CICERO Working Paper 2001:3

The Kyoto mechanisms and the quest for compliance:

Unresolved issues and potential pitfalls

Henrik Malvik and Hege Westskog

April 2001

CICERO
Center for International Climate
and Environmental Research
P.O. Box 1129 Blindern
N-0318 Oslo, Norway
Phone: +47 22 85 87 50
Fax: +47 22 85 87 51
E-mail: admin@cicero.uio.no
Web: www.cicero.uio.no

CICERO Senter for klimaforskning
P.B. 1129 Blindern, 0318 Oslo
Telefon: 22 85 87 50
Faks: 22 85 87 51
E-post: admin@cicero.uio.no
Nett: www.cicero.uio.no

Tittel: The Kyoto mechanisms and the quest for compliance: Unresolved issues and potential pitfalls
Forfatter(e): Henrik Malvik og Hege Westskog
CICERO Working Paper 2001: 3
20 sider
Finansieringskilde: Norges Forskningsråd
Prosjekt: Håndheving Kyoto
Prosjektleder: Jon Hovi
Kvalitetsansvarlig: Jon Hovi
Nøkkelord: klimapolitikk, Kyotoprotokollen, fleksibel mekanismer, etterlevelse, håndheving
Sammendrag: I denne artikkelen belyses mulige problemer som kan oppstå med håndhevelse av fleksibilitetsmekansimene i Kyotoprotokollen. Kvotehandel, Felles Gjennomføring sammen med Andre Annex B land and Den Grønne Utviklingsmekanismen gir muligheter for fleksibilitet innenfor Kyotoavtalen. Vi diskuterer de utfordringer som kan oppstå for overvåkning, rapportering og verifikasjon innenfor et kvotehandelsregime, i tillegg til supplementaritetsspørsmålet, intertemporal kvotehandel, problemet med såkalt "varm luft" og ansvar for overholdelse av forpliktelser oppnådd gjennom kvotehandel. Felles gjennomførings-prosjekter utføres innenfor et allerede eksisterende kvotehandelsregime, og dette forenkler håndhevelse av en slik mekanisme sammenlignet med den grønne utviklingsmekanismen hvor handelen med utslippskreditter foregår utenfor kvotehandelsregimet. Tilleggsproblemene som oppstår med felles gjennomføringsprosjekter i forhold til vanlig kvotehandel, er i første rekke økte transaksjons-kostnader som følge av forhandlinger mellom de to partene som står for prosjektgjennomføringen. Ved den grønne utviklingsmekansimen oppstår imidlertid flere nye problemer. I artikkelen diskuteres problemet med kvantifisering av utslippsreduksjoner, og lekkasje av utslipp mellom regulerte prosjekter og andre utslippskilder i landet hvor den grønne utviklings-mekanismen benyttes. Til slutt diskuteres håndhevelse ved ikke-oppfyllelse av de forpliktelser man har påtatt seg i henhold til Protokollen. Vi konkluderer ved å diskutere mulige incentiver for juksing og undergraving av intensjonene ved Kyotoavtalen gjennom bruk av fleksibilitetsmekanismene.
Språk: Engelsk

Title: The Kyoto mechanisms and the quest for compliance: Unresolved issues and potential pitfalls
Author(s): Henrik Malvik and Hege Westskog
CICERO Working Paper 2001: 3
20 pages
Financed by: The Research Council of Norway
Project: Enforcing the Kyoto Protocol
Project manager: Jon Hovi
Quality manager: Jon Hovi
Keywords: climate policy, Kyoto Protocol, flexibility mechanisms, compliance, enforcement
Abstract: The purpose of this paper is to illuminate potential problems with the flexibility mechanism in the Kyoto Protocol connected to the establishment of an enforcement system. The Kyoto mechanisms are emission trading, Joint Implementation with other Annex B countries and finally the Clean Development Mechanism. With regard to emission trading, we discuss new challenges for monitoring, reporting and verification, the issue of supplementarity, intertemporal emission trading, the "hot-air" problem and liability issues. The Joint Implementation mechanism is a credit trading mechanism within an already established emission trading regime. The additional problems for Joint Implementation projects under the Kyoto Protocol compared to emission trading would mainly be higher transaction costs obtained from bargaining between two parties. Increased costs through an enforcement system would not necessarily occur here. The Clean Development Mechanism on the other hand is a credit trading mechanism outside an emission trading system and here several new problems arise. We discuss the problem of additionality and leakages. Finally, we discuss the enforcement of non-compliance under the Protocol. We conclude by discussing the possible incentives for cheating and undermining the intentions of the Protocol that are revealed by the problems with the flexibility mechanisms discussed in the paper.
Language of report: English

Rapporten kan bestilles fra:
CICERO Senter for klimaforskning
P.B. 1129 Blindern
0318 Oslo

Eller lastes ned fra:
http://www.cicero.uio.no

The report may be ordered from:
CICERO (Center for International Climate and Environmental Research – Oslo)
PO Box 1129 Blindern
0318 Oslo, NORWAY

Or be downloaded from:
http://www.cicero.uio.no

Contents

1 Introduction

On December 11, 1997, over 150 nations adopted the Kyoto Protocol to the United Nations Framework Convention on Climate Change. Agreed upon after tough and protracted bargaining, this unprecedented agreement commits industrialized countries to reducing their emissions of greenhouse gases (GHG). The Protocol is therefore a significant step on the crucial road towards abatement of GHG emissions. For the protocol to function properly and eventually be ratified several issues must be resolved.

In order to get an agreement in Kyoto, negotiators deferred action on several important but controversial elements to the subsequent Conferences of the Parties (COP).[1] Various typos still remain to be corrected, mechanisms need to be developed further and potential loopholes must be closed. Among other things, an enforcement scheme is not in place. A viable enforcement system could increase the likelihood of countries ratifing the agreement by increasing the Parties confidence that the agreement will be complied with and absent of free-riding.

With the establishment of the Kyoto-Protocol, three different market mechanisms were introduced to help parties achieve their emission reduction obligations at lower costs. The new mechanisms, dubbed the *Kyoto mechanisms* or the *flexibility mechanisms*, permit countries to go beyond their borders to undertake mitigation actions for the purpose of reducing their abatement costs. Apart from abating emissions at home, a country can engage in emission trading with other Annex B countries, invest in joint implementation projects in other Annex B countries or fund emission reduction projects in developing countries (the Clean Development Mechanism).[2]

The flexibility provided by the Kyoto mechanisms is unprecedented in international environmental agreements. Despite the apparent advantages of an emission trading system, however, many countries and commentators continue to express concerns about using this approach to control GHG emissions. As of today, the Protocol says little about how these mechanisms should be designed and implemented. Therefore, the rules regarding the functioning of the mechanisms need to be elaborated together with appropriate rules for enforcement. The institutional structure of that system will greatly shape the climate change regime's ability to promote compliance and discourage non-compliance. It must therefore be designed with great care and diligence.

In this paper we will give an overview of already existing enforcement[3] mechanisms in the climate treaties, describe the Kyoto mechanisms and illuminate potential problems with these mechanisms connected with the establishment of an enforcement system in the Kyoto Protocol. However, first we will take a closer look at what makes international environmental agreements different from the national environmental planning problem, and hence also, what makes the compliance issue on the international level different from compliance problems nationally.

[1] The Conference of the Parties (COP) is the supreme body and decision-making authority of the UN Framework Convention on Climate Change (FCCC). It comprises approximately 170 nations that have ratified the Convention. The COP meets on a yearly basis and its first session was held in Berlin, Germany, in 1995. Its role is to promote and review the implementation of the Convention. It periodically reviews existing commitments in light of the Convention's objective, new scientific findings, and the effectiveness of national climate change programs.

[2] The Annex B countries include most members of the OECD plus states of Central and Eastern Europe.

[3] It is important to make a distinction between enforcement and compliance. Enforcement refers to the mechanisms that a country, or here a group of countries, uses to secure compliance of the different parties, and hence minimize the incentives to cheat. Compliance or non-compliance is connected to how the different parties respond to an agreement (including the enforcement system); they can choose to comply or not comply with the agreement. Hence, below we refer to an enforcement system when we mean the rules that are agreed upon to secure the desired behavior, i.e compliance by the different parties, and compliance and non-compliance as a response to those rules.

2 International agreements and compliance

Jeppesen and Andersen (1998) discuss two properties that make international environmental problems different from environmental problems that can be handled at the national level. First, for such international environmental problems as the climate issue, it is the *global* aggregate emissions that matters: what one country emits is a very small share of the total global emission level, but at the same time emissions from one country affect all the other countries. The countries are thus highly interdependent, and the international environmental problems need to be co-ordinated at the international level. Second, the need for regulation of environmental problems is not as easily met at the international level as at the national level. At the international level no supranational institution exists that can impose necessary instruments on countries to reduce the problem. Environmental problems are instead managed by voluntary agreements among a group of countries. Efforts to solve international environmental problems and thus also enforcement issues thus tend to a much greater extent to focus on negotiations and coordination, not on government intervention as is the case for national environmental problems.

The absence of international coordination of environmental problems or the presence of enforcement schemes that do not function, we could end up in a well-known situation termed the "tragedy of the commons". In the absence of specified property rights, there is an incentive for each individual (country) to overuse the good in order to maximize individual welfare. When everyone follows this strategy, we end up in a situation where all are worse off compared to a situation with cooperation and reduced emissions. The problem is, however, that to each individual (country) it is preferable to defect from this kind of agreement and free-ride. This is akin to the "prisoners' dilemma" in game theory.

Jeppesen and Andersen (1998) describe such a game for a global CO_2 agreement. Figure 1 below reproduces their description of this game. We have two countries, A and B, that both emit CO_2. The equilibrium of this game is (defect, defect) (which is the Nash-equilibrium), and follows from the following reasoning: For country A, regardless of the choice of country B, the best country A could do is to defect. If B cooperates in an international agreement to reduce their emissions of CO_2, country A will prefer to drop out, earning profits of 5 instead of 4. If B defects, the best country A could do is also to defect, earning profits of 1 instead of 0. For country B the situation is equivalent. This is what characterizes the prisoner's dilemma game: each country will prefer to defect, whatever the other country does. However, the paradox is that both countries would be better off cooperating. As Jeppesen and Andersen (1998) conclude, "the prisoners' dilemma shows that an international CO_2 agreement will either not be reached in the first place, or, if it is reached, it will inevitably be undermined by free-riding.

		Country B	
		Cooperates in a CO_2 agreement	Defects from the CO_2 agreement
Country A	Cooperates in a CO_2 agreement	4,4	0,5
	Defects from the CO_2 agreement	5,0	1,1

Figure 1: A game for global CO_2-emissions.

This way of looking at international agreements and the possibilities for achieving compliance is rather unfortunate. The tradition of looking at international environmental agreements from a prisoner's dilemma point of view has given rise to the study of self-enforcing agreements. The argumentation here is that since the management of a shared environmental resource cannot be enforced by a third party, it must be self-enforcing. Barrett (1993, 1994) , Hoel (1992) and Mäler (1989) provide important insights into these kinds of agreements. The lesson learned from these studies are that for global environmental problems an international environmental agreement may not be able to improve substantially upon the non-cooperative outcome. In Barretts (1993) words:

> the principal result of this work is that when the number of countries sharing a resource is large, the self-enforcing international environmental agreement can sustain a large number of signatories only when global net benefits are not much smaller in the non-cooperative outcome than in the full cooperative outcome; when global net benefits are substantially higher in the full cooperative outcome compared to the non-cooperative outcome, a cooperative agreement which substantially closes this gap in net benefits cannot be sustained as a self-enforcing agreement.

Thus, where the relative gains from cooperation are largest, cooperation is infeasible, and where cooperation takes place, the absolute gain to cooperation is negligible. A country would join an agreement if the benefits of joining are higher than the benefits of free-riding. In Barretts (op.cit.) model, the signatories maximize their collective net benefits taking into consideration how their actions will affect the actions of the non-signatories. Non-signatories on the other hand choose their actions on the assumption that the other countries will not respond. When a country joins an international environmental agreement, the other countries will increase their abatement levels, and hence reward the country for acceding to the agreement. When a country withdraws, the remaining signatories reduce their abatement levels, and hence punish the country for withdrawing from the agreement. These punishments and rewards are credible, because the signatories maximize the collective net benefits. However, the magnitude of the punishments and rewards may not be sufficient to sustain a large number of signatories. With the assumptions and functional specifications of in Barrett (1993) the results given above arise. [4]

The necessity of a well-developed enforcement system is of less importance with a self-enforcing agreement. Each party will comply with a self-enforcing agreement since all parties have a permanent incentive to abide voluntarily by the contract – no participating party will wish to defect from it, and no non-participating country would wish to accede – the benefits of joining the agreement just outweigh the benefits of free-riding for the last Party to join.

What seems to contradict this rather pessimistic view is the existence of more than 140 international environmental agreements (Barrett 1991). Although many of them are ineffective either because of ineffective enforcement, or because it is mostly the non-affected parties that have joined the agreement, it is difficult to see why the theoretical conclusions above are the whole truth. Jeppesen and Andersen (1998) give arguments that increase the possibility of more signatories in international environmental agreements, and also make the enforcement issue of much greater interest. Here we focus on their discussion of commitment.

Some countries have expressed greater concern about environmental issues than other countries, and a few of them can be characterized as being committed to environmental policies. This is for instance shown by a willingness to take unilateral actions to reduce emissions. This would be an explanation of why we would expect international environmental agreements to consist of more signatories than predicted by the theory of self-enforcing agreements. Jeppesen and Andersen (1998) model commitment by assuming that some countries would cooperate regardless of what other countries are doing. They show that the possibility of having stable coalitions consisting of more

[4] Barrett also show the results with another model specification. He models an International Environmental Agreement as an infinitely repeated game. The results with this model are equivalent to the results mentioned above.

countries in this case is larger than in the pure self-enforcing agreement discussed above. However, what remains is an explanation of why countries should be committed. Jeppesen and Andersen (op.cit.) discuss fairness in environmental policies as one explanation of commitments. Countries will do their part of their job if others do theirs as well.[5] In such a game, having a enforcement scheme that ensures this is of vital importance. Below, we will discuss compliance from this perspective, e.g. when not all countries are guided exclusively by self-interest in their attitude towards international cooperation. Hence, with this theory as a background, we would expect larger stable coalitions with a greater necessity of an effective enforcement mechanism.

Practical experience also gives important lessons for the possibilities of success of an international environmental agreement. Victor (1995) makes a distinction between international agreements covering management of resources and pollution control regimes, where the former is often more successful than the latter. Managing the resource is in the long term interest of affected industries; limiting pollution and other externalities typically is not. Resource regimes affect a particular industry. Pollution control regimes often affect many industries and building coalitions to develop and implement pollution control policies across industries is more difficult. This indicates that successful agreements to achieve reductions in greenhouse gas emissions are more difficult to achieve and implement than for instance management of whaling. However, it does not mean that it is impossible, but the process would probably be longer and the issue of design more important both when it comes to different flexibility mechanisms and the enforcement regime that is built into the agreement.

=

3 Existing mechanisms of enforcement under the FCCC and the Kyoto Protocol

To secure compliance at the international level, several bodies are established under the FCCC. In the absence of a supranational authority, these bodies only have an advisory role. Under the FCCC, the Subsidiary Body for Implementation (SBI) was established in Article 10. It has a significant role to play when it comes to questions of implementation and securing compliance. The role of the SBI, as described in the FCCC, is to "assist the [COP] in the assessment and the effective implementation of the Convention" (FCCC 1992: Article 10). It is to consider information communicated in accordance with Article 12 of the FCCC to assess the overall effect of steps taken by the Parties. The SBI can procure information from the Subsidiary Body for Scientific and Technological Advice (SBSTA), which according to Article 9 of the FCCC is called upon to provide assessments of the effects of measures taken by Parties to implement the Convention. The SBSTA has also worked closly with the IPCC and the OECD in considering the methodological issues in the preparation and aggregation of national inventory communications (Victor and Salt 1994: 14). Expert review-teams that scrutinize the national communications, work under the auspices of the SBI and SBSTA. Thus far, the most significant contribution of the SBI have been that of preparing synthesis reports of the national communications submitted to the Secretariat (Wettestad 1998: 25).

Below, we give an overview of the existing elements for securing compliance under the FCCC and the Kyoto Protocol, against the background of the perspectives of international environmental agreements given above. The elements are divided into three groups: monitoring and reporting, verification and review, and finally mechanisms for non-compliance. The first two elements are inter alia necessary as a basis to decide if an agent is in non-compliance according to its commitments and the extent of non-compliance from that agent. While the last element function as a punishment mechanism for those agents that are in non-compliance with their commitment.

[5] This would mean that the commitment is a "contingent" commitment – contingent upon others behaviour.

3.1 Monitoring and reporting

The sharing of information by governments is central to how the Convention and the Kyoto Protocol work, and is probably the most important part of an international enforcement system. It is the basis for controlling how the Protocol works and important for ensuring transparency of how the different Parties implement the Protocol. Articles 4.1(a), 4.2 (a and b) and 12 of the Convention contain a commitment for all Parties to submit *national communications* providing information on their national greenhouse gas inventories, emission projections, and the policies and measures they intend to implement to limit future emissions. Industrialized countries (Annex I country Parties)[6] are given stronger commitments than developing countries and are obligated to provide particularly detailed information on a regular basis. The first communication was set to be due within six months of the entry into force of the Convention (FCCC 1992: Article 12.). This information about national greenhouse gas emissions, international cooperation, and national activities is reviewed periodically.

To achieve the best possible monitoring results, a methodology is required to guide the Parties in their work with the national communications. After the signing of the FCCC in Rio de Janeiro in 1992, the IPCC offered to elaborate an inventory compilation method by improving an existing effort in collaboration with the OECD. The methodology is very pragmatic in that the compilation to a large extent can be based on data already collected by governments for other purposes - particularly energy related statistics. During the first Conference of the Parties (Berlin – 1995) the methodology elaborated by the IPCC and the OECD to compile national inventories was endorsed by the COP and accepted as the standard methodology to be used by the Parties to the Convention (Lanchbery & Victor 1995: 37; Agrawala 1998b: 635).

3.2 Verification and review

At the first Conference of the Parties, it was decided that the Annex I Party communications[7] were to be subjected to in-depth reviews carried out by expert review teams within one year of being received by the Secretariat. The review-teams should comprise Party nominated experts and experts suggested by the appropriate inter-governmental organizations. Furthermore, the teams were given the mandate, if deemed helpful, to visit the Parties to clarify communications (FCCC/CP/1995/7/Add.1: 7).

The inventory compilation system has continued to be developed. Additional methodological improvements and measures to secure increasing comparability in reporting have been added. The ultimate practice regarding reporting and review was essentially codified in the Kyoto Protocol, which notes that methodologies accepted by the IPCC and agreed by the COP shall be used to compile national inventories through the first commitment period, 2008-2012 (Kyoto Protocol 1997: Article 5).[8] Moreover, the Kyoto Protocol further develops and strengthens the reviewing and reporting mechanisms that exist in the FCCC. Articles 7.1 and 7.2 of the Protocol are more specific regarding compliance as they explicitly require Parties to provide supplemental information in their national communications to demonstrate *compliance* with their commitments under the Protocol. In addition, Article 8 of the Protocol is more specific on the review process and, inter alia, calls on expert review

[6] Annex I countries under the FCCC comprise the OECD countries (but South Korea and Mexico) plus the countries of the former Soviet Union and Eastern Europe. It differs form the Annex B list under the Kyoto Protocol by the division of Czechoslovakia into the Czech Republic an by excluding Turkey.

[7] The national communications focus on ten main issues, which can be found in Annex III of the Berlin Mandate (FCCC/CP/1995/7/Add.1). In general they contain specific guidelines for what should be covered by the national communications in order to provide detailed information from each country. Moreover, providing such a guiding framework ensures that the Secretariat obtains the same information from each Party, hence making it easier to compare achievements. The methodology to be used in compiling the national communications is continually under improvement.

[8] The Annex I Parties are requested to use the latest *Revised 1996 IPCC Guidelines* for the preparation of national inventories to be reported under the Convention. These can be found in a three-volume publication by the IPCC, viz. J. T. Houghton et al (1997a, 1997b, 1997c).

groups to be used more widely. Hence, the Protocol makes it clear that reviewing national communications is one of the activities that is necessary for assessing implementation and compliance.

Progress on the reporting procedures seems to have functioned quite well, and Parties seem to have been complying with their reporting obligations. By October 1997, all Annex I countries but one had submitted their first national communications. Thirty-two country visits had taken place in connection with in-depth reviews of national communications, and twenty-eight reports had been published (FCCC/SBI/1997/INF.6). The reporting procedure is so far considered to be the main monitoring device in the regime, but the FCCC and the Kyoto Protocol contain other institutions and mechanisms that are intended to enforce and ensure compliance.

3.3 Non-compliance responses

As explained above, international environmental agreements have to be based on voluntarity in the absence of a supranational authority that can easily enforce what it decides. Based on this fact, we would expect that monitoring, reporting, verificaion and review mechanisms would be easier to achieve in an effective manner than establishing effective non-compliance responses based on interference with the voluntarity of the Parties. This is also what we experience in the negotiations of an enforcement system related to the FCCC and the Kyoto Protocol.

A system for responses to non-compliance is lacking both in the FCCC and in the Kyoto Protocol. However, some steps have been taken to establish at least a body that could resolve conflicts erasing from non-compliance.

At COP-1 it was decided to establish an open-ended group of legal and technical experts to study all issues on the *multilateral consultative process* (MCP) for the resolution of questions regarding the implementation of the Convention (FCCC/CP/1995/7/Add.1). The establishment of this particular group was based on the notion that it could be practical to have "a forum where concerns about lacking implementation and implementation problems could be discussed in a non-confrontational way" (Wettestad 1998: 25). The process has been inclusive, with substantial inputs from both interested Parties and NGOs. In general, discussions so far have rather stressed methods of positively enhancing implementation than methods to highlight non-compliance. As its work has progressed the role of the MCP has become more clarified, and has turned out to be advisory rather than supervisory (Andresen 1998: 11).

3.4 Conclusion

Since voluntarity has to be the main element of an international environmental agreement, we would expect that it would be easier to agree on and have effective monitoring and reporting procedures, and verification and review procedures than procedures for non-compliance. Monitoring and reporting mechanisms are already well established in the Convention Articles 4 and 12 and the Protocol Articles 5 and 7. As for the second step – Review and Verification – it has been established through the establishment of the COP and the SBI, which are to review the information provided through the national communications. This point is strengthened through the Article 8 of the Protocol, which calls on expert review teams to be used more widely. Procedures and mechanisms for non-compliance are lacking altogether. However, Article 18 of the Kyoto Protocol states that procedures and mechanisms to determine and address cases of non-compliance are left for the subsequent COP process to determine. Up to now, where we know the outcome of the COP6 process, there has been little progress on these issues.

Hence, the climate change regime needs a better elaborated enforcement system. Further, the Protocol's establishment of binding reduction commitments and the sophisticated Kyoto mechanisms render a further development of the reporting and monitoring system necessary. The elaboration of appropriate monitoring systems and assessment methodologies is necessary in order to make the use of the mechanisms credible and in order to facilitate verification and review. Several issues connected to

compliance issues following from the Kyoto mechanisms are discussed in the following sections of this paper.

4 The Kyoto mechanisms

The agreement made in Kyoto is complex and ground-breaking. The cardinal acquisition is the establishment of quantified commitments on reductions of greenhouse gas emissions. Central in order to reach agreement seems to have been the inclusion of the Kyoto mechanisms that grant Annex B Parties flexibility in achieving their commitments (see for instance the Richels et al study (1996) which estimates the benefits of interregional trade compared to no-tradig possibility between countries). These mechanisms offer great promise for reducing the total cost of emission abatement compared to abating the whole committed amount in their own country. The Protocol contains three main mechanisms to ensure flexibility, viz. *emission trading*, *joint implementation* (JI) and the *Clean Development Mechanism* (CDM).[9] All three of these mechanisms imply trade with emissions in one way or another. However, it is convenient to distinguish between allowance-trading programs and credit-trading programs. Allowance-trading programs impose on each agent an emission target coupled with the possibility for each agent to engage in trade with the allowances authorised by this target. A credit-trading program on the other hand, allows each agent to trade emissions *reductions* that are shown to be below the agents permitted level of emissions. Credit trading systems are project based and requires that each source establish its emission baseline, permitted level and reduction plan. An allowance might be comparable to a currency unit, whereas a credit might be better compared to a specific good whose value must be determined for each trade. The first flexibility mechanism mentioned above, emission trading, is an allowance trading mechanism, whereas to the two others are credit trading mechanisms. Below, we will briefly describe these three mechanisms.

4.1 Emission Trading

Within an emission trading (Cf. Kyoto Protocol (1997) Article 17) system, the parties have the option to sell and buy tradeable quotas in order to reduce their abatement costs. The policy instruments ensure a cost-effective distribution of abatement for any given initial allocation of quotas, given that certain assumptions for the functioning of the tradeable quota market are fulfilled (Montgomery 1972); the market for quotas must be competitive and agents must be allowed to move emissions freely across periods.

In a competitive market for quotas, it is optimal for all agents to sell (buy) quotas as long as the market price of quotas is higher (lower) than their own marginal abatement costs. In equilibrium, marginal abatement costs are equalized across all agents in each period. Furthermore, if each agent can allocate the use of quotas freely through time, it is optimal to distribute abatement across periods such that their present values of marginal abatement costs are equalized. A competitive market where the agents can distribute the use of quotas freely through time, will then in equilibrium result in equal marginal abatement costs across agents and across periods, which is a cost-effective distribution of abatement.

Since emission trading lowers the cost of attaining the Kyoto GHG limits, it avoids the waste of resources compared to an agreement with no trade among parties (see e.g. the Richels et al study). From a political perspective, lower implementation costs make it politically less difficult to agree to targets. However, the rules and institutions that are to govern international trading of greenhouse gas

[9] A fourth flexibility mechanism is also referred to in the literature, namely Article 4 – *Joint Fulfillment* (JF). JF allows Parties with emission reduction commitments to jointly meet their commitments by entering into an agreement that redistributes the total reductions among parties to the agreement. Once the agreement is finalised and deposited with the secretariat, the revised emission reduction target for each participating Party becomes enforceable under the Protocol. The functions of this flexibility mechanism will not be pursued any further in this paper.

emissions among Annex B countries must first be established. What has been agreed, is that emission trading, as a mechanism, is limited to use among Annex B countries. It is also underlined in the Protocol text that emission trading should be supplemental to domestic actions. However, what supplemental means is not yet defined.[10] Further, intertemporal emission trading is restricted. It is only banking of emission quotas that is allowed (with banking of quotas, each agent can reduce emissions more than indicated by the quotas it holds and bank those quotas for future use). Borrowing quotas from subsequent commitment periods is not permitted (with borrowing of quotas, an agent is allowed to increase emissions in excess of the quotas it holds against future emission reductions). However, most of the details concerning the rules for implementation and enforcement within this system have not yet been agreed to. A comprehensive agreement on these issues is critical if it is to achieve its potential.

Several lessons concerning the design of emission quotas can be drawn from experience with different emission trading regimes in various countries. First, an allowance trading mechanism like the emission trading mechanism given by the Kyoto Protocol Article 17, usually requires a low level of government involvement in approval of trades once the system is designed. Consequently it has very low transaction costs. [11](See UNCTAD 1998 for a further discussion of this issue.) Second, intertemporal emission trading introduces additional flexibility into the trading programs by allowing individual sources flexibility in timing of its emissions. This offers the opportunity to reduce abatement costs for each party. As mentioned above, the Kyoto Protocol opens up the possibility for banking of quotas. Borrowing quotas, however, is not permitted. Third, simplicity and reliability in monitoring and reporting routines are important as are effective penalties for non-compliance. As discussed above, the last point is of course of major concern in an international agreement to reduce global emissions of greenhouse gases since there are few enforcement mechanisms to use against independent nations.

4.2 Project-level crediting – Joint Implementation

Article 6 of the Kyoto Protocol (1997) allows project-level crediting, or what is better known as Joint Implementation (JI). This is a credit-trading program which allows Annex B Parties to transfer to or acquire from other Annex B Parties emission reduction units (ERUs) associated with specific projects designed to reduce emissions or enhance sinks of GHGs. A transfer of ERUs is a subtraction from a Party's assigned amount, while the purchase of ERUs is an addition to a Party's assigned amount. Thus, one Party, or private entity, may sponsor or finance a GHG reduction project in another Party's territory in exchange for some or all of the GHG reductions resulting from the project. According to Article 6, both Parties involved must approve such arrangements. Furthermore the arrangements must provide climate benefits beyond those that would otherwise occur and must be supplemental to domestic action in the acquiring Party. Finally they are prohibited if the acquiring Party is not in compliance with its accounting and reporting obligations under the Protocol. Joint implementation is also restricted to take place between Annex B Parties.

The premise behind JI is that (i) it will result in lower costs for a given level of emission reduction, and/or (ii) it will result in a greater emission reduction for a given cost and thus promote the overall

[10] The EU has proposed a concrete limit on the transaction of emission permits. The EU proposal is divided into two sections: rules for buyers and rules for sellers. In the buyer case, two options are provided. Annex B parties purchases may not exceed the higher of the two:

1) 5% of $\frac{\text{base year emissions multiplied by 5 + assigned amount}}{2}$

2) 50% of the difference between the actual annual emissions of any year between 1994 and 2002 multiplied by 5, and its assigned amount.

In the seller case the Parties should not be allowed to sell more quotas than given by formula 1 above. See http://www.unfccc.de/resource/docs/2000/sb/04.pdf for further reference.

[11] Transaction costs in the market for emission trading may arise due to high search and information costs, high bargaining and decision costs and high monitoring and enforcement costs (Stavins 1995).

reduction of global GHG emissions. On the other hand, a credit-trading mechanism like JI will probably be less efficient than international allowance-trading because of the increased transaction costs and uncertainty following from the design of a credit-trading mechanism. (See UNCTAD 1998). However, there is a difference between credit-trading mechanisms that exist within an emission trading system such as JI, compared to credit-trading systems that are not part of an overall emission trading system such as CDM. Within a JI system the quotas a country has through the assigned amounts in the Kyoto Protocol define the initial amounts that emission reductions could be counted from, whereas in CDM the business as usual emissions are not defined and the emission reductions obtained form a project will vary with the level of the business as usual emissions. The transaction costs of the latter would thus in most cases probably be much larger than in the former since much more effort would probably have to be put into deciding the ERUs with the CDM compared to JI. In section 5.2. and 5.3 we further discuss this issue.

4.3 The Clean Development Mechanism

The Clean Development Mechanism (CDM) (cf. Kyoto Protocol 1997, Article 12) is a modified version of Joint Implementation that was included in The Kyoto Protocol for project-based activities in developing countries. It was established for the purposes of assisting developing countries in achieving sustainable development and helping Annex B parties meet their emissions limitation and reduction obligations. The CDM will allow non-Annex B countries to benefit from project activities through additional financial and technical flows. Annex B parties can use reductions achieved through these projects to contribute to compliance with their own emission commitments. Certified emission reductions (CERs), obtained from year 2000 up to the beginning of the first commitment period, can be used to assist in achieving compliance in the first commitment period. This makes the CDM unique with respect to the other mechanisms.

Under the supervision of an executive board, private and public funds may be channeled through this mechanism to finance projects in developing countries. As in the case of JI, the CDM opens for both private and public entities to engage in projects and moreover the entities are to be subjected to whatever guidance may be provided by the executive board of the CDM. One innovative aspect is that a share of the proceeds from project activities is to be used to cover the administrative expenses of the clean development mechanism. Moreover, another part of those proceeds will be used to help particularly vulnerable developing countries meet the costs of adapting to a changing climate. In effect, this establishes a charge on using the CDM.

Since this is a credit trading mechanism, we would expect increased costs compared to an allowance trading system, due to higher transaction costs and uncertainty. However, as Tietenberg and Victor (1994) argue the credit trading mechanisms included in the Kyoto Protocol could function as an important first phase in developing a well functioning allowance-trading market with a dense worldwide market for quotas. In that way they both are necessary elements in the shaping of a cost-effective system for reducing emissions of climate gases. However, it is of course important to make the credit-trading program (and an allowance-trading program) as effective as possible. To achieve this, we need to identify the incentives for non-compliance that can be identified by the way the flexible mechanisms are designed. Based on this, it is possible to give specific recommendations for design of an enforcement system connected to the flexibility mechanisms in the Kyoto Protocol. Below we discuss possibilities for non-compliance connected to the Kyoto mechanisms. The problems discussed are either directly connected to the establishment of an enforcement system by increasing the probabilities for cheating with emissions, or connected to general compliance with the Kyoto Protocol by increasing the probabilities for not fulfilling the Protocols intentions.

5 Problems

The Kyoto mechanisms are the most novel and intricate aspects of the Protocol, and many issues remain to be resolved concerning their operation, implementation and potential implications. The design of the flexibility mechanisms, however, is not simple and may affect compliance with the Protocol in a number of ways. In fact, the mechanisms may well offer ways of strengthening compliance overall, including the use of private law governing firms operating under the mechanisms (Grubb et al. 1999: 225). Furthermore, if structured in an appropriate manner, the Kyoto mechanisms should increase the likelihood of compliance by providing lower cost opportunities for achieving emissions reductions. Understood in this way, the mechanisms may hence provide *safety valves* that allow Parties experiencing difficulties in meeting their commitments domestically to bring themselves into compliance by purchasing emission quotas of another Party's assigned amount, or achieving credits generated by projects in other countries. On the other hand, the introduction of the flexibility mechanisms in the Protocol may have resulted in the Parties agreeing to higher emission reduction levels than without this possibility. From this point of view, the possibility of safety valves was included in the parties' strategies when negotiating the Protocol and may contribute little to increased compliance (although to lower emissions). Nevertheless, the introduction of too lenient safety valves can have longer-term detrimental effects on the compliance of certain Parties, as well as the progressive evolution of the regime (Werksman 1998: 25).

During the negotiations, concerns have been expressed that the mechanisms could be difficult to implement, supervise and administer. Concerns have been expressed among other things about monitoring and verification, the establishment of baselines, potential leakages, liability and supplementarity. The design of climate change policy will ultimately depend on the resolution of these concerns and the environmental credibility of the Protocol will be strongly influenced by these details. Below we will take a closer look at problems related to above-mentioned elements. When discussing the problems related to the mechanisms we will distinguish between the three Kyoto mechanisms mentioned above.

5.1 Emission trading

5.1.1 New challenges for monitoring, reporting and verification with emission trading.

As elucidated above, the FCCC and the Protocol already require significant monitoring and reporting procedures to be used by the Parties for the estimation of greenhouse gas emissions and the development of annual inventories. Articles 5 and 7 of the Kyoto Protocol explicitly link national reporting and review to compliance assessment. At the same time, the introduction of the Protocol allows Annex B Parties to meet their emission targets through a mix of domestic and international actions. This injects a new dimension into the issue of monitoring, reporting and verification. For Annex B nations, monitored emissions must also be matched to the amount of quotas each country has in order to verify compliance. This would probably be quite easy to implement in an allowance trading system.

The additional procedures needed for monitoring, reporting and verification can be extremely simple for allowance trading. An allowance-trading program offers a system-based solution in which issues such as baselines, allowable levels and allocation are dealt with in the initial phase of establishing the overall program. Allowance trading can then proceed without the need to revisit these issues for individual trades. The monitoring allowance-trading could be harmonized with the emission-monitoring system to allow matches between emission monitoring, reporting and verification, and allowance monitoring, reporting, and verification. In practice this could mean using a computerized database designed to perform such functions as aggregating the different gases, aggregating across sectors and across Parties. (UNCTAD 1998).

The Parties to the Protocol will have the primary responsibility for monitoring both their national emissions and transactions that affect their target emissions level. Parties using strong domestic monitoring, reporting, and verification approaches will hence bolster the use of the new

mechanisms. However, besides domestic monitoring and reporting, some international governing institutions will be necessary to supervise and ensure that the Parties comply with the guidelines set for the mechanisms. As it appears today, the Protocol does not specify the institutions that will be needed to make the mechanisms work. In many instances, existing institutions might be called upon to take on the new task of supervision.

In the discussion on compliance, the question of *eligibility* has been connected to monitoring, reporting, and verification. Among the negotiating Parties there is a growing recognition that Parties who wish to trade should meet and maintain minimum eligibility requirements. These could include standards for the quality of emissions data and for reporting. Minimum standards for national systems to monitor and estimate national emissions under Article 5 could be a prerequisite for Parties to meet before they are eligible to join the trading system or to authorize entities to participate in international emissions trading (Mullins 1998: 19). As a result, Parties with lower standards of emission monitoring and reporting could be prevented from trading. Hence, the possibility that transfers of quotas from a Party with weak national inventory systems would be used to increase emissions in another country would be minimized. Eligibility requirements of this sort are present in current proposals from Annex B Parties (see e.g. FCCC/SB/1998/MISC.1/Add.3 and FCCC/SB/1998/MISC.1/Add.1/Rev.1).

Accordingly, eligibility requirements for trading could provide an incentive for Parties to improve the quality of their emission data and reporting, and could facilitate compliance assessment as well as establishing a good foundation for trading. Emission data from entities that are monitored under domestic trading systems or other policies and measures might improve the quality of information used in national inventories. Moreover, traders would have greater confidence in the national systems run by Parties, such as the systems that track changes to assigned amounts (Mullins 1998: 19). Nonetheless, limiting participation by requiring excessively stringent standards of performance for monitoring, reporting and verification may have some disadvantages. It could be seen as inequitable and might increase transaction costs and overall compliance costs by excluding some low-cost reductions from the trading system. On the other hand, encouraging Parties to operate with sound data could increase the possibility that all traded units are backed by real, verifiable reductions. Otherwise the environmental goal could be undermined and the credibility of the mechanisms jeopardized (OECD 1998: 7).

5.1.2 Supplementarity

Although the Protocol text authorizes the use of emission trading, it adds that this trading must be *supplemental* to domestic actions for the purposes of meeting commitments (this is also so for JI and CDM). Supplementarity constraints reflect a concern by some Annex B countries that participation in international flexibility mechanisms will limit the scope and stringency of domestic policies, thus retarding the long-term development of technology and improved energy efficiency needed to achieve and go beyond the Kyoto goals. The principle of *supplementarity* refers to whether the parties of the Protocol, while using flexibility mechanisms such as emissions trading to lower greenhouse gas mitigation costs, also institute adequate domestic energy and other policies for ensuring the achievement of long-term greenhouse gas reduction goals. This implies that a party should undertake some domestic emission reductions and not seek to meet its obligation by simply purchasing reductions elsewhere.

Restrictions on quota trade that impose real limits on the sale and purchase of quotas would result in inefficiencies in the quota market, i.e. marginal abatement costs would not be equalized across Parties. Hence, from a strictly economic point of view, there would be no reason for imposing restrictions on quota trade. However, arguments connected to technological progress, the wish to restrict the possibilities of “hot-air” trade, and morality arguments may be used to defend restrictions. (See Westskog 2001).

Having a supplementarity cap could add more problems to the process of achieving compliance by the different Parties. The most difficult issue surrounding supplementarity is how to implement and define any such requirement and hence how to secure that the rules agreed for a

supplementarity cap is observed. As of today, the Protocol is very unclear when it comes to a definition of supplementarity (the EU has a concrete proposal, see footnote 10). However, almost how supplementarity is defined, concrete ceilings would probably pose several major difficulties. One is technical in nature. Private companies involved in the trade of quotas cannot necessarily know in advance whether a specific trade might exceed the supplementarity ceiling. This difficulty would be further complicated by the existence of different flexibility mechanisms. "Generally, discussions of whether 'concrete ceilings' should apply to the mechanisms individually or collectively have led to proposing both: individual limits to preserve equity between the mechanisms, and a collective limit to prevent collective flexibility being to great" (Grubb et al. 1999: 219f).

5.1.3 Banking and borrowing.

With banking of emission quotas, each agent can reduce emissions more than indicated by the quotas it holds. Excess quotas can be banked for future use. With borrowing of quotas, an agent is allowed to increase emissions in excess of the quotas it holds against future emission reductions. Allowing for intertemporal flexibility could increase the possibilities for a country to adhere to its commitments by reducing the total abatement costs of achieving the target. (If quota prices decrease/increase over time, the possibility of borrowing/banking quotas would reduce the costs.)

The Kyoto Protocol opens up the possibility for banking quotas between subsequent commitment periods. Borrowing quotas between such periods is, however, not allowed, even though this would probably reduce total costs of abatement considerably (Westskog 2000). This restriction can be understood by the fear of increased opportunities for free-riding. Since there is no supranational authority on the international level, a change in government, for instance, can make a country change their policy towards co-operation in an international agreement. The temptation for a country to free-ride is likely to increase with the amount of quotas borrowed. Hence, this temptation can be reduced by restricting intertemporal trading to banking.

5.1.4 Hot Air

In most OECD countries, emissions have continued to increase. But in the EITs and most notably Russia, emissions fell dramatically with the economic transition. Parties that are allocated assigned amounts that exceed what their emissions would be even in the absence of any limitation, and transfer this surplus to other Parties, contribute to the so called "hot-air" problem when the other Parties uses this to lessen their degree of abatement. The EITs would probably have a lot of "hot-air" to trade on an emission trading market. The "hot-air" issue concerns the implications of their transferring to other Parties what may turn out to be a substantial surplus, and it is the possibilities for free trade of "hot-air" quotas and banking of quotas that makes this a problem. If the "hot-air" quotas can be sold or banked, they will not be a result of an equivalent emission reduction amount in the seller or banking country.

The transfer of this "hot-air" would not represent any real emission reductions by the exporting country, and, by transferring the surplus to a country that may use it, it makes emissions higher than they would be in the absence of trading. Moreover, in political terms, assigning to some countries large surpluses that are then transferred to the wealthiest countries, enabling these wealthy countries to avoid substantive action, will be seen by developing countries as violating the spirit of the Kyoto agreement and that of the Convention itself by undermining the aim of developed-country leadership. Potentially, the most fatal aspect of "hot-air" trading is its implications for the expansion of the regime. If countries presently within Annex B could trade and bank assigned amounts that do not correspond to equivalent emission reductions, it would be difficult to negotiate an agreement with new countries that would have no possibility for "hot-air" trading and banking.

Against this background, several Parties (among them the European Council of Ministers) wanted to reduce the possibilities for such trades. Their suggestions that emission trading should be supplementary to domestic actions and common co-ordinated policies and measures was meant, among other things, to reduce "hot-air" trading. However, the question is whether this is an approach

that reduce the problem of "hot-air". Grubb et al (1999) argues that a supplementarity cap as agreed in the Kyoto Protocol, would not necessarily solve the problem of "hot-air". It could simply mean that countries with real surplus assigned amounts would spread their "hot-air" more widely among acquiring countries. A direct ceiling on sales from transferring countries, which is also suggested by EU, could be somewhat more effective because the amount of "hot-air" a country can sell is restricted. However, countries with "hot-air" could still sell their "hot-air" and not face any incentive to real abatement.

5.1.5 Liability

An effective enforcement system must include liability rules related to quota trades. A quota or credit should only be valid if it represents a surplus to the domestic emissions of the selling country. Hence, an important issue to consider when designing the enforcement system is whether the buyer (caveat emptor) or seller (caveat vendor) should bear the risk if the traded asset loses value, e.g. that the quota traded actually represents a surplus to the domestic emissions of the selling country.

In the case of seller liability, a country purchasing allowances will not have to worry whether the country selling the allowances actually meets its commitment under the protocol. If the selling country does not have quotas equal to its emissions, sanctions can be imposed on the seller and the buyer will still be able to use the purchased allowances to offset its emissions. Under such a scheme, all quotas would be worth the same regardless of who sold them. As a consequence, potential buyers would have no incentive to promote strong compliance procedures. Instead, all Parties could gain economically from lax procedures and the participation of weak or irresponsible states. For this reason, seller-only accountability could encourage a regime of weak compliance and default, to the disadvantage of the atmosphere and the danger of compromising the integrity of the Kyoto Protocol itself (Grubb et al. 1999: 211). The negotiating Parties have hence increasingly accepted that seller-only liability cannot be an acceptable basis for the trading regime.

In a system with buyer liability,[12] default on the part of a seller will make some or all of the quotas sold by the defaulting party invalid and not usable to offset emissions in the buyer country. In such a system, quotas will have different risks and thus different prices depending on the seller's reputation. Buyer liability increases the environmental performance of the system by reducing the probability of invalid quotas circulating, but it also considerably increases the cost of participating in the trading system. This in turn reduces the incentive to trade and raises the overall cost of compliance. Different countries and stakeholders are taking different positions on this trade-off between compliance cost and environmental assurance (Kerr 1998: 7).

Ultimately, however, both buyer- and seller-responsibility regimes depend on the effectiveness of the Protocol's enforcement system to ensure that the Party left carrying the burden is brought into compliance (Werksman 1998: 26).

5.2 Joint Implementation.

Credit trading programs usually create high transaction costs both through monitoring, verification and reporting and through bargaining costs resulting from each credit trade. However, there is a difference between credit trades that are undertaken within an overall emission trading system, as would be the case for Joint Implementation projects, and credit trades outside an overall emission trading system, as would be the case for the Clean Development Mechanism. As mentioned above, with JI the assigned amounts of quotas in the Kyoto Protocol defines the initial amounts that the emission reductions could be counted from. The emission reductions obtained from the project could be decided by bargaining between the two involved parties only, without the need to certify the result of the bargaining process. The two parties would have opposite interests in the negotiation process. The investor wants to have as

[12] The system of Buyer liability is also called "shared liability", because the seller is still just as liable to non-compliance procedures as before (Grubb et al. 1999: 212).

many emission reduction units out of the investment as possible, whereas the host wants to minimize this amount to sell more quotas on the ordinary quota exchange. Of course the outcome of this process is not necessarily correct when it comes to the emission reductions trade, but we would not expect the outcome of this bargaining processes to systematically overestimate or underestimate the emission reductions obtained from the project. Hence, the additional problem for the Joint Implementation projects under the Kyoto Protocol compared to emission trading would mainly be the higher transaction costs obtained from bargaining between the two project parties. Increased costs through an enforcement system would not necessarily occur.

5.3 The Clean Development Mechanism.

Under the credit-trading program in the United States, the principal criteria are that emission reductions should be quantifiable, additional (constitutes a new reduction that would not have otherwise occurred without the existence of the project), and enforceable. With a credit-trading system that is not part of an overall emission trading system, monitoring, reporting and verification must address all of these issues. One of the most difficult things to measure is additionality, which requires an estimation of the counterfactual baseline (the emissions that would be generated without the project). Below we will discuss the problem of quantifying emissions reductions resulting from a CDM project. This includes the problem of additionality as well as the problem of leakages.

5.3.1 Quantification of emission reductions resulting from the project. The problem of additionality. [13]

To quantify emissions resulting from a credit-trading system without a connection to an emission trading system is a much more challenging issue than for credit trades within an emission trading system. Investors and hosts of credit-trading programs outside an emission trading system both have the same interests. They want to get a maximum number of certified emission reduction units through the projects, which could be done by overestimating the counterfactual baseline of the project or by underestimating the emissions after the project has been implemented. The gain for the investor depends on the ratio of total project costs to the number of certified emission reduction units. On the other hand, the host will only find an investor if the project leads to gain for the investor, and will tend to overstate the possible emission reductions and the actual emission reductions obtained from the project to attract investors for future projects. Cheating could obviously become widespread without close monitoring and verification of emissions reductions. However, defining the counterfactual baseline of the project would constitute much greater problems than estimating the actual emissions following from the project under credit trades outside an emission trading system.

During the pilot phase of the project-trading mechanism that was established under the UNFCCC, *Activities Implemented Jointly* (AIJ), defining project baselines has been one of the most challenging issues. Despite the implementation of a number of projects and a great deal of analytical work, considerable difficulties persist in determining project baselines that are environmentally sound, have minimal transaction cost implications, and are politically feasible (OECD 1999).

When the baseline without the credit-trading project must be certified by the regulatory unit, it must be determined whether projects that would be profitable for the host without any covering of investment costs from the investor should be included (so-called no-regret projects). This question has led to heated debates among economists. While some say that there cannot be no-regret projects, because such opportunities would have been grasped immediately, others estimate that 10-30 per cent of today's emissions could be reduced via such projects (see IPCC 1996). These differences in opinion arise form the fact that despite the theoretical profitability of many options, there are still regulatory and judicial obstacles, lack of information and skilled personnel and organizational rigidities. Some authors hence conclude that all no-regret projects should be included in the baseline and therefore excluded from joint implementation, whereas others would accept all of them.

[13] This section relies heavily on UNCTAD (1998).

When estimating the counterfactual baseline, indirect effects arising from the project should also, at least in principle, be calculated. Indirect effects can arise when a project uses goods whose production causes greenhouse gas emissions. Emissions can also be influenced by price effects. For example, if carbon-rich fuels are largely replaced by low-carbon fuels, the price of the latter increases, while the price of carbon-rich fuels falls. The price effect would provide an incentive for greater use of carbon-rich fuels and lead to an increase in emissions. Demand-side energy savings would also cause prices to fall. Indirect effects are difficult to quantify and therefore likely to be excluded. Thus, is seems very appealing to calculate a baseline for the whole country and then aggregate the effects of different CDM-projects. However, reliable quantified measurements of actual emissions are an important prerequisite for establishing such a baseline. Substantial evidence can be found that countries try to overstate business-as-usual emissions, which can be used to support a negotiating position that offers high reduction from a spurious baseline (Jochem et al, 1994).

5.3.2 Leakages

Emissions leakage is a concept often used by policymakers in reference to the problem that emissions abatement achieved in one location may be offset by increased emissions in unregulated locations. Such leakage can arise, for example, in the short term as emissions abators reduce energy demand or timber supply, influencing world prices for these commodities and increasing the quantity emitted elsewhere; and it can arise in the longer term, for example, as industries relocate to avoid controls.

An informal market in CDM credits from abatement projects in uncapped host countries does raise concern about local leakage from these CDM projects to other emissions sources in the same host country. However, the question is whether such local leakage within the CDM host country would be greater than the leakage from capped to uncapped countries if the same amount of abatement were undertaken within the CDM investor country. Local leakage would not be a problem in an emission trading market, because all emissions of all participating countries would be counted in the national inventories used to assess compliance. And both JI and formal allowance trading could actually reduce global leakage by inhibiting free riding and reducing abatement cost, thus attracting more global participation and reducing the incentive for industries to relocate to escape controls.

6 Enforcement of non-compliance

An effective enforcement mechanism is essential to assure integrity of a trading system. Any loss in market confidence would seriously erode the benefits of a trading system. Grubb et al (1999:225) express it like this: “Market mechanisms need a strong compliance regime to be effective. Because international enforcement mechanisms are weak, accountability for traded units will need to be shared in the event of non-compliance.”

Designing mechanisms for enforcement of non-compliance at the international level is difficult because no supranational institution exists that can impose necessary instruments on countries that are non-compliant. International institutions are often weak, and international treaties rest on the assent of their Parties. As a consequence, most episodes of non-compliance and potential enforcement actions take the form of disputes, and in environmental treaties the Parties can choose a variety of means to resolve disputes. Ultimate recourse is to the International Court of Justice, but this is a rare and cumbersome process. Consequently, disputes typically have no outlet, and there is no regularized system of enforcement; disputes are addressed diplomatically through negotiations or left as unresolved differences in interpretation. (UNCTAD 1998).

The Kyoto Protocol is no exception. Article 18 of the Protocol addresses the issue, but it is really quite “empty” in nature. At present, Article 18 is nothing more than a placeholder for the yet to be negotiated issues of compliance and consequences for non-compliance. The article states:

> The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, approve appropriate and effective procedures and mechanisms to determine and to address cases of non-compliance with the provisions of this Protocol, including through the development of an indicative list of consequences, taking into account the cause, type, degree and frequency of non-compliance. Any procedures and mechanisms under this Article entailing binding consequences shall be adopted by means of an amendment to this Protocol.

From the lessons learnt from other international treaties we would not expect further negotiations on Article 18 to result in an agreement of strong enforcement mechanisms. Hence, the possibilities for erosion of benefits from the trading system could be higher. However, as discussed above, these shortcomings are reduced by strong norms in the international system in favor of compliance with international law as well as strong pressures – in the form of reputation and reciprocity – to comply with international treaties.

7 Conclusion

In this paper we have discussed the issue of enforcement under the Kyoto Protocol with special focus on the Kyoto mechanisms and the problems we could be facing when creating a viable enforcement system with these mechanisms.

International environmental agreements differ from the national context in that no supranational authority exists that can impose the necessary instruments on countries to reduce the problem. International environmental problems, and thus also enforcement issues, would to a much greater extent have to be solved through negotiation and coordination, not government intervention as is the case for national environmental problems. Hence, we would expect, and this is also what we find, that it would be easier to agree on effective monitoring and reporting procedures, and verification and review procedures, than on procedures for non-compliance. The Kyoto Protocol is no exception. Monitoring and reporting mechanisms are already well established in the Convention Articles 4 and 12 and the Protocol Articles 5 and 7. Review and Verification mechanisms are strengthened through the Protocol Article 8, which calls on expert review teams to be used more widely. However, procedures and mechanisms for non-compliance are lacking in the Kyoto Protocol.

With the Kyoto mechanisms, new challenges and problems have emerged connected to the establishment of an enforcement system within the Kyoto Protocol. In this paper we have discussed both problems directly connected to enforcement of non-compliance by increasing the probabilities for cheating with emissions, and issues connected to compliance with the Protocols intentions. We have focused on new challenges arising for monitoring, reporting and verification with the three flexibility mechanisms and pointed out the differences between an allowance- trading system and a credit-trading system, especially when the latter is outside an already established emission trading system. An allowance-trading program offers a system-based solution in which issues such as baselines, allowable levels and allocation are dealt with in the initial phase of establishing the overall program. However, with a credit-trading system the principal criteria are that emission reductions should be quantifiable, additional and enforceable, which make monitoring, reporting and verification much more problematic. The supplementarity principle included in the Protocol also creates new challenges for an enforcement system. What does supplementarity mean and how should it be implemented?

With the Kyoto Protocol, the parties are given the opportunity to bank quotas to subsequent commitment periods. Borrowing is, however, not permitted, probably to reduce the possibility of free-riding. Also, the problem of transfers of “hot-air” between parties resulting from the possibilities of trade and banking of quotas challenge the establishment of an enforcement system. Further, the issue of liability is important when a party does not comply with its commitments. Invalidation of quotas/credits after they have entered the market place could here be one way to proceed. Invalidation of quotas/credits after they have entered the market place raises the issue of whether the buyer (caveat emptor) or seller (caveat vendor) should bear the risk if the traded asset loses value. The negotiating

Parties have increasingly accepted that seller-only liability cannot be an acceptable basis for the trading regime. However, buyer liability is not without problems.

However, under the Joint Implementation system, the credit-trading program is established within an emission trading system. The additional problem for the Joint Implementation projects under the Kyoto Protocol compared to emission trading would mainly be the higher transaction costs obtained from bargaining between the two project parties. However, with the Clean Development mechanism, the credit-trading program is not part of an established emission trading system, and several new problems arise. One of the most difficult things to measure is additionality, which requires an estimation of the counterfactual baseline. This requires addressing such issues as whether no-regret projects should be included in the calculations of the baseline and how the indirect effects should be calculated. Local leakage is also of concern with the Clean Development Mechanism. An informal market in CDM credits from abatement projects may result in local leakage from these CDM projects to other emissions sources in the same host country.

The question is, however, what implications these problems give for the establishment of a viable enforcement system in the international context and for compliance with the Protocols intentions. First of all, the problems discussed above reveal some of the possible incentives for cheating connected to the different flexibility mechanisms in the Kyoto Protocol. These incentives have important implications for the design of an enforcement system. Second, the problems also reveal incentives for undermining the intentions of the Protocol.

Parties will have an incentive to cheat if the penalty for cheating is less than the cost of compliance. (For a discussion of different aspects of cheating connected to the emission trading market, see articles by Keeler 1991, Malik 1989 and Egteren and Weber 1994). Thus, there are two elements to consider here – the penalty function and the cost of compliance.

It follows from the statement above that the higher the cost of compliance (or the abatement costs), the higher the incentive for cheating - all else being equal. The cost of compliance is influenced by how the different flexibility mechanisms are designed. If quota trade is restricted (a supplementarity cap is agreed to), the total global abatement costs will increase. The incentives for cheating will depend on domestic abatement costs, which can either increase or decrease with a supplementarity cap. The incentive for cheating will increase if the abatement costs for a Party increases. Further, if the design of the credit-trading system results in high transaction costs, this will increase cheating incentives. Finally, including a borrowing possibility in the agreement will increase the incentives for cheating in the period where the Party must pay back the borrowed quotas by reduced emissions, since this will increase marginal abatement costs (with a “normal” abatement cost function) in this period.

The penalty function will consist of two elements: a system for detection and a penalty if non-compliance is detected. The possibility for detection is influenced by how the monitoring, reporting and verification procedures are designed. In this paper we have looked at the monitoring, reporting and verification procedures included in the Kyoto Protocol and pointed out several weaknesses of these procedures. As it appears today, the Protocol does not specify the institutions that will be needed to make the mechanisms work, for instance no mechanisms are specified for monitoring, reporting and verification of quota trades and credit trades. Creating a procedure for monitoring, verification and reporting of allowance trades should, as discussed, be quite easy. However, greater challenges are connected to procedures for credit trades. With weak procedures the incentives for cheating could increase.

The penalty for non compliance (enforcement procedures) will also, of course, influence the probability of cheating. At the international levels, the possibilities for effective enforcement mechanisms are lower than at the national level since no supranational authority exists. This challenges the design of the enforcement system and hence the penalty system. Tietenberg and Victor (1994) and UNCTAD (1998) discuss the requirements of an enforcement system for reducing climate

gases under an international agreement. They give the following design principles for securing an economically and viable enforcement system in the international context:

- Rely heavily on domestic enforcement, especially by existing institutions
- Set international standards for domestic enforcement
- Perform veracity checks and international adjustments through agreed procedures
- Ensure proper operation of dispute-resolution procedures
- Push early adoption of institutions and procedures
- Ensure transparency

The problems discussed in this paper have also revealed incentives for undermining the intentions of the Protocol. Parties could have incentives for exaggerating both baselines and emission reductions obtained from credit trades, which would undermine the goals set by the Parties. In negotiations of reduction levels for emissions, Parties could have an incentive to exaggerate the baselines level of its emissions in order to obtain more quotas if they know that the allocation of quotas will be based on historical emissions. Also, by including the possibilities for having "hot-air" to trade, Parties joining the Protocol later on will have increased incentives to exaggerate their own baseline for emissions to get more "hot-air" quotas to trade. With CDM, Parties will, as discussed above, also have incentives to exaggerate the baseline levels of emissions and also the emissions reductions obtained from the projects. To reduce these problems the design of the monitoring, reporting and verification mechanisms is again of vital importance. The stronger these mechanisms are, the lower is the possibilities for strategic manipulation of baselines and emission reductions.

8 References

Agrawala, Shardul (1998), "Structural and Process History of the Intergovernmental Panel on Climate Change", *Climatic Change*, 39, pp. 621-642

Andresen, Steinar (1998), *The Development of the Climate Regime: Positions, Evaluation and Lessons*, The Fridtjof Nansen Institute, Lysaker, FNI Report 3/98

Barrett, S. (1991), "Economic Analysis of International Environmental Agreements: Lessons for a Global Warming Treaty", in OECD, *Climate Change: Selected Economic Topics*, Paris: OECD.

Barrett, S. (1993), "Heterogeneous International Environmental Agreements", CSERGE Working Paper, University of East Anglia and University College London.

Barrett, S. (1994), "Self-Enforcing International Environmental Agreements", *Oxford Economic Papers*, 46.

Egteren, H. V. and M. Weber (1994), "Marketable Permits, Market Power and Cheating", *Journal of Environmental Economics and Management* 30, 161-173.

FCCC (1992), *United Nations Framework Convention on Climate Change*, Published for the Climate Change Secretariat by UNEP's Information Unit for Conventions (IUC), Geneva

FCCC/CP/1995/7/Add.1 – *Report of the Conference of the Parties on its first session, held at Berlin from 28 March to 7 April 1995*. Part two: Action taken by the Conference of the Parties at its first session, Addendum

FCCC/SBI/1997/INF.6 – *National Communications from parties included in Annex I to the Convention*. Progress with regard to in-depth reviews of first national communications and status of submission of second national communications, Note by the secretariat

FCCC/SB/1998/MISC.1/Add.1/Rev.1 – *Preparatory work needed for the fourth session of the Conference of the Parties on the items listed in decision 1/CP.3*, paragraph 5, Submission by Parties addendum

FCCC/SB/1998/MISC.1/Add.3 – *Preparatory work needed for the fourth session of the Conference of the Parties on the items listed in decision 1/CP.3*, paragraph 5, Submission by Parties addendum

Grubb, Michael, Christiaan Vrolijk and Duncan Brack (1999), *The Kyoto Protocol: A Guide and Assessment*, The Royal Institute of International affairs, London

Hoel, M. (1992), "International Environment Conventions: The Case of Uniform Reductions of Emissions", *Environmental and Resource Economics*, 2: 141-159.

IPCC (1996), *Climate Change 1995: Economic and Social Dimensions of Climate Change, Contribution of Working Group III to the Second Assessment Report of the International Panel on Climate Change (IPCC)*, Cambridge, Cambridge University Press.

Jeppesen, T. and P. Andersen (1998), "Commitment and fairness in environmental games". In Hanley, N. and H. Folmer (eds.), *Game Theory and the Environment*, Edward Elgar.

Jochem, E. et al. (1994): *Analyse und Diskussion der jüngsten Energiebedarfsprognosen für die groβen Industrienationen im Hinblick auf die Vermeidung von Treibhausgasen*, Bonn.

Keeler, A. G. (1991), "Noncompliant Firms in Transferable Discharge Permit Markets: Some Extensions", *Journal of Environmental Economics and Management* 21, 180-189.

Kerr, Suzi (1998), *Enforcing Compliance: The Allocation of Liability in International GHG Emission Trading and the Clean Development Mechanism*, RFF Climate Issue Brief #15 Internet Edition, Resources for the Future

Kyoto Protocol (1997), *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, FCCC/CP/1997/L.7/Add.1

Lanchbery, John and David Victor (1995), "The Role of Science in the Global Climate Negotiations", in Bergesen and Parmann (eds.), *Green Globe Yearbook 1995*, Oxford University Press, New York

Malik A. S. (1989), "Markets for Pollution Control when Firms are Noncompliant", *Journal of Environmental Economics and Management* 18, 97-106.

Mäler, K-G. (1989), "The Acid rain Game", in H. Folmer and E. van Ierland (eds), *Valuation Methods and Policy Making in Environmental Economics*, Amsterdam: Elsevier.

Mongomery, D.W. (1972), Markets in Licenses and Efficient Pollution Control Programs, *Journal of Economic Theory* 5, 395-418.

Mullins, Fiona (1998), *International emissions trading under the Kyoto Protocol*, OECD Information Paper, OECD, Paris

OECD (1998), *Key issues in the design of new mechanisms under the Kyoto Protocol: A scoping paper*, COM/ENV/EPOC/DCD/DAC/IEA(98)/REV1, OECD, Paris

OECD (1999), *Status of research on project baselines under the UNFCCC and the Kyoto Protocol*, ENV/EPOC(99)19/FINAL, OECD, Paris.

Richels, R. et.al (1996), "The Berlin Mandate: The Design of Cost-effective Mitigation Strategies", Energy Modeling Forum, Stanford University, Stanford California.

Stavins, R. N. (1995), Transaction Costs and Tradeable Permits, *Journal of Environmental Economics and Management* 29, 133-148.

Tietenberg, T. and D.G. Victor (1994), Possible Administrative Structures and Procedures for Implementing a Tradeable Entitlement Approach to Controlling Global Warming, in *Combating Global Warming, Possible Rules, Regulations and Administrative Arrangements for a Global Market in CO_2 Emission Entitlements*, UNCTAD/GID/8.

UNCTAD (Tietenberg et al) (1998), *Greenhouse Gas Emission Trading: Defining the Principles, Modalities, Rules and Guidelines for Verification, Reporting and Accountability*, New York, United Nations.

Victor, David G. and Julian E. Salt (1994), "From Rio to Berlin: Managing Climate Change", *Environment*, Vol. 36. No. 10, pp. 6-15 and 25-32

Victor, D.G: (1995), "The Uses and Design of Targets in International Environmental Agreements", http://www.gcrio.org/ASPEN/science/eoc95/sessionII/Victor.html, 20.11.00.

Werksman, Jacob (1998), *Responding to non-compliance under the climate change regime*, OECD Information Paper, OECD, Paris

Westskog, H. (2000), "Intertemporal Flexibility in a Tradeable CO_2 quota system", *Environment and Development Economics 5*, 203-220.

Westskog, H. (2001), "Why should quota trade be restricted – the arguments behind the EU-position towards emission trading". Unpublished paper.

Wettestad, Jørgen (1998*), Organizing Effective Climate Cooperation: More "issue-specific incrementalism" than application of general regime lessons?*, The Fridtjof Nansen Institute, Lysaker, FNI Report 5/98

-