The Kyoto Mechanisms & Global climate change

Coordination Issues and Domestic Policies

Prepared for the Pew Center on Global Climate Change

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Foreword *Eileen Claussen, President, Pew Center on Global Climate Change*

The Kyoto Protocol to the United Nations Framework Convention on Climate Change sets limits on emissions for developed countries, but also provides a means to reduce these emissions in cost-effective ways through emissions trading. The key to unlocking the full potential of the Kyoto Mechanisms — the Clean Development Mechanism, Joint Implementation, and International Emissions Trading — lies in crafting an institutional framework that minimizes barriers to the use of these Mechanisms.

Some of the proposed rules for the Mechanisms could limit cost savings and substantially change the distribution of responsibilities under the Protocol, such as those preventing the participation of private companies and emissions brokers in emissions trading or those restricting substitution among allowances. Under some conditions the rules might even make it more difficult to comply with the Protocol commitments. The institutional framework for the Kyoto Mechanisms needs to protect the environmental integrity of the commitments, allow the potential cost savings to be realized and maintain an equitable distribution of obligations. Getting these elements of the framework right will greatly contribute to the success of the Protocol.

In an effort to advance the debate and highlight potential barriers, the Pew Center has commissioned this report to analyze the institutional and regulatory dimensions of these Mechanisms. The authors identify areas where coordination across the Mechanisms is needed to avoid limiting their use and address how domestic climate change policies will affect access to the Mechanisms. Without reducing environmental benefits, decision-makers can avoid the economic efficiency losses of such limits by:

- Crafting rules that allow substitution among the different allowances to improve economic efficiency by equating prices across the three Mechanisms;
- Developing rules for International Emissions Trading that allow legal entities to participate subject to the approval of their national government;
- Heeding the caution that binding supplementarity rules could increase costs, thereby increasing the risk of non-compliance; and
- Allowing private entities easy access to the Kyoto Mechanisms through domestic cap and trade systems, since other domestic mitigation options will diminish the potential economic benefits.

This report complements the previously released *International Emissions Trading & Global Climate Change* (1999) *and Market Mechanisms & Global Climate Change* (1998) reports. The Pew Center and the authors appreciate the valuable input of reviewers of previous drafts, including Michael Grubb, Judi Greenwald, Axel Michaelowa, Andrea Pinna, Wytze van der Gaast, and Robert Stavins. The views and opinions expressed herein are those of the authors, and do not necessarily represent the views of the reviewers.

Executive Summary

The Kyoto Protocol sets greenhouse gas emissions limits for 2008-2012 for 38 developed countries. Developing countries have no emissions limits. The Protocol also creates three "mechanisms" that enable countries to reduce the cost of meeting their emissions limits. The nations of the world are now negotiating the detailed rules for implementing the Protocol, including the three Kyoto Mechanisms.

A number of countries have made specific proposals to restrict the use of the Mechanisms to achieve environmental or equity objectives. Other countries are arguing for an unrestrictive approach to improve economic efficiency. In addition, the lack of integration among the three Mechanisms may inadvertently restrict or bias their use. Finally, the extent to which countries may avail themselves of the Mechanisms depends both on the rules for the Mechanisms and on the domestic policies adopted by the developed countries to meet their commitments.

This report evaluates proposed rules for implementing the Kyoto Mechanisms in terms of their implications for equity, environmental integrity, and economic efficiency, and discusses coordination of domestic policies with the Kyoto Mechanisms. The authors conclude that:

The Kyoto Mechanisms have the potential to dramatically reduce the costs of meeting the Kyoto commitments. The Kyoto Protocol allows nations to fulfill part of their emissions reduction obligations by purchasing emissions reductions from other nations. Because greenhouse gases (GHG) lead to global effects, it does not matter, from an environmental perspective, where GHG reductions occur. However, because countries and businesses face widely differing control costs, it matters greatly from an economic perspective where GHG reductions occur. Hundreds of analyses using a wide array of economic models agree that the costs of controlling GHG emissions are significantly lower if emissions trading is permitted than if each nation has to meet its emission reduction responsibilities domestically. The broader the trade possibilities, the lower the costs of control.

The rules should allow substitution among the different Mechanisms. Some countries have proposed limiting substitution (fungibility) among the three Mechanisms. Others argue that the Protocol does not allow full fungibility. To limit such substitution, the rules governing use of the Mechanisms would have to be very restrictive. Even then countries could develop means to circumvent the restrictions. It would be better to simply allow substitution among the Mechanisms.

The rules for International Emissions Trading should allow "legal entities" (emitters, emissions brokers, etc.) to participate. Legal entities should be allowed to participate in emissions trading, just as they are allowed to participate in Joint Implementation, the Clean Development Mechanism, and international trading of other goods and services. If governments rather than legal entities trade, the potential efficiency gains of trading cannot be realized because governments do not know the compliance costs faced by the emitters. If the international rules don't allow legal entities to participate, individual governments could circumvent those rules, if they wish, by establishing internationally tradable "obligations to transfer." Rather than encourage the development of complex legal devices, countries should simply agree to allow legal entities to participate in emissions trading.

Lack of harmonization among the three Mechanisms may inadvertently restrict their use. There will be differences in design among the Mechanisms because their purposes vary. For example, only one of the three Mechanisms is designed to promote sustainable development in developing countries. However, an important objective of each of the Mechanisms is to allow legal entities and nations to use the most cost-effective means available to comply with their domestic and international obligations. Differences in rules among Mechanisms that are unrelated to differences in their purposes reduce economic efficiency and should be minimized to the extent possible.

Significant penalties for non-compliance and effective enforcement of those penalties are crucial to the environmental integrity of emissions trading. If the penalties for non-compliance with national emissions limitation commitments are relatively weak, emissions trading enables a country to benefit financially through non-compliance. Such behavior reduces the value of the allowances held by governments and legal entities. Liability proposals seek to limit the extent of such non-compliance by limiting sales to allowances expected to be surplus to the seller's compliance needs. Liability proposals differ in their environmental effectiveness, their economic efficiency, and their impact on the timing of transactions. Negotiators should adopt rules that are maximally effective in encouraging compliance with minimal increase in cost or environmental risk.

The Mechanisms are most amenable to use by countries that adopt domestic cap and trade systems. Countries will need to implement domestic policies to control emissions by different sources if they are to meet their emissions limitation obligations. The cost of compliance with domestic policies can be minimized by giving sources access to the Kyoto Mechanisms to the extent allowed by the international rules. Use of the Mechanisms is easiest to structure for participants in a domestic cap and trade system. However, the Mechanisms could be used, albeit with some difficulty, by countries that adopt emissions taxes or that specify the means of compliance through some types of regulations or negotiated agreements.

I. Introduction

The Kyoto Protocol sets greenhouse gas (GHG) emissions limits for 38 developed countries (known as Annex B countries, because their commitments are listed in Annex B of the Protocol). The limits cover emissions of six greenhouse gases by virtually all anthropogenic sources over the period 2008-2012. Developing countries do not have emissions limits. The Protocol also creates three Mechanisms — the Kyoto Mechanisms — that enable Annex B countries to reduce the cost of meeting their emissions limits.[1] The nations of the world are now negotiating the detailed rules for the Mechanisms.

This report evaluates proposed rules for the Kyoto Mechanisms in terms of their implications for equity, environmental integrity, and economic efficiency. To fulfill their role in reducing the cost of meeting the emissions commitments, the rules should not unduly restrict access to, or increase the cost of using, the Mechanisms. In addition, economic efficiency suggests that domestic policies in Annex B countries must allow individual sources to have access to the Mechanisms. At the same time, use of the Mechanisms should not compromise the environmental benefits embodied in the emissions commitments. Nor should the rules substantially change the distribution of responsibilities under the UN Framework Convention on Climate Change and the Protocol.

A. The Benefits of Emissions Trading

Because greenhouse gases lead to global effects, it does not matter, from an environmental *perspective, where GHG reductions occur.* However, because countries and businesses face widely differing control costs, it matters greatly from an *economic* perspective where GHG reductions occur. Hundreds of analyses, using a wide array of economic models, agree that the costs of achieving a GHG target are significantly lower if international emissions trading is permitted than if each nation has to meet its emission reduction commitment domestically.[2] The broader the trade possibilities, the lower the costs of meeting a given target.

The cost savings result from differences in emission control costs for different sources. For example, say Company A is required to reduce a ton of CO_2 emissions, and the company determines that it will cost $100 to achieve that reduction at its own facility. Say Company B faces no emission reduction requirements, but can reduce a ton of CO_2 emissions for $10. Company A could pay Company B $50 to reduce a ton of emissions. Company A would save $50 (the difference between the $100 it would have to spend to reduce its own emissions, and the $50 payment to Company B). Company B would earn $40 (the difference between the payment it receives from Company A and the amount it spends to reduce its emissions). Total emissions remain the same, emission reduction costs are reduced, and each company benefits financially as a result of the trade.

B. The Kyoto Mechanisms

The Kyoto Protocol contains three Mechanisms that have the potential to dramatically reduce the cost of meeting the Kyoto targets. These Mechanisms enable an Annex B country to fulfill part of its emission limitation commitment by purchasing emissions reductions or sink enhancements from other nations. (Sink enhancements are activities, such as planting trees, that absorb greenhouse gases.)

The Kyoto Mechanisms are "Joint Implementation (JI)," the "Clean Development Mechanism (CDM)," and "International Emissions Trading (IET)." JI allows companies or countries with emissions limitation commitments to *fund specific emission reduction projects in other developed countries,* and to "credit" the resulting emissions reductions against their obligations. CDM allows companies or countries with emissions obligations to *fund specific emission reduction projects that contribute to sustainable development in developing countries,* and to "credit" the resulting emissions reductions against their obligations. IET allows countries with emissions limitation commitments to *transfer part of their allowed emissions from one country to another,* keeping the total allowable emissions constant. (See Box 1.)

Box 1

The Kyoto Mechanisms and Their Allowances

Article 6: Joint Implementation (JI)

One Annex B country (through the government or a company) can invest in an emissions reduction or sink enhancement project in another Annex B country to earn *emission reduction units* (ERUs) that the investor can credit toward its emissions limit. An investment by a firm in the United States that enables a district heating system in the Czech Republic to switch from coal to natural gas and to improve the efficiency of the system could be a Joint Implementation project.

Article 12: Clean Development Mechanism (CDM)

A project to mitigate climate change in a developing (non-Annex B) country can generate *certified emission reductions* (CERs) that can be used by an Annex B country toward its emissions limitation commitment. An investment by the government of The Netherlands to improve the efficiency of a re-heat furnace in a steel plant in Thailand could qualify as a Clean Development Mechanism project.

Article 17: International Emissions Trading (IET)

One Annex B country can transfer some of its allowable emissions, *assigned amount units* (AAUs), to another Annex B country. This increases the allowable emissions in the recipient country and reduces those of the seller. A transfer of part of its assigned amount by the Russian Federation to the government of Japan would be an example of International Emissions Trading.

In this report, where the distinctions between ERUs, CERs, and AAUs are not important, they will be called "allowances." Thus allowances can be any or all of these units. But where the distinctions are important, "ERU," "CER," and "AAU" will be used.

The Mechanisms differ as to whether they are "project-based" (JI and CDM) and as to whether they are limited to countries with emissions limitation commitments (JI and IET). The emissions limitation commitments of the Annex B countries establish an overall cap on GHG emissions by these countries. IET allows portions of that cap to be transferred from one country to another while keeping the overall cap fixed. Each country must keep its actual emissions below its national cap, as adjusted through IET trades — i.e., as increased by purchases, and reduced by sales, of emissions allowances. The fixed overall cap, together with the requirement that each country hold sufficient allowances to cover its actual emissions, ensures environmental integrity. Within a "cap and trade" system, individual emissions reduction actions or "projects" by companies reduce actual emissions and so help meet the adjusted national caps.

With "project-based" trading, emissions reductions achieved by eligible projects are traded. Emissions reductions are measured from a "baseline" that represents an estimate of what emissions would have been in the absence of the project. Environmental integrity is ensured by careful specification of the baseline and oversight of the emissions reductions achieved by specific projects. To keep overall emissions from increasing, the rules must ensure that the baseline is a good estimate of the emissions

that would otherwise occur and hence that the reductions claimed are "additional." When there is no overall cap, a source could claim "credits" for reductions it was planning to implement anyway, in which case the "credits" do not represent a reduction from what emissions would have been otherwise. If the "credits" were applied against the emissions of a capped source, total emissions would be higher than they would have been otherwise.

The CDM is the Kyoto Protocol's project-based Mechanism for projects located in developing countries. Its goals are to allow developed countries to meet their emission reduction obligations cost-effectively, to promote sustainable development in developing countries, and to allow developing countries to contribute to the goal of stabilizing atmospheric concentrations of greenhouse gases. To ensure the environmental integrity of the reductions claimed by such projects, the CDM establishes an international process for review by qualified, independent experts.

JI involves project-based trading for projects located in countries with emissions limitation commitments (Annex B countries). Since the reductions achieved by such projects contribute to meeting the national commitment, any allowances awarded for these reductions must be subtracted from the allowable emissions, to avoid double-counting. For this reason, the Protocol requires that any ERUs awarded for JI projects must be subtracted from the host country's AAUs.

C. Implementation Issues

Rules for the operation of the Mechanisms are currently being negotiated.

Numerous proposals would restrict the use of the Mechanisms or make one Mechanism more attractive relative to the others. Such proposals include:

- Establishing limits on the use of the Mechanisms, individually or collectively, for compliance with Annex B emissions limitation commitments — i.e., supplementarity rules;
- Restricting participation in International Emissions Trading to Annex B *governments*, not "*legal entities*" (such as emitters, emissions brokers, etc.);
- Prohibiting countries from selling AAUs until after the selling country has demonstrated compliance, which means that Annex B countries could not purchase allowances through IET for compliance with their emissions limitation commitments for 2008-2012;

- Restricting sales of AAUs not needed by the selling country to cover its actual emissions, as could occur under some liability proposals;
- Requiring that CERs be transferred to the government of the investor country with no possibility for subsequent trade; and
- Requiring that CDM projects be "fairly" distributed geographically.

Most of the restrictive proposals are motivated by genuine concerns about equity and environmental integrity. But they reduce economic efficiency and so increase compliance costs, which also has equity implications. The challenge is to formulate rules that address countries' genuine concerns about equity and environmental integrity with minimal loss of economic efficiency.

In addition to intentional restrictions, simple lack of harmonization among the Mechanisms may inadvertently restrict or bias their use. There will be design differences among the Mechanisms because their purposes vary. For example, contribution to sustainable development is an explicit objective for CDM projects but not for JI projects. While differential costs due to differences in purposes are unavoidable, differences that are unrelated to the purposes of the Mechanisms should be avoided.

D. The Kyoto Mechanisms and Domestic Policies

Achievement of the Kyoto Protocol's emissions limitation commitment at lowest cost requires that the cost of reducing or sequestering an incremental ton of CO_2 (or an environmentally equivalent amount of another greenhouse gas) emissions – the marginal abatement cost – be the same for all sources in all countries. Use of the Kyoto Mechanisms by Annex B governments equates *national* marginal abatement costs. However, marginal abatement costs could still vary widely across *sources* within each country. To equate marginal abatement costs across sources in all countries, individual *sources* must be able to use the Kyoto Mechanisms for compliance with their domestic policy obligations.

To meet their commitments, Annex B countries will need to implement policies to limit greenhouse gas emissions by domestic emissions sources. Countries could adopt a domestic cap and trade program, an emissions or carbon tax, negotiated agreements, various types of regulations, or other measures to limit

emissions by different categories of sources. A given country might impose different policies on different sources resulting in differential access to the Mechanisms across sources in a given country and across similar sources in different countries.

The Mechanisms are most amenable to use by countries that adopt domestic cap and trade systems. Legal entities in countries that adopt an emissions or carbon tax could import allowances and apply them against their tax obligations if the government is willing to accept the associated loss of revenue, but export of allowances by legal entities subject to a tax is more difficult. Use of the Mechanisms by legal entities subject to negotiated agreements or regulations that specify emissions reductions is feasible under some conditions. When developing their domestic policies, governments will need to specify how sources can use the Kyoto Mechanisms to comply with their obligations under the domestic policies.

E. Equity, Environmental Integrity, and Economic Efficiency

The purpose of this report is to evaluate proposed rules for the Kyoto Mechanisms in terms of their implications for equity, environmental integrity, and economic efficiency, and to discuss coordination of domestic policies with the Kyoto Mechanisms, where:

- Equity is the fair distribution of costs and benefits among Parties (countries that have ratified the Protocol);
- Environmental integrity is achievement of the emission reduction commitments by Annex B Parties as a whole; and
- Economic efficiency means minimizing the cost of meeting the emission reduction commitments.

How these criteria relate to the proposed rules requires some explanation.

Equity. To a great extent, equity is a subjective criterion. Most Parties to the Kyoto Protocol consider the principle of "common but differentiated responsibilities" among developed nations, and between developed and developing nations, to be equitable. To the extent that obligations under the Kyoto Protocol embody this principle, rules that require Parties to do more or less than they agreed to do may be considered inequitable.

Rules that favor one Mechanism over another may be considered to be inequitable. Because the CDM applies to reductions that occur in developing countries, and both JI and IET apply to reductions that occur in developed countries, rules that favor JI and IET relative to CDM might be considered inequitable. On the other hand, rules that favor CDM relative to JI and IET might be considered an equitable reflection of the common but differentiated responsibilities of developed and developing countries.

Some would argue that supplementarity restrictions (limits on the percentage of a country's commitment that can be met using the Mechanisms) are equitable because they require that every country do its "fair" share of reducing emissions. Others consider supplementarity restrictions to be inequitable because they favor countries that happen to have cheaper domestic reductions. These countries are already less likely to use the Mechanisms.

Recognizing real reductions (i.e., as embodied in liability provisions) is fair enforcement of a fair rule. Since the fundamental rule of the cap and trade system is that nations must hold enough allowances to cover their emissions, it seems to make sense to prohibit the sale of allowances by a country that does not comply. However, some liability provisions might be considered to be inequitable — for example, if they penalize *purchasers* of allowances because of non-compliance by the *seller*. Others find such provisions to be equitable because they reward careful buyers of real reductions.

Environmental integrity. The rules for the Mechanisms can promote environmental integrity by ensuring that Annex B countries, as a group, meet their targets. Rules that aim to ensure that reductions are real promote environmental integrity. However, rules that make it too difficult for countries to comply may work against environmental integrity by promoting non-compliance. Rules that establish a higher standard of environmental integrity for one Mechanism may simply drive Parties to utilize the other Mechanisms.

Economic efficiency. Section I.A explained that the broader the trade possibilities, the larger the potential cost savings. Thus restrictions on trading reduce economic efficiency. This includes *differential restrictions* among the Mechanisms or among different countries in their implementation of the same Mechanism. An example involving the CDM can help to clarify this point.

Consider a source ("legal entity") in an Annex B country that must reduce its emissions to comply with domestic policy. After careful engineering cost calculations, the source determines, based on the required investment and operating costs, that the two lowest cost reduction options are:

1. An emissions reduction project at its own facility ($35/tCO$_2$)

2. A CDM project ($25/tCO$_2$)

Thus the CDM project is the lower cost option. However, say the rules for *registering* a CDM project or *certifying* the emissions reductions achieved by a CDM project are so burdensome that (a) the CDM project becomes uneconomical and does not go forward, or (b) the CDM project cost is increased beyond $35 per ton. Then there would be a loss in economic efficiency because the lowest cost reduction would not be used for compliance. Likewise, if the domestic or international rules for *utilizing* the CDM allowance are so restrictive that the source would not be able to utilize the CDM allowance to demonstrate compliance, efficiency is also reduced.

If the rules for *generating* CDM allowances are more restrictive than the rules for other Mechanisms, but the added restrictions do not increase the cost to $35 per ton, the investor would still choose the CDM project, but it would have to spend more money to do so. This still results in a loss of economic efficiency.

If the rules for *utilizing* CDM allowances are more restrictive than the rules for other Mechanisms, the price of CERs could be lower than the prices of ERUs and AAUs. Then the return to investors for CDM projects would be reduced relative to other emission reduction options. This would result in less utilization of CDM than is cost-effective and hence a loss of efficiency.

Some of the proposed rules involve trade-offs among these principles, which negotiators will need to balance.

II. Proposed Rules for the Kyoto Mechanisms

This section evaluates proposed rules for the Kyoto Mechanisms in terms of their implications for equity, environmental integrity, and economic efficiency as well as their harmonization across Mechanisms.

A. Participation by Legal Entities

All Parties agree that Annex B governments are responsible for meeting their emissions limits. Some countries believe that this requires that only the governments themselves may engage in International Emissions Trading. Other countries believe that participation by legal entities (emitters, emissions brokers, etc.) is necessary to achieve the potential cost savings made possible by the Mechanisms without compromising the responsibility of the Annex B governments. Those Parties envision a global allowance market in which (1) legal entities would buy and sell allowances; (2) national governments, to preserve environmental integrity, would establish and enforce rules to ensure that individual emitters hold allowances sufficient to cover their emissions; and (3) Parties jointly establish and enforce rules to ensure that each Annex B country's aggregate allowances match its aggregate emissions.

The Kyoto Protocol explicitly provides for participation by legal entities in JI and CDM projects, subject to government approval. The Protocol is silent on whether legal entities may participate in International Emissions Trading, although several countries have proposed rules that would allow such entities to participate.[3] Since the Annex B governments remain responsible for meeting their emissions limitation commitments, each country would need to regulate the activities of its legal entities participating in the Mechanisms to ensure that they contribute to compliance and so protect environmental integrity.

If the rules for International Emissions Trading do not allow legal entities to participate, individual governments that wish to allow such participation could devise financial instruments to achieve the same result. For example, an Annex B government could issue a tradable "obligation to transfer" — a promise to transfer an assigned amount unit to the Annex B government designated by the holder of the "obligation."[4] Firms could trade these "obligations" internationally. A firm that purchased "obligations" could ask the

issuing government to transfer the corresponding AAUs to its government as partial compliance with the company's domestic obligations. Allowing legal entities to participate in International Emissions Trading would be preferable to encouraging such devices.

The authors believe in allowing legal entities to participate in emissions trading, subject to the approval of their national government, for the following reasons:

- The potential efficiency gains of trading cannot be realized without participation of legal entities. Efficiency gains arise from equalizing the marginal cost of abatement for all *sources*, which can only occur if legal entity buyers and sellers (who know their costs) execute mutually beneficial trades.
- There are no equity or environmental arguments for limiting participation to governments.
- Consistency with the other Mechanisms, which allow participation of legal entities, requires that legal entities be allowed to participate in International Emissions Trading.
- If the international rules don't allow legal entities to participate, individual Annex B governments could circumvent those rules, if they wish, by establishing internationally tradable "obligations to transfer" that could be traded by legal entities.

B. Substitution Among Mechanisms (Fungibility)

The purpose of the Mechanisms is to allow nations to use the most cost-effective means available to achieve compliance with their international obligations. Each Annex B Party must hold sufficient allowances to "cover" its actual emissions for the 2008-2012 period.[5] Under Article 3 of the Protocol, CERs, ERUs and AAUs all contribute equally to a country's assigned amount. Thus Article 3 allows full substitution among the Mechanisms to achieve compliance.[6] Economic efficiency would be improved by allowing full substitution among allowances for the three Mechanisms because it would equate prices across the Mechanisms in all Annex B countries.[7]

Some non-Annex B countries have submitted proposals that would limit substitution among Mechanisms.[8] They propose that project-based allowances (i.e., ERUs from JI, and CERs from CDM) be transferred to the government of the investor country and be used by that country to meet its emissions limitation, with no possibility for subsequent transfer to other countries. These proposed restrictions yield no environmental benefits.

Restricting substitution among allowances would be difficult in practice. It would require rules, such as those mentioned above, which allow only a single transfer from one government to another. Such rules would reduce the use of the Mechanisms, thus increasing compliance costs. Reduced use of the Mechanisms might have a larger impact on some countries than others, with resultant equity impacts that are difficult to predict.

Such restrictive rules on transfers of allowances might lead to the creation of financial instruments that can be traded independently of the rules for the Kyoto Mechanisms. Such instruments could include "obligations to transfer" as discussed in Section II.A. The owner of such an "obligation" could exchange it for the appropriate allowances, subject to the rules adopted for the Kyoto Mechanisms. Since these instruments could be traded freely, they would provide full substitution across the Mechanisms. These instruments would be more cumbersome than simply allowing substitution among different types of allowances, but would improve economic efficiency relative to the restrictive rules proposed.

In summary, the authors advocate free substitution (fungibility) among allowances that can be used for compliance because:

- They all contribute equally to bringing the Annex B country into compliance;
- Economic efficiency is improved by allowing free substitution;
- Restricting substitutability does not yield environmental benefits;
- Limiting substitution across Mechanisms requires restrictive rules that make them much less attractive, thus increasing compliance costs, and affecting equity in unpredictable ways; and
- It is possible to develop financial instruments that circumvent restrictive rules.

C. Supplementarity

Articles 6 and 17 state that use of allowances from other countries must be "supplemental to" domestic action by the Annex B Party in meeting its emissions reduction commitment. Article 12 states that an Annex B Party can use allowances from CDM projects to meet only "part of" its emissions limitation commitment. These are called "supplementarity" restrictions. How to implement these supplementarity restrictions remains to be negotiated.

Advocates of a restrictive supplementarity provision argue that domestic emissions reductions by Annex B countries are an essential element of equity and that such actions will stimulate development of low-emissions technologies. Opponents of a restrictive supplementarity provision focus on the loss of economic efficiency due to the increased cost of meeting Annex B commitments. A binding supplementarity restriction could have an indirect negative effect on environmental integrity if the increased cost raises the risk of non-compliance.

It is not clear that a supplementarity restriction is the best way to stimulate development of low emissions technologies. How technology development responds to different stimuli is not well understood. A supplementarity limit might lead to a number of distinct markets each with a different emission control cost, whereas in the absence of such a limit there would be a global market with a single allowance price. While the pattern of technology development is likely to differ for these two situations, which one lowers emission reduction costs more is not known. The only analysis of the effects of a supplementarity limit that incorporates technology development finds that the benefits due to technological innovation are less than the increased compliance costs.[9]

All Annex B countries will implement some emissions reductions domestically because negative- or low-cost measures are available in every country. The question then becomes: how much domestic action must be mandated and what is the increase in compliance cost associated with that requirement? Good information to answer that question is not currently available. But it is clear that a supplementarity restriction that limits the use of the Mechanisms is likely to increase compliance costs more for some countries than for others with consequent equity implications. A supplementarity restriction yields no environmental benefits, since trading does not inherently compromise environmental integrity.

Given the complexity of the environmental integrity, economic efficiency, and equity concerns involved in this issue, a traditional compromise approach, such as a limit at half the level proposed by the advocates, may not be successful. Several alternative approaches to addressing the concerns of advocates of a supplementarity provision — none of which satisfy the concerns of those opposed to these types of restrictions — have recently been proposed, including:

- A requirement for a minimum level of domestic mitigation effort by an Annex B country as a condition for access to the Kyoto Mechanisms.[10] Parties would need to agree upon the minimum level (presumably less than current cap proposals), measurement of the domestic effort, and the timing of access to the Mechanisms. For example, if a country can only demonstrate the minimum level late in the compliance period, then it and its private entities will have been effectively barred from using the Mechanisms.

- Application of a levy on the use of the Mechanisms. Extension of the levy on CDM for administrative expenses and adaptation assistance has been proposed for other reasons and is discussed in Section II.J below.

- Adoption of a quantitative limit on the use of JI and IET coupled with a second, less-restrictive limit on the use of all three Mechanisms based on the different wording ("part of") used in Article 12.[11] This would provide an incentive to implement CDM projects and stimulate development of technologies appropriate to developing countries.

The authors do not have a preferred approach to meeting the divergent interests of the Parties on this issue.

D. Penalties, Enforcement, and Liability

Significant penalties for non-compliance and effective enforcement of those penalties are crucial to the environmental integrity of emissions trading.

A financial penalty for each ton of excess emissions that is substantially higher than the revenue one could earn from the sale of an AAU would be sufficient if effectively enforced. Some countries have proposed that the non-compliance sanctions include financial penalties that meet this test. Other countries prefer a strategy of helping countries to achieve compliance.

The history of international agreements is that "sanctioning authority is rarely granted by treaty, rarely used when granted, and likely to be ineffective when used."[12] If the non-compliance penalties are weak or not enforced, an Annex B government can benefit through non-compliance — i.e., it can earn revenue by selling some of the AAUs it needs for compliance. If the sales leave the country with insufficient allowances to cover its actual emissions during the commitment period, it is subject to the penalties for non-compliance. With weak penalties, the country might choose to incur the penalties rather than meet its emissions limitation commitment. If the revenue received exceeds the penalties for non-compliance, the country is rewarded for its non-compliance.

A liability provision is a rule that seeks to limit transfers of allowances by an Annex B government to those allowances that the country does not need to cover its actual emissions during the commitment period.[13] Governments and non-governmental organizations have developed a number of liability proposals. Among the options proposed are quantitative limits on sales. If the limit is too loose it is not effective in limiting excess sales, and if it is too tight it prevents sales of surplus allowances and so raises compliance costs. Depending on how the limit is specified, the appropriate value may differ for each country and may be impossible to estimate accurately in advance. Other options propose restoration of excess allowance sales through instruments such as reserves, insurance, or escrow accounts. Other proposals seek to prevent excess sales by invalidating purchases if the seller does not meet its commitment. Then buyers have an incentive to buy from sellers likely to meet their commitments. The price of an allowance would then vary by country, and possibly by transaction, depending upon the risk of non-compliance by the seller.

A few of these proposals are effective in limiting sales of AAUs to quantities in excess of the seller's compliance needs with minimal increase in cost or environmental risk.[14] A liability provision that would have environmental integrity and be economically efficient and equitable would establish a reserve of AAUs approximately equal to estimated emissions for 2008-2012 but leaving at least 5 percent of the total assigned amount available for trade.[15] The AAUs in the reserve could not be traded until after compliance had been established. This leaves the expected surplus AAUs available for sale throughout the commitment period and does not restrict purchases. A relatively high estimate of the emissions provides better environmental protection, but may restrict sales of some surplus units and so increase compliance costs. A relatively low estimate of the emissions does not increase costs, but may lead to some non-compliance.

Governments will need to weigh the trade-offs to find an appropriate balance between environmental protