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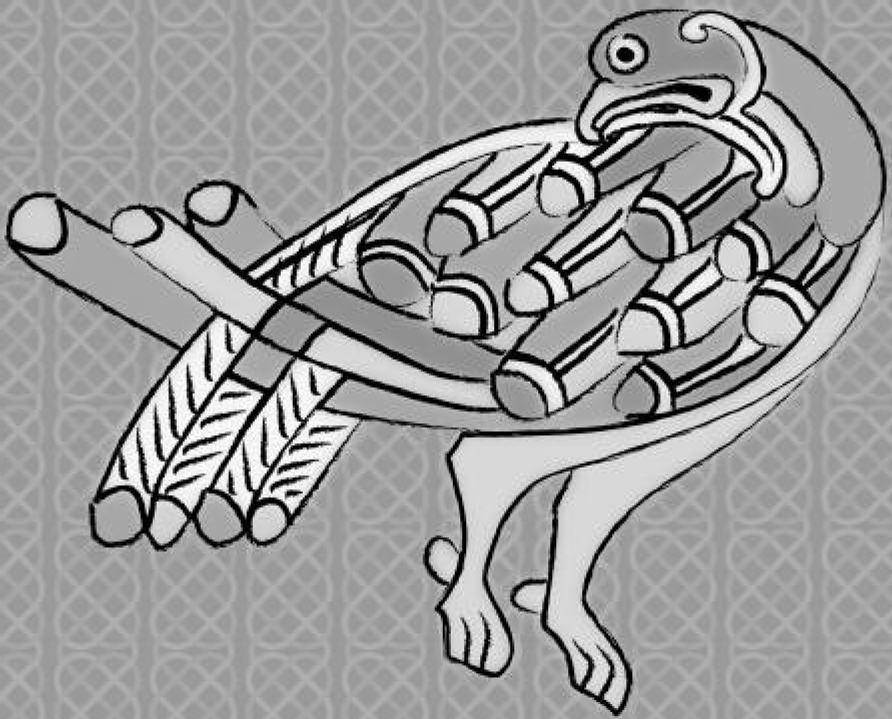


Objective and Audience

The overall objective of this series of Policy Briefs is to provide those in the policy system dealing with the design and implementation of emissions trading schemes with insights that allow them to understand some of the key issues, what theory and experience have to offer in clarifying choices and their implications.

A key issue that must be addressed in setting up and operating an emissions trading scheme is the institutional framework. This Policy Brief discusses the issues involved in tackling this crucial issue.

The key audience will typically have little or no background in economics, but will be wise to the ways in which policy evolves and is shaped. The text limits the use of technical language, of graphs and equations, and any material that might intimidate the non-specialist. Boxes are used to highlight case studies or interesting examples.

It is informed by the research papers presented at the Concerted Action on Tradable Emissions Permits (CATEP) workshops — these are available on www.emissionstradingnetwork.com and have been synthesised in Convery *et al.* (2003), Haites (2003), Lefevere (2003) and Peterson (2003). They will also be published in synthesis form by the OECD in 2004.

The 5th Framework DG Research CATEP (Concerted Action on Tradeable Emissions Permits) network project has held a series of workshops over three years bringing together experts from policy, academic, research and industry fields to discuss the latest thinking, research and experience on Emissions Trading as the European Directive came closer to fruition. The Network consisted of eleven partners and this series of policy briefs reflects and synthesises the results of the workshops organised by the following topics:

1. Issues in Emissions Trading - an Introduction
2. Allocating Allowances in Greenhouse Gas Emissions Trading
3. Emissions Trading Regimes and Incentives to Participate in International Climate Agreements
4. Institutional Requirements
5. Linking Emissions Trading and Project-Based mechanisms
6. International Trade and Competitiveness Effects

A complete listing and links to all papers presented at the workshops and further details about the partners and the CATEP network can be found on the website: www.emissionstradingnetwork.com.

We gratefully acknowledge the European Commision's financial support of these Policy Briefs and the entire CATEP (EVK2-CT-2000-200003) project.

1. Introduction

Literature on emissions trading stems mainly from three broad fields: economics, legal studies and political economy. The economics literature concentrates on (rational) design options but focuses little attention as to how, and whether, institutions are actually capable of fulfilling the aims of a specific emissions trading scheme. The legal literature focuses on how to translate rational design options into law and statutes for institutions. Given that the legal systems — even within the EU — are very different, by definition, the legal literature is case-based, and this limits the generalisability of the results. The literature on the political economy of emissions trading does attempt to draw general conclusions on what design options work politically and which ones do not (Egenhofer, 2003).

