would in fact amount to double regulation, prescribing for a firm both the quantity of emissions (in the case of the trading scheme) and the technology to be used (in the case of the regulated standard). This would annul the advantage of emissions trading, which is that the polluter can abate emissions where is cheapest, leaving the emitter with two sets of conflicting constraints. Governments, consequently, must choose

between regulation and emissions trading. Similarly, taxation and allowance trading are largely incompatible. Taxation fixes the marginal abatement costs of compliance with an uncertain level of compliance, whereas allowance trading fixes the level of compliance but results in uncertain marginal costs. In practice, however, allowance trading and taxation can be combined in a hybrid system if a price ceiling for the allowance is set through, for instance, a fixed penalty price (as in the Danish emissions-trading scheme). If the price for allowances goes beyond the penalty, the penalty rate effectively assumes the function of a tax with the predictable result that marginal abatement costs are fixed, but the level of compliance is uncertain (i.e. the same effect as a tax). Regarding the interaction of NEAs and emissions trading, the discussion above (section 4.3.1) on the different concepts of trading schemes and the debate on relative versus absolute targets concluded that cap-and-trade schemes are largely incompatible with NEAs if the latter are based on relative targets, whereas baseline-and-credit schemes could be combined with NEAs.

Returning to the original question of whether the proposed Directive on emissions trading constitutes a systems change, a number of observations can be made. Legally speaking it does not constitute a systems change, since to date – apart from the ACEA/JAMA/KAMA agreement with the car industry – there is no EU-wide regulation of GHG emissions. In practice, however, member states already regulate greenhouse gas gases through regulation, taxation and NEAs. In reality, therefore, the introduction of a cap-and-trade scheme would amount to a systems change for at least some areas. The foregoing analysis suggests that regulation via emissions or technology standards would be incompatible with emissions trading and would have to be discontinued at member state level if an EU Directive on emissions trading is adopted. The same is true for energy efficiency requirements in the IPPC Directive, since these would amount to double regulation. Although there are ways in theory to link emissions trading with taxation – by setting a penalty rate to act as a price cap for allowances, for instance – or NEAs with relative targets – through baseline-and-credit schemes, for instance – the current Commission proposal does not allow for such a linkage. The proposed cap-and-trade scheme would by and large be the only instrument to regulate CO_2 for the affected industrial sectors.

4.4.2 Could a voluntary scheme work?

The prospect that emissions trading represents a systems change has given rise to calls from some sectors that participation in the trading scheme should be voluntary. It is difficult to see how a voluntary scheme could work in practice, however. It takes supply *and* demand to drive a market. A basic requirement for a well functioning market is that all sectors covered by the emissions-trading scheme have an incentive to take part in that market. This incentive would be given as soon as companies take on targets. Assuming that the trading scheme were voluntary at company or sector level, the most likely outcome would be that only those firms that can easily meet their targets would accept a cap. The most likely outcome would be a market with sellers and no buyers. Similarly, allowing member states to opt out would mean that first, there would be no uniform EU carbon price and second, those countries with low abatement costs would have little or no incentive to join a system with higher abatement costs, since net buyers domestically would have to pay a higher price than otherwise. Theoretically, this could be addressed by an incentive system to entice buyers into the market. Such incentive systems are prone to fall subject to EC rules governing state aid, however, and they would add a further layer of government intervention. The likely consequence would be tension in the internal market. The recent Commission state-aid investigations into the Danish and UK emissions-trading schemes and the German *Freiwillige Selbstverplichtung* (voluntary commitment) may offer a taste of things to come.

Combining emissions trading with an NEA could be a useful but incomplete way to create an emissions-trading market. NEAs such as Germany's *Selbstverpflichtung* may lead to overall emissions reductions, but such agreements are inherently non-transparent since they involve

burden-sharing arrangements between firms that necessarily must be worked out in secret negotiations. Different voluntary systems might not necessarily be compatible with each other, reducing flexibility for the market participants. Voluntary systems also depend on a kind of altruism. Without incentives to join a trading system, a firm in a sector that has accepted a reduction target will be reluctant to bear the cost of reducing emissions unless it receives compensation from the other firms within the group that are also benefiting from the scheme. This disadvantage could arise in the UK trading scheme among participants in the Climate Change Levy that have delegated their trading authority to their sector association.

4.4.3 Nevertheless, a temporary voluntary scheme could address the costs of adaptation

Although a voluntary trading scheme does not appear to be a preferable option, there is still scope for *temporarily* introducing voluntary elements in a trading scheme. This could address the *costs of adaptation,* facilitate *capacity-building* (e.g. administrative, monitoring, trading infrastructure, etc.) and help to overcome political obstacles to introduce a trading scheme. A precondition is that participation in emissions trading must become mandatory according to a definite timetable, because an emissions-trading scheme based on voluntary participation forever will not work.

Such temporary elements of voluntarism could be done through opt-outs via enabling clauses. These enabling clauses could be set at three possible levels: EU member state, sector and company. All three options have serious negative effects that need to be weighed against the potential benefit of reducing transition costs.

i. *Member-state level.* The most radical approach would be to allow member states to opt out of the trading system. This would almost certainly lead to different national carbon prices across the EU and therefore to disjointed national carbon markets in the EU. The result would most likely include not only a fragmented internal market but also lower efficiency gains due to lower liquidity and reduced market size.

ii. *Sector level.* Enabling clauses at sector level equally risk leading to distortions to the internal market and would need to be carefully aligned with EU internal market and competition law. The argument that enabling clauses at member state level would lead to lower economic efficiency also holds for opt-outs at sector level. The main difference is that opt-outs at sector level would not prevent a uniform EU carbon price, provided that not all sectors of a given member state are excluded.

iii. *Company level.* The effects of enabling clauses at company level are similar to those at sector level, with two exceptions. Opt-outs at company level might create distortions to competition not only within the EU but also within a member state. Thus, if companies feel that an opt-out is a better deal, the whole sector might pursue this road, leading *de facto* to opt-outs at sector level.

The crucial issue is how opt-outs are decided upon. If the decision is left to member states, there is no difference in the outcome between enabling clauses at member state, sector or company level, since a member state might decide to allow its entire industrial sector to opt out of the scheme. The situation would be different if opt-outs were decided at EU level, for instance by obliging member states to make the case for opt-outs (e.g. by proving that there would be high transition costs) and, crucially, to propose credible and transparent measures that lead to comparable results. The requirement that non-participating sectors and companies undertake comparable efforts is particularly important to prevent the non-trading sectors from free-riding on the efforts of the trading sectors. A further negative consequence would be that the years in which opt-outs exist are likely to be high-emission years, making the target harder to achieve later. Should any opt-outs be granted in such a way, the initial “voluntary” phase would in fact

be better described as a *translation period*, whereby existing national policies are translated into an EU-wide emissions-trading scheme.

4.4.4 Elements of "voluntarism" in a translation period

If we accept the value of a translation period to minimise the costs of transition and allow for capacity-building with the certainty of a future mandatory scheme, there are differences of opinion about what lends itself well to "voluntarism" and what does not. Participation during this translation period could become voluntary with regard to sector coverage, gases or targets, for example (see above sections on allocation and, especially, target-setting). Companies would be free to opt in or out of a trading scheme by choosing whether or not to accept a target. The definition of the target (its stringency and whether or not it is relative or absolute) could become a crucial element in informing the choice of whether or not to join the trading scheme. For example, a relatively soft initial target could constitute an incentive to join a scheme that is initially voluntary but will become mandatory. Caps on allowance prices through a fixed penalty rate could also make the scheme more attractive to undecided participants. Another incentive to join a voluntary scheme could be the possibility to bank allowances into the Kyoto period (on the basis of clear and transparent rules). Similarly, it needs to be ensured that those staying outside the trading scheme undertake comparable action.

On the other hand, it is essential that monitoring, verification and registries, and data collection in general to inform the choice for allocation – irrespective of which method is chosen in the end – are all essential for capacity-building and should be mandatory from the earliest stages, given that the trading scheme must eventually become mandatory.

Theoretically, a distinction could also be made between mandatory and voluntary participation with regard to the size of the company. For example, big companies (depending on an agreed threshold) could be obliged to participate whereas SMEs could be free to choose whether or not to participate. Whether such a distinction would be feasible depends on which sectors are covered. The proposed Directive does not foresee the inclusion of SMEs on a considerable scale.

References

Brewer, T. (2002), "The trade and climate regimes – compatibilities and conflicts in WTO-Kyoto Protocol relationships", Policy Brief presented at a CEPS workshop on The Transatlantic Dialogue on Climate Change: New Ideas for a New Era, CEPS, Brussels, 19 March.

Buchner, B., C. Carraro and I. Cersosimo (2001), *On the Consequences of the U.S. Withdrawal from the Kyoto/Bonn Protocol*, draft paper, Fondazione Eni Enrico Mattei, Italy.

Burtraw, D., K. Palmer, R. Bharvirkar and A. Paul (2001), *The Effect of Allowance Allocation on the Cost of Carbon Emissions Trading,* Discussion Paper 01-30, Resources for the Future, Washington, D.C.

Carraro, C. and C. Egenhofer (eds) (2002), *Firms, Governments and Climate Policy: Incentive-Based Policies for Long-Term Climate Change*, Edward Elgar, Cheltenham (forthcoming).

Carraro, C. and D. Siniscalco (eds) (1996*), Environmental Fiscal Reform and Unemployment*, Kluwer Academic Publishers, Series Economics, Energy, Environment, The Hague.

DEFRA (2000), UK Emissions Trading Scheme. Department for Environment, Food & Rural Affairs (DEFRA) (*http://www.defra.gov.uk/environment/climatechange/trading/index.htm*).

den Elzen, M.G.J., and A.P.G. de Moor (2001), *The Bonn Agreement and Marrakech Accords: An updated analysis*, RIVM.

Dudek, D. et al. (1997), *More Clean Air for the Buck: Lessons from the U.S. Acid Rain Emissions Trading Programme,* Environmental Defense Fund, Washington, D.C.

Egenhofer, C. (2002), "The compatibility of the Kyoto Mechanisms with traditional environmental Instruments", in C. Carraro and C. Egenhofer (2002).

Egenhofer, C. and F. Mullins (2000), *The Role of Emissions Trading in EU Climate Change Policy,* CEPS Working Party Report, Centre for European Policy Studies, Brussels.

EpE/MIES (2000), "Implementing an emissions credits trading system in France to optimize industry's contribution to reducing greenhouse gases." MIES (Interministerial task force on climate change), Industry Working Group, Paris, March (see www.epe.asso.fr).

European Commission (2001a), *Proposal for a Council Decision concerning the conclusion, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder*, COM(2001) 579.

European Commission (2001b), *Communication from the Commission on the implementation of the first phase of the European Climate Change Programme*, COM(2001) 580.

European Commission (2001c), *Proposal for a Directive of the European Parliament and of the Council establishing a framework greenhouse gas emissions trading within the European Community and amending Council Directive 96/61/EC* COM(2001) 581.

European Commission (2001d), *European Climate Change Programme: Report*, Brussels, June.

European Commission (2001e), *Commission proposal for a Directive on the energy performance of buildings*, COM(2001) 226, Brussels.

Godard, O. (2000), "L'expérience américaine des permis négociables", *Economie Internationale*, Vol. 82/2, Paris.

Haites, E. and F. Mullins (2001), *Linking Domestic and Industry Greenhouse Gas Emissions Trading Systems,* paper prepared for EPRI, IEA and International Emissions Trading Association (IETA) (see http://www.iea.org/envissu/epri.pdf).

Hasselknippe, H. and G. Høibye (2001), *Meeting the Kyoto Protocol Commitments*, NHO (Confederation of Norwegian Business and Industry), Oslo.

Hessen (2001), Pilotprojekt "Planspiel zum CO_2 Emissionshandel. Abschlussbericht - Ergebnisse and Empfehlungen", Hessisches Ministerium für Umwelt, Landwirtschaft und Forsten (see http://www.mulf.hessen.de/umwelt/atomaufsicht/_fr_atom.htm).

Hourcarde, J-C and E. Fortin (2000), "Impact économique des politiques climatiques: des controverses aux enjeux de coordination", *Economie Internationale*, Vol. 82/2, Paris.

Janssen, J. (2000), "Kyoto Flexible Mechanisms: Opportunities and Barriers for Industry", in C. Carraro and C. Egenhofer (eds) (2002).

Joskow, P. and R. Schmalensee (1998), "The Political Economy of Market-Based Environmental Policy: The U.S. Acid Rain Program", *The Journal of Law and Economics*, Vol. 41/1, Chicago.

Klaassen, G. (1996), *Acid Rain and Environmental Degradation: The Economics of Emissions Trading*, Edward Elgar, Cheltenham, UK and Brookfield, US.

Kopp, R. et al. (1999), *A proposal for Credible Early Action in U.S. Climate Change Policy*, Resources for the Future, Washington, D.C.

Korppoo, A. et al., (2002) *Russian Green Investment Scheme: Potential for Cooperation on Green Investment Strategies,* forthcoming.

Koutstaal, P. et al. (2002), "A Comparison between Emissions Trading with Absolute and Relative Targets", paper presented at the CATEP meeting on Design and Integration of National Tradable Permit Schemes for Environmental Protection, University College London, 25-26 March.

McKibbin, W. and P. Wilcoxen (1997), *A Better Way to Slow Climate Change*, Brookings Policy Brief No.17, Brookings Institution, Washington, D.C.

NERA (2002), *Evaluation of Alternative Initial Allocation Mechanisms in a European Union Greenhouse Gas Emissions Trading Scheme*, report prepared for DG Environment, European Commission by National Economic Research Associates (NERA) with assistance from Jaako Pöyry Consulting, March.

Pedler, R.H. and G. Schaefer (eds) (1996), *Shaping European Law and Policy: The Role of Committees and Comitology in the Political Process,* European Centre for Public Affairs, Maastricht.

Stavins, R. (2001), "Experience with Market-Based Environmental Policy Instruments", Discussion Paper 01-58, Resources for the Future, Washington, D.C. to be published in K.G. Mäler and T. Vincent (eds), *The Handbook of Environmental Economics,* North-Holland/Elsevier Science, Amsterdam (forthcoming).

Sterner, T. and C. Azar (2002), *Allowances must be auctioned!,* discussion paper for Climate Strategies, Department of Economics, Göteborg University and Department of Physical Resource Theory, Chalmers University of Technology, Göteborg.

Stronzik, M. and M. Cames (2002), *Final Report for the Preparation of an Opinion on the Proposed Directive on the Implementation of EU-wide Emissions Trading (COM(2001)581*), report on behalf of the Ministry of the Environment and Transport of the State of Baden-Württemberg, Centre for European Economic Research (ZEW) and Öko-Institut – Institute for Applied Ecology, Mannheim/Berlin.

Ten Brink, P. (ed.) (2002), *Voluntary Environmental Agreements: Process, Practice and Future Use*, Greenleaf Publishing, Sheffield.

Ten Brink, P. et al. (2002), "Negotiated Agreements and Climate Change Mitigation", in C. Carraro and C. Egenhofer (eds) (2002).

Tietenberg, T. (2001), "The Tradable Permits Approach to Protecting the Commons: What have we Learned?" paper presented at the International Workshop on Trading Scales: Linking Industry, Local/Regional, National and International Emission Trading Schemes, Fondazione ENI Enrico Mattei (FEEM), Venice, 3-4 December.

UNFCCC (2001), *The Marrakech Accords and the Marrakech Declaration*, Bonn (see http://unfccc.int/cop7/documents/accords_draft.pdf).

APPENDIX 1
TYPES OF EMISSIONS TRADING

Trading, one of mankind's oldest activities, requires only two elements: a tradable commodity and a willing seller/buyer. The emissions reductions established by the Kyoto Protocol, the different economic states of the signatories and the preferences of certain countries, especially the US, make GHG emissions trading almost inevitable. Previous emissions-trading programmes have taken one of two forms, credit trading or allowance trading, but it is possible to envisage other design options.

It is important that the correct terminology be used and the proper distinction maintained between terms such as "assigned amount", "allowance", "credit", etc. Much confusion and misunderstanding have been caused in the past by the incorrect usage of terminology.

1. Credit Trading

In credit trading. emissions credits are generated when emissions are reduced below an agreed baseline. This may be based on absolute criteria (e.g. tonnes of CO_2-equivalent per annum) or relative criteria (e.g. tonnes of CO_2-equivalent per unit of output). These emissions credits can then be traded. By their nature credit programmes tend to be associated with specific sources or projects.

Where the baseline forms an absolute cap on tonnage then this form of credit trading is fully equivalent to allowance trading (see below).

The nature of credit trading requires the certification of trades in order to quantify the emission reductions. If the credit trading is associated with voluntary or negotiated agreements, these mechanisms may already be in place.

Credit trading does not, in general, guarantee the achievement of absolute targets.

Emission Reduction Units, generated from JI projects, and Certified Emission Reductions, generated from CDM projects, can be regarded as examples of emission credits that are generated against a baseline (one that will require international recognition). Once acquired, both kinds of credits are added to the assigned amounts of the acquiring country and can then be traded in absolute terms.

2. Allowance trading

Allowance trading begins by defining an aggregate emissions cap (such as a proportion of a country's Kyoto target). The emissions authorised by this cap are then allocated to eligible entities. By allocating a finite number of allowances to emitters the government puts a cap on total emissions covered by the system.

The two most important factors in any allowance trading system are the coverage of the system and the allocation of allowances. The allocation of allowances is a highly political process in which Governments take account of wider political objectives such as energy and social policies.

Since JI and CDM credits are added to the assigned amount of the acquiring country they can be directly used for emissions trading.

In general, programmes imposing emission caps coupled with allowance trading have performed well, whereas credit-trading systems have generally not met expectations. Credit-trading systems have proved to be less secure environmentally and have created higher transaction costs and greater uncertainty and risk than allowance trading.

Sinks that create direct real reductions can be used as credits in a capped allowance trading system.

3. Combination of trading systems

It is feasible, although more complex, to combine different systems if there is a common currency (e.g. tonnes of CO_2 equivalent, as is defined by the UNFCCC) and provided that appropriate allocations are agreed by all parties. Great care needs to be taken to ensure that there is no double accounting (of either positive or negative impacts), no leakage and no "free-riders".

Source: UK Emissions Trading Group.

APPENDIX 2
AUCTIONING VS GRANDFATHERING: AN ECONOMIC ANALYSIS

The Kyoto Protocol and the Marrakech Accords set rules for the international trade of carbon permits from 2008, and the EU has agreed on a scheme to redistribute its overall reduction burden between the 15 EU member states. Each country has the authority and responsibility to control its own emissions and to choose the mix of policy instruments it sees fit. This choice contains several difficult aspects. One of these is how to allocate carbon permits within the economy. It is incorrect to argue, as some do, that these are domestic issues and do not require harmonisation. Auctioning would be the best instrument for allocation, but if some countries choose to allocate permits freely, their competitors in other EU countries would argue that they face an unfair burden. This could well trigger the proverbial "race to the bottom" as each country competes to be the most business-friendly.

To explain the various effects that would result from the different ways of allocating permits, we need to consider the mechanisms through which a policy instrument operates. Let us consider the case of a tax on fossil carbon, which has three different effects:

1. It provides an incentive to substitute carbon-saving technologies for carbon-intensive ones: for instance to use wind instead of coal in producing electricity. This is the *technology effect*.
2. Some electricity will still be produced using gas or coal and the tax on these sources will make electricity more expensive leading households and industries to use less electricity. This is the *output-effect.*
3. Finally there is a *revenue recycling effect,* since the tax revenue can be used to lower other taxes at the national level.

If allowances are auctioned they will have all three effects. Auctioned allowances are, like taxes, an ideal market instrument for this problem. If permits are grandfathered, in contrast, they will only have effects 1 and 2, and if they are allocated in proportion to output they will only have the first, technical effect.

The idea of the "output-effect" is that output expansion should carry an opportunity cost – the cost of acquiring more permits or of selling those already held. If a steel plant expands its production, then this should *not* lead to an automatically increased allocation of free permits because that would in effect subsidise output expansion in a way that goes exactly against the grain of what the Kyoto Protocol tries to achieve.

We should mention that there are many successful programmes that allocate permits on the basis of production volume. This was the case of the US programme for the phase-out of lead from petrol, although in this case only the technology effect was desired (since the intention was to phase lead out by new technology, not by using less petrol).

To solve the problems of climate change, both effects, the technological and the output substitution, are needed. Programmes lacking these effects may still be beneficial, but they will be neither sufficient nor efficient in solving the problems. This is for instance the case of "benchmarking" programmes such as the UK's *Climate Change Levy Agreements* (CCLA) for energy-intensive firms, which operate on the basis of relative targets for energy efficiency. Such programmes do create incentives such as the 1st effect above but they do not have output-substitution or revenue-recycling effects (2-3) and thus do not fully exploit all the potential for cost-savings to the economy.

Many European countries already levy substantial taxation on energy and/or carbon emissions. If such taxation were to be replaced by free permits, this would in effect lead to *lower* carbon emissions costs and that would clearly be a step in the wrong direction. On the other hand, if all carbon rights were auctioned that would imply a dramatic increase in carbon-emissions costs and raise fears of lowered competitiveness. In the old world of competing European states each with its own separate market, currency and legislation, competitiveness might in principle have posed such a problem. The academic studies on the question of whether environmental regulation leads to capital

flight are usually inconclusive, but in principle the possibility of capital flight exists. In an integrated Europe, however, it is all the more unlikely that there would be even a small loss of competitiveness simply because all the economies of Europe experience the same conditions.

Allocation of allowances for free is difficult. If allowances are allocated in proportion to current output, the important effect of output substitution mentioned above is lost. This is the reason why the US often uses "grandfathering" – which means that industries receive permits in proportion to historical levels of pollution. This is not a good principle since it rewards the least effective and discourages new and efficient firms. Grandfathering does not in any way encourage "proactive" behaviour. In fact if all polluters were to know that all regulators will always use "grandfathering", then clearly they would *never* have any incentive to clean up problems in anticipation of future legislation and policy. On the contrary, there would be quite a strong incentive for polluters to emit as much as possible in order to get a large allocation of permits or a favourable baseline against which to measure abatement. Since all firms would do this, it might be hard to find proven technology that is cleaner and the development of clean technology would be slower.

For political reasons, however, the free allocation of allowances can be used to win over the opposition to the overall idea of permit-trading and regulation. Nevertheless, as suggested above, there is ample room for lobbying as different parties will find different arguments to support mechanisms that benefit them individually. Given the considerable size of the rents involved in carbon permits it seems inevitable that the ultimate mechanism chosen will be some form of compromise between various principles. This would correspond to a notion of shared ownership of the natural environment.

In the long run, when the permits become very expensive, the importance of allocation costs will dominate and it is thus important that most permits should eventually be auctioned. In the short run, however, the key issue is to get stakeholders to agree to launch a workable system. Thus in the short run, and particularly in the pre-Kyoto phase (2005-08), the political and distribution aspects are dominant. There could initially be a component of free allocation, most of which would be grandfathered to pave the way for acceptance and to avoid any perceived problem of competitiveness. There would still be a significant share of auctioning (which helps initiate market trading and increases the reliability of the system for new entrants). The share of auctioning should however increase over time as we move into the Kyoto Protocol's first Commitment Period (2008-12, during which time the US is expected not to participate) and particularly into the second Commitment Period (2013-17), during which time it is hoped that more countries, including the US, will participate.

Source: Discussion paper for Climate Strategies by Thomas Sterner, Department of Economics, Göteborg University and Christian Azar, Department of Physical Resource Theory, Chalmers University of Technology, Göteborg.

APPENDIX 3
GLOSSARY OF TERMS AND ABBREVIATIONS

AAU	Assigned Amount Unit, a part of the overall absolute target of GHG emissions assigned to Annex B Parties to the Kyoto Protocol.
Absolute target	A cap on emissions expressed in absolute terms (e.g. X tonnes of CO_2); see also Specific Targets and Box 6.
Allowances	Refers to (allowance-based) emissions trading and means the total allowed emissions as expressed in permits, quotas or certificates for GHG emissions that can be traded.
Annex 1	Annex 1 of the UNFCCC refers to industrialised countries (including many economies in transition).
Annex B	Annex B of the Kyoto Protocol to the UNFCCC refers to those industrialised countries (including many economies in transition) that have agreed to an absolute reduction target under the Kyoto Protocol. Annex B is largely the same as Annex 1 except that Belarus and Turkey are not included in Annex B.
BAT	Best-Available Technology.
CDM	Clean Development Mechanism: Art. 12 of the Kyoto Protocol establishes that Annex I Parties (and firms in these countries) can transfer certified emissions reductions (CERs) from projects in developing countries.
CERs	Certified Emission Reductions, credits generated by CDM projects.
CHP	Combined Heat and Power (co-generation), which has a conversion efficiency of 70% or more.
COP	Conference of the Parties, consisting comprising representatives of governments that are Party to the UNFCCC. The COP is the supreme decision-making body in the UNFCCC negotiations. The seventh such conference, COP7, was held in Marrakech, Morocco, in November 2001.
CO_2	Carbon dioxide, the main GHG.
CH_4	Methane.
EC	European Communities, referring to the economic competencies of the European Union.
ECCP	European Climate Change Programme, the European Commission's programme to consult with stakeholders on climate change.
EEA	European Economic Area, comprising the 15 EU member states plus Norway, Iceland and Liechtenstein. Within the EEA the rules of the EU internal market apply, including a common jurisdiction.
EPA	Environmental Protection Agency (US).
EpE	Entreprises pour l'Environnement, a grouping of major French companies active in environmental issues.
ET	Emissions Trading: generic term for trade of emissions certificates (see also IET, International Emissions Trading).
EU	European Union (see also EC).

€ (or EUR)	EU single currency, euro.
FDI	Foreign Direct Investment.
Flexible Mechanisms	Those market-based mechanisms established by the Kyoto Protocol that allow the transfer or exchange of emissions reductions obligations between Parties. Sometimes also referred to as the Kyoto Mechanisms or Mechanisms (see also CDM, JI, ET and Box 3).
GHG	Greenhouse gas, usually referring to one of the six gases covered by the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).
GWP	Global Warming Potential. The index used to translate the level of emissions of various gases into a common measure.
GIS	Green Investment Scheme. A proposal to allow investments, for example in Russia, in exchange for AAUs – possibly even in advance of the Kyoto Protocol's first Commitment Period (2008-12).
Grandfathering	The practice of granting allowances in an allowance-based emissions-trading scheme to an entity based on its previous emissions.
Hot air	Quantities of unused AAUs in some Parties that could be traded in IET. Trade of large quantities of surplus AAUs could depress the carbon price to an extent that it could move towards zero, thereby undermining efforts to invest in emissions reduction. Hot air arises from the fact that the targets under the Kyoto Protocol for some Parties are higher than projected actual emissions (e.g. in the case of Russia, Ukraine, based on a business-as-usual scenario). Hot air may also arise out of uncertainties due to the use of land-use changes (for the latter, see also Sinks).
IET	International Emissions Trading, as established under Article 17 of the Kyoto Protocol, allowing Annex B Parties to trade AAUs.
IPCC	Intergovernmental Panel for Climate Change, a scientific body created by the UN, generally assumed to be the most authoritative source on climate change science.
JI	Joint Implementation: Art. 6 of the Kyoto Protocol establishes that Annex I Parties (and firms in these countries) can transfer ERUs from individual projects.
Mt	Million of tonnes.
$MtCO_2e$	Millions of tonnes of carbon dioxide equivalent, the most commonly used way to express quantities of GHGs..
NEA	Negotiated Environmental Agreement, also known as Voluntary Negotiated Agreement (VNA), Voluntary Agreement (VA), Negotiated Agreement (NA), Long-Term Agreement (LTA).
NGO	Non-Governmental Organisation.
ODA	Overseas Development Aid
OECD	Organisation for Economic Cooperation and Development.
Parties	Countries that are party to the UNFCCC. The European Union is also a Party.
PAMs/Policies and Measures	GHG-reduction policies that take place domestically, rather than through the Flexible Mechanisms. The Marrakech Accords specifies that a "significant" share of a country's abatement effort should be

	through PAMs rather than the flexible mechanisms.
Sequestration	The capture of CO_2 in sinks.
Sinks	The ability of land to absorb CO_2. Land-use changes that lead to sinks (such as afforestation, reforestation) or remove sinks (e.g. deforestation), are counted against a country's emissions.
SPR	Standard Performance Rate. Indicator of a standard emissions intensity for any given industry or sector.
UNFCCC	United Nations Framework Convention on Climate Change, agreed at the UN Conference on Environment and Development (Rio de Janeiro, 1992). The ultimate objective of the UNFCCC is to stabilise GHG emissions at a level that would prevent dangerous anthropogenic interference with the climate system.
WTO	World Trade Organisation.

APPENDIX 4
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