This Policy Brief does not concentrate on the full range of political economy issues involved in emissions trading. Instead it focuses on a very narrow sub-set that we call 'design options at implementation stage'. It attempts to fill a gap by providing guidance as to how a good emissions trading scheme should be implemented if it is to function properly, i.e., reducing emissions in a cost-effective way.

There is limited literature in this field apart from the 'usual suspects', namely those involved in the US EPA cap and trade schemes. As a result, most of the literature will rely on US experiences; the US SO_2 trading scheme as well as the Ozone Transport Commission (OTC) NOx Budget Trading Programme.[1] The latter programme is particularly interesting in that it has been less centralised than the SO_2 allowance trading programme. The experiences of the US schemes will be compared with those of the EU emissions trading scheme (EU ETS), which is a primary focus of this Policy Brief.

There is another set of literature dealing with 'capacity' or 'capacity building' (Philibert, *et al.,* 2003), which is usually referred to as institutional, but this is beyond the scope of this brief.

1 The Clean Air Act Amendments (CAAA) of 1990 has established the Acid Rain Programme, which uses an allowance trading scheme to reduce SO_2 emissions. The OTC consisting of 11 states in the northeastern region, some counties of Virginia, and the District of Columbia set up the NOx Budget Trading Programme, which was meant to help states meet the obligations of the NOx State Implementation Plan (SIP) Call.

2. Cap and Trade and Rate Based Trading

Emissions trading, and cap-and trade schemes in particular, offer the possibility of least-cost abatement. But that promise will only be fulfilled if schemes are properly designed to reduce transaction costs as much as possible.

2.1. Inefficient design

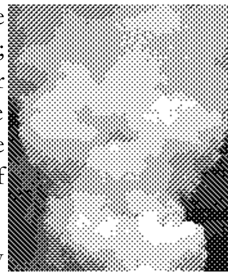
The advantage of cap-and-trade emissions trading schemes is that it produces the least cost means of achieving a specified level of emissions. It imposes a cost at the margin as each additional unit of emissions requires surrendering an allowance. Technology standards are avoided, leaving participants in trading schemes free to apply whatever strategies they feel are most economical. However, rate-based trading, which is typically based on performance standards may have the same effect as direct regulation and may force firms to apply expensive technology to comply with a standard in order to gain eligibility for participation in a trading scheme. In principle, this can be addressed by applying concepts such as netting, bubbles, averaging, banking and borrowing. But the early US emissions trading schemes show that this makes trading schemes more complicated, and therefore increases the transaction costs (Klaassen and Nentjes, 1997a; Godard, 2000).

Inevitably, as a scheme is designed and developed, bargaining between industry and government on which performance standard to adopt and which flexibility provisions to accept adds complexity. Negotiated environmental agreements (NEAs), the European model of voluntary agreements have been greeted with suspicion by the public (ten Brink et al., 2003). This might increase administrative oversight and the risk of inefficient economic solutions, e.g. hybrid solutions using market mechanisms and command-and-control elements together as was the case in EPA early trading schemes (Klaassen and Nentjes, 1997b). It might also create political uncertainty (Godard, 2000) and eventually 'regulatory creep'—continuous changes of the regulatory environment. Such bargaining is largely absent in cap-and-trade programmes as well as credit trading on the basis of absolute targets except when deciding on overall number of allowances. This is based on an implicit performance standard coupled with output growth assumptions and once the target is set the most contentious issue politically is over, and with it the risk of mistrust leading to 'double-regulation'.

2.2 Transaction costs

In market economies, transaction costs are ubiquitous. They arise whenever a transaction is made. Transaction costs inhibit market activity and consequently limit the gains from trade. If the transaction costs inhibit trade in permit trading schemes, the advantages will not materialise. As emissions trading is a relatively new instrument, considerable attention has been given to transaction costs.

The literature (Stavins 1995; Dudek and Wiener, 1996; Kerr and Maré, 1997) distinguishes between a number of different transaction costs. First, the buyer and seller must find each other (search costs), communicate, and exchange information. They must bargain and make the deal, which could also involve, for instance, the drawing up of a contract (negotiation costs). Dudek and Wiener (1996) have grouped them as costs for market transactions. Furthermore, trades must be permitted by a regulatory authority (approval costs). Independent monitoring and verification (monitoring costs) will be required, and there must be a way of enforcing compliance (enforcement costs), although it is likely that the government will bear this cost (Stavins, 1995). Transaction costs may arise if the trading involves asymmetric or incomplete information (information costs). Trading may also involve the release of confidential information, making firms reluctant to trade except internally (Kerr and Maré, 1997; Convery, 2001). There are also opportunity costs arising from choosing one kind of emissions-trading regime over another more flexible or cost-effective one (Dudek and Wiener, 1996). The risk of failure of the transaction, due for instance to engineering failure or a change in political environment, may lead to insurance costs, either in the form of insurance policies or through an investment decision, such as diversifying a portfolio against the risk of failure in any one enterprise. For an overview see Table 1.



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, participation of small economic entities is preferable for efficiency (e.g., increase of liquidity) and effectiveness reasons. Results of a simulation study for a GHG emissions trading scheme in the German State of Hesse suggest however that transaction costs depend less on the size of the company than on characteristics of the emissions source (Hessen, 2001).

In the US permit market for lead emissions, for instance, the efficiency losses from transaction costs amounted to 10%. According to Kerr and Maré (1997), the lead trading programme was ‘very close to a textbook tradable permit market’ in that most of the traders are large sophisticated agents such as large refineries and oil companies, but even in this market some participants faced higher than average transaction costs, leading to efficiency losses.

This loss would be exacerbated ‘[if] the market was composed of small, unsophisticated players, or players with few existing connections among themselves’ (Kerr and Maré, 1997). Dudek and Wiener (1996) suggest numerous concrete proposals to address transaction costs in international emissions trading such as Kyoto trading and identify the clarity of property rights and obligations as the crucial determinant for transaction costs. A whole set of

Table 1. Variables affecting transaction costs borne by market participants

Category of Transaction Cost	Description	Variables Affecting Cost
Search costs	Seller and buyer must find each other and communicate and exchange information	- Liquidity - Transparency Can greatly be enhanced by market intermediaries, trade exchanges and 'optimal' definition of markets (for example no ceilings)
Negotiation cost	Seller and buyer must bargain and draw up contract	- Transparency - Volume of trades (economies of scale)
Approval costs	Trades need to be supervised by govern-ments	- Complexity of government regulation - Clarity of property rights
Monitoring costs	Necessity for independent monitoring and verification	- Efficiency of verification process - Clarity of property rights Does not differ to other instruments such as voluntary instruments, taxation or regulation
Enforcement costs	In case of non-compliance governments need to enforce it	- Simplicity/complexity of compliance system - Clarity of property rights
Information costs	Lack of, asymmetric, or release of confidential information	- Individual firm response
Opportunity costs	Arising from choosing one kind of ET scheme over another	- Carefulness of design of scheme
Insurance costs	Against technical or political risk	- Quality of installation - Predictability of government policy - Clarity of property rights and obligation

Source: Adapted from Egenhofer, 2003 (based on Stavins, 1995; Dudek and Wiener, 1996; Kerr and Maré, 1997; Stavins, 2001)

transaction costs is related to flaws in the design when setting up emissions trading schemes, which has been reported in many papers that can be found on the CATEP website (www.emissionstradingnetwork.com).
Nevertheless, as Stavins (1995) notes, even a complicated trading system with high transaction costs and consequently lower-than-expected levels of trade will most likely be more cost-effective than a conventional command-and-control. A trading system in which little trading takes place is likely to be less costly than, for instance, a technology standard, 'because a trading system provides flexibility to firms regarding their chosen means of control'. Choosing a trading system with high transaction costs obviously incurs the opportunity cost of the more flexible system that was not chosen.

The implication is, that although tradable-permit systems are demonstrably more cost-efficient than command-and-control systems, transaction costs can greatly affect the relative cost-effectiveness of differently designed systems. The devil is in the detail, since careful attention to the design of specific systems will reduce the risk of overselling these policy ideas and help create systems that can be implemented in the real world. As Convery (2001) points out 'economists tend to pay relatively little attention to institutional design — and associated legal and administrative frameworks — but they are central considerations if emissions trading is to be successfully mobilised.'

3. Implementation

At the implementation phase, the following are the main areas that affect transaction costs and ultimately mark the difference between success and failure: i) measuring, monitoring, certification, ii) transparency, iii) compliance, iv) opt-ins, v) enforcement, vi) degree of centralisation, vii) linking of cap-and-trade and credit-and-baseline schemes, viii) cap-and-trade and technology standards.

3.1 Measuring, Monitoring and Certification

Accurate monitoring and timely reporting ensure compliance, environmental integrity, and accuracy and comprehensiveness of the information. At the same time, monitoring and reporting carries the risk of high transaction costs. Mangis (1998) concluded for the US acid rain programme that accurate monitoring is the most complex and costly element component of the trading scheme. This has also been the case for the OTC NOx Budget Trading Programme, which was based on actual and real-time monitoring equipment. For example, each unit is required to install, certify, and operate an on-line direct Continuous Emissions Monitoring System (CEMS)[2] at the source. This measures hourly emissions and submits a quarterly report electronically to the USEPA's (United States Environmental Protection Agency) computer centre which houses the Emissions Tracking System (Holmstead, 2002). As a result the whole process of producing reports including certification of the monitoring equipment, and submitting them to EPA is fully automated. There was significant testing and refinement before the systems would reliably work. One third of initial files received by EPA in the first round of submissions were inaccurate (Mangis, 1998). This seems to call for built-in lead times and testing phases before actual monitoring and measurement equipment is actually applied. The EPA has at all times engaged in an active dialogue with the operators of all of the effected units to work out problems in data collection and submission to obtain the most accurate data (Mangis, 1998).

However, the situation is somewhat different in the case of greenhouse gas (GHG) emissions. While NOx and SO2 are indeed measured, GHG emissions will mainly be calculated based on energy usage. This raises however another issue, namely which emissions monitoring protocol to use as common standard. The American Petroleum Institute found differences greater than a factor of 10 when comparing different protocols for measuring emissions from onshore oil production facilities. For large complex refineries, the differences still amounted to a factor of two (Greco, 2003).

These findings underline the importance of monitoring and measuring protocols. Unless reliable methodologies or technologies are applied, the expected efficiency gains may remain theoretical.

2 Such equipment costs about half a million Euro per stack.

Similarly, verification has a major impact on efficiency of the trading scheme. Efficient verification will bring costs down. While in the US SO_2 and NOx schemes, certification is linked to the approval and certification of the equipment itself, within the EU Emissions Trading Scheme (EU ETS), certification remains largely unresolved and general.[3] To avoid a repetition of the EU Eco-Audit and Management Scheme (EMAS) where almost two thirds of all EU schemes are certified in Germany, rules for certification as well as certifier-accreditation should be harmonised at EU level. If this meets with opposition by some member states, accreditation bodies in all EU member states should at least follow similar rules for accreditation (to reduce transaction costs). Ultimately, this should also allow the 'mutual recognition' of accredited bodies from one EU member state to another. Similarly, there is a need for efficient rules of the certification process. Preferably, there will be harmonised or at least approximated (i.e., roughly comparable) rules across the EU.

3.2 Transparency

While the efficiency of verification has a major impact on transaction costs, the importance of verification is even greater for transparency and accuracy. Not only does this include accurate measurement but also consistency between the different verifiers and — for the EU — between member states. Transparency is enhanced by clear, open and repeatable processes.

Since the EU ETS is only about to be implemented, there is little to be said about transparency requirements other than generally, that EC internal market rules and competition law mandates a high degree of transparency (Egenhofer and Legge, 2002; König, Braun and Pfromm, 2003.) As with the US SO_2 and NOx trading schemes, it was the Emissions Tracking System and Allowance Tracking System (ATS) that provide an unprecedented level of transparency. Under these schemes, emissions from regulated sources are submitted to the tracking system, which serves as a repository of SO_2, NOx and (in principle) CO_2 emissions data from utilities. Once all the emissions data are checked and all the optional information from the Allowance Deduction Form is entered into the Allowance Tracking System (ATS), allowances will be transferred into a permanent EPA retirement account.[4]

Both the emissions tracking system and the ATS have ensured transparency, and sound record-keeping. As a result, all data are publicly available on the internet, providing complete transparency and the public assurance necessary for the programme's legitimacy. The programme was developed with unprecedented levels of accountability and transparency (Holmstead, 2002).

3 For example, Art. 15 of the EU ETS (based on the 'Provisional, unofficial version' accepted by the Council on 22 July: http://europa.eu.int/comm/environment/climat/emission.htm).

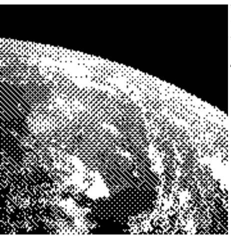
4 EPA 'Acid Rain Program Annual Reconciliation Fact Sheet', http://www.epa.gov.

3.3 Compliance

The USEPA has limited its collection of information to the minimum considered necessary to ensure compliance. The EPA interprets its primary function as ensuring compliance rather than evaluation or the monitoring of transactions (Lile *et al.,* 1996).

The ATS and the Emissions Tracking System have been essential for ensuring compliance (Environmental Defense, 2000). ATS accounts are the official records[5] for allowance holdings and transfers used for compliance. The ATS provides an efficient, automated means of monitoring compliance with allowance trading programmes. The ATS also provides the allowance market with a record of who is holding allowances, the date of allowance transfers, and the allowances transferred through a set of interactive reports that can be created online. The ATS does not, however, record the price or other terms associated with allowance trades nor does it record transfers to be executed at some future date (Lile *et al.,* 1996; Environmental Defense, 2000; Mangis, 1998). This reflects an understanding that the goal of the ATS is to provide a central registry of recorded allowance transfers for compliance purposes (Lile *et al.,* 1996).

The US acid rain programme has been built on 100% compliance consisting of two pillars: an automatic penalty of $2,000 (inflation-indexed) and automatic deduction of one allowance from the following year's allocation per excess tonne.[6] Goffman (2002) has dubbed this 'the stiffest and closest-to-automatic penalties in almost all of public law'. This contrasts with the OTC NOx Budget Trading Programme, which had no financial penalties for non-compliance. However, non-complying units will have allowances deducted from the subsequent year at a rate of 3:1 (i.e., 10 excess tonne requires 30 allowances to be deducted). There have been minor cases of non-compliance reported each year, between one and five participants with total excess emissions of less than 60 tonnes per year (UNEP, UCCEE and UNCTAD 2002).



The certainty of the penalty also compares with uncertainty in the Regional Clean Air Incentives Market (RECLAIM) scheme. In the RECLAIM scheme the authority can decide on a case-by-case basis whether to apply a penalty and how much to penalise.[7] (Stranlund et al., 2002 in Peterson, 2003).

5 EPA assigns every account an identification number and every allowance a serial number.

6 There was however some temporal flexibility in the automatic penalty that the utility could demand to deduct the allowance later.

7 For noncompliance the excess emissions are automatically deducted from the next year's allocation. In addition, administrative penalty of up to $500 per violation per day may apply. If administrative penalties are sought, the Executive Officer will follow several steps: a notice of the penalty; call for a hearing; a notice of final decision following the hearing; and assessment over the amount of penalty (California Air Resources Board, District Rules Database, http://www.arb.ca.gov/drdb/sc/curhtml/r2010.htm).

3.4 Opt-ins

The US acid rain programme had a number of different ways to involve sources not covered by the agreement. Similar approaches exist in the EU ETS. Member states can cover additional sectors and gases, in principle. While there are a number of generic advantages in broader sector coverage, such as increased liquidity and lower risk of creating competitive distortions between sectors, the US acid rain programme had built in a number of incentives to encourage non-covered sources to opt-in. In principle, the following opt-in provisions existed (Ellerman *et al.,* 1997; Environmental Defense, 2000; Boemare and Quirion, 2002): bonus allowances for low utilisation forces; substitution provisions to permit utilities to substitute other units for covered sources; compensation provisions to permit utilities to reduce power generation below the baseline levels; rewards for retrofitting; early reduction credits and whole industry opt-ins. What emerged was that the substitution and compensation provisions applying to power generating units have been extensively used, with approximately 30% of eligible sources participating. The 'opt-in' provision applying to industrial sources for early entries has not been greatly utilised due to the high transaction costs (Ellerman and Harrison Jr., 2003). In general, the results were mixed. Well-designed opt-ins work while those which are badly designed do not.

3.5 Enforcement

According to Ellerman (2000), simplicity, strict accountability and flexibility go together, and Goffman (2002) notes that the US SO_2 programme passes the ‘keep it simple’ test. Such simplicity includes, for example: that small units were exempted automatically; legal systems to deal with non-compliance (e.g., automatic sanctions); and the technical capability (e.g., CMS) to detect violations almost automatically (Boemare and Quirion, 2002). Another factor was that bilateral trades did not need prior government approval, which favours trading and lowers transaction costs. According to Hahn and Hester (1989) government pre-approval of trades have particularly hampered the earlier EPA trading schemes.

The most important aspect of enforcement and environmental effectiveness appears to be the absence of exemptions and exceptions. No firm can claim particular hardship due to unique circumstance. In a market with many buyers none will be unique. The authority of the system also appears greatly enhanced by legislative allocation. Legislative allocation of allowances was important in addressing equity concerns and achieving the degree of finality that was needed (Ellerman, 2000).

This highlights two major differences between the US and the EU schemes. The first is that allocation in the EU is done administratively in a highly decentralised process of National Allocation Plans (NAPs), and checked only by EC competition law. The second difference concerns 'force majeure' in Article 25c, under which member states can issue additional non-transferable allowances to operators that suffer from special circumstances (e.g., cannot obtain allowances). This explains the recent pleas for border tax adjustment to compensate for the fact that competing industries in, for example, the US or certain developing countries are not subjected to a similar carbon constraint (Brewer, 2002). All such measures potentially reduce the efficiency of the scheme by adding complexity.

3.6 The degree of centralisation

In decentralised political systems such as the US or the EU, the development of emissions trading schemes is a mixture of bottom-up and top-down. From both the EU and US we can conclude that although the basic design options have to be set at central level, they have been influenced by participatory processes involving various stakeholders from governments, business and industry and NGOs. In the case of the EU ETS, this was the European Climate Change Programme (ECCP), a multi-stakeholder initiative sponsored by the European Commission to identify cost-effective measures to reduce GHGs.[8] In the US OTC NOx Budget Trading Programme, multi-stakeholder discussions formed the basis for developing 'model trading rules'. The OTC States, in cooperation with the EPA, representatives from industry, utilities, and environmental groups developed a model rule identifying key elements that should be consistent in all participating states for the creation of an integrated interstate emissions trading programme. Those EU member states with an interest in emissions trading set up (multi-stakeholder) national emissions trading groups. The UK emissions trading group can be seen as an example.[9]

It is interesting to compare the NOx Budget Trading Programme and the development of the EU ETS as to their degree of centralisation.[10] Both were intended to help member states or states (in the case of the US) to meet their emissions reduction obligations. Both had their roots in sub-federal initiatives. Within the EU, some member states, notably Denmark and the UK, - others had concepts in the pipeline - built their own emissions trading scheme. This, in return, triggered a response for an EU-wide scheme, not least because of concerns of fragmentation of the internal market (Legge, 2001; Egenhofer and Legge, 2002). The EU settled for a (framework) directive, while the OTC decided upon a Memorandum of Understanding (MoU) to set up a model trading rule as guidance for the development of the trading regime.

8 For ECCP see http://europa.eu.int/comm/environment/climat/eccp.htm

9 For the UK emissions trading group see http://www.uketg.com/

10 The US SO2 trading programme has been more centralised from the beginning. This reflects mainly the fact that it has grown out of EPA early trading programmes, which partly as a result of their decentralised character have failed (Egenhofer 2003).

The model rule reflects a consensus among the States and the EPA on key elements of a NOx Budget Programme that implements the OTC MoU. The key elements include: programme applicability; control period; NOx emissions rates; emissions monitoring; record keeping of emissions and allowances; and electronic reporting requirements. Each state is responsible for enacting regulations consistent with the model rule (EPA and OTC, 2003; OTC, 1997).

In the OTC, operational aspects such as data collection, monitoring and reporting have always been distinctly more top-down. The OTC provides additional technical guidance and clarification on the emissions monitoring, data collection and reporting requirements of the Model Rule (OTC, 1997; EPA and OTC, 2003; Boemare and Quirion, 2002). The EU currently seems to move in a similar direction. There is guidance on the operational aspects including allocation notably by the influential Monitoring Mechanism Committee consisting of representatives of member states and the European Commission. Further guidance is provided by the EU's competition authorities, which are placed within the European Commission (i.e., the European Commission's Directorate General for Competition).

Regarding allocation, the EU has taken a more centralised approach than was taken in the OTC programme. The EU allows for up to 5% and 10% auctioning in the pilot period (2005-2007) and first commitment period (2008-2012) respectively should a member state wish to auction allowances.[11] In the OTC NOx trading scheme, in a joint effort, the OTC, EPA, industry, and environmental groups have established overall ceilings (EPA and OTC, 2003), leaving the states free to determine the allocation procedure and methodology. Under the MOU each state identifies affected facilities (i.e., budget sources) and allocates allowances to their respective budget sources. States may also include other source categories.

Allowances in each state are allocated based on either grandfathering (i.e., as a percentage of total 1990 emissions) or a performance standard (i.e., an output-based allocation). Allowances can either be allocated on an annual or multi-year basis. A source may choose either standard and the state environmental agency allocates allowances according to the standard (Boemare and Quirion, 2002; Boemare and Quirion, 2001). Though rules vary from state to state, states generally set aside a portion of allowances for new sources. Once units have adequate monitored data they will be allocated on the same basis as existing units (Boemare and Quirion, 2001). This contrasts with tighter EU rules, which can be explained by concerns of the integrity of the internal market. Within the EU there is a record of distortions to competition due to state aid and regulatory barriers.

11 Based on the agreement reached between the European Parliament, the Council of Ministers and the European Commission on 22 July 2003, op. cit.

3.7 Linking the cap-and-trade scheme with credit-and-baseline programmes

More recently, the EU is thinking about allowing credits from Joint Implementation (JI) and the Clean Development Mechanism (CDM), both essentially baseline and credit schemes to ensure compliance. Among the reasons stated[12] for justification is higher liquidity. This can be interpreted as fear of a lack of liquidity.

As the European Commission has pointed out, there might be a trade-off or at least tension between i) economic efficiency (i.e., 'deliver an efficient market' and ii) environmental effectiveness (i.e., 'achieve environmental objectives'). In the context of the proposed Directive to link JI and CDM projects to the EU ETS (Linking Directive), the European Commission has raised the issues of quantitative (at least in principle) and qualitative restrictions on the use of JI and CDM (European Commission 2003). While the unhindered use of JI and CDM in the EU ETS would reduce compliance costs, there could be a number of drawbacks of such an 'outsourcing'. The EU might not live up to its responsibility to reduce domestically (supplementarity). Thereby it would possibly not only forego environmental co-benefits but also retard technological development ('dynamic efficiency argument'), which would give the EU a first mover advantage.

Although the analogy to the US should not be taken too far, it is interesting to note that a similar discussion emerged in the US (Environmental Defense, 2000). In 1989/90 Congress weighed a variety of arguments from stakeholders concerning fears over shortage in supply of low-cost SO2 reductions. In the end Congress rejected all compliance mechanisms such as additional possibilities to obtain allowances that would divert investment from the SO2 emissions reductions.
In effect, Congress decided in favour of technology forcing and thereby providing incentives for US companies to develop new technologies.

3.8 Cap-and-trade and technology standards

In principle, technology standards are incompatible with allowance trading. Prescribing the application of specific technologies would reduce the cost-effectiveness of an allowance trading programme. Technology standards require specific reductions at plant level while tradable permits schemes aim at least-cost reductions. When an allowance trading programme is introduced, companies or sectors would get an overall allowance of GHG emissions instead of a permit, thereby making a permit linked to a technology standards obsolete.

12 Other and perhaps more important reasons for linking include i) diversity of compliance options and therefore reduction of compliance costs, ii) stimulation of demand for JI credits, particularly in Russia, iii) more investment by EU companies and the development and transfer of advanced technology, iv) assistance to developing countries in their efforts to achieve sustainable development, and v) contribution to GHG reductions.

This was only a minor issue for the EU ETS. GHG emissions in most cases are not yet regulated. In practical terms there are no technology standards for such gases that might reduce the cost-efficiency of GHG allowance trading. However, firms are typically subject to regulation for a number of other emissions than greenhouse gases. Within the EU, particular industrial activities must obtain a permit that includes emissions limits for a number of pollutants including SO_2, CO or volatile organic compounds (VOCs) and others as laid down in the so-called IPPC Directive.[13] In particular, the IPPC Directive calls for considering energy efficiency when determining the technology standard. Theoretically, companies would be subject to double-regulation; once through a technology standard — through energy efficiency requirements — and once through the overall ceiling of GHG allowances.

Although this 'double regulation' continues to exist, in practice its impact is likely to be limited. In reality, IPPC energy efficiency requirements are superseded by emission ceilings related to the pollutants covered by the IPPC Directive such as NOx or SO_2. It is unavoidable that emission ceilings for example on NOx indirectly impact on technology choices, which in return affect the flexibility for greenhouse gas emission reduction strategies.

The situation is aggravated in non-GHG emissions trading. This is because there is already regulation for these pollutants. Hence, when moving from regulation to emissions trading, there is a need to change permitting laws. In the EU, this may pose some problems when national trading schemes (for example for NOx or SO_2) are in opposition with EU regulation such as the IPPC Directive. For example, a national NOx trading scheme is incompatible with the IPPC Directive. Ideally, there would be a move at the EU level to move to allowance trading. If not all member states follow, individual countries need exemptions. However, this may result in legal complications. Another reason is the so-called 'hot spots', which are areas of very high concentrations of pollutants with a local effect. While GHGs lend themselves well to trading schemes, since the location of the abatement is irrelevant, this might be different for NOx or other pollutants with a regional impact. Allowance trading facilitates the creation of 'hot spots' if, as can be the case, they allow clustering of emissions in vulnerable areas. The OTC NOx Budget Trading Programme has accommodated for this. Regardless of the number of allowances a source holds, it cannot emit at levels that would violate other federal or state requirements. Sources must apply Reasonably Available Control Technology (RACT). Consequently, there might be a trade off between allowance trading and technology standards in other than GHG trading schemes. However, it is worth noting that this problem did not arise in practice with the U.S. acid rain trading programme, in part because the lower-cost abatement opportunities coincided with the 'hot spots', so that most of the clean-up took place there.

13 Council Directive 96/389/EC of 24.9.96 concerning integration pollution and prevention control (so-called IPPC Directive). The substances covered are listed in Annex of the Directive.

4. Concluding Remarks

This Policy Brief has reviewed the literature on transaction costs. There are two major areas which influence transaction costs. The first is the general design, i.e. the choice of the design options such as up-stream versus down-stream or cap-and-trade versus baseline-and-credit. The second — less-well researched area — is the design options at implementation phase. This is what this Policy Brief has concentrated on.

As we show in part 3, there are a number of potential pitfalls that can undermine the effectiveness and efficiency of a trading scheme. While transparency, enforcement and compliance are obviously central elements to an efficient trading scheme, and therefore get considerable coverage both in the literature and this Policy Brief, we would like to highlight three additional points, with particular relevance to the emerging EU ETS.

The first relates to the degree of centralisation. While different schemes show varying degrees of centralisation, there is a tendency towards harmonisation of the operational aspects such as programme applicability, control period, emissions monitoring, record keeping of emissions and allowances. The increasing availability of 'best practices', economies of scale (by using the same technologies and processes across the board) and more generally, bringing down transaction costs are the driving forces. We expect that the EU will go through a similar development in its initial phase. The European Commission has announced a Guiding Document to accompany allocation at member state level. Currently this Guiding Document is non-binding but it may well harden over time and become more binding, comparable to the OTC Memorandum of Understanding.

A second interesting area is the design of opt-in clauses in the US to enlarge the trading scheme and add extra flexibility. The lesson is that opt-in clauses can be designed in a way that is attractive.

The third lesson for the EU ETS is the importance of monitoring, measuring and verification or certification. The literature agrees that efficient and effective monitoring, measuring and certification provisions have been central to the success of the recent US schemes. This has been largely due to the automated measuring and reporting devices used in the US for NOx and SO_2. They are however very expensive and not suited for GHG emissions, which will be estimated rather than measured. Thus, we have identified a need to swiftly agree on a common GHG Emissions (Estimate) Protocol to ensure that measuring is comparable. There are also potential efficiency gains in the way the verification or certification process is organised. It is advisable to harmonise rules for certification and for accreditation of certifiers at EU level. Should this not be possible, accreditation bodies in all EU members states should at least follow the same rules for accreditation (to reduce transaction costs). Ultimately, this should also allow the 'mutual recognition' of accredited bodies from one EU member state to another. Similarly, there is a need for efficient rules of the certification process. Preferably, there should be harmonised or at least approximated (i.e., roughly comparable) rules across the EU.

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List of Acronyms

API	American Petroleum Institute	MoU	Memorandum of Understanding
ATS	Allowance Tracking System	NAPs	National Allocation Plans
CDM	Clean Development Mechanism	NOx	Nitrous Oxide
CEMS	Continuous Emissions Monitoring System	OTC	Ozone Transport Commission
EMAS	Eco-Audit and Management Scheme	RACT	Reasonably Available Control Technology
EPA	Environmental Protection Agency	RECLAIM	Regional Clean Air Incentives Market Scheme
ETS	Emissions Trading Scheme	SO_2	Sulphur Dioxide
EU	European Union	US EPA	United States Environmental Protection Agency
GHG	Greenhouse Gas	VOC	Volatile Organic Compound
IPPC	Integrated Pollution Prevention and Control		
JI	Joint Implementation		

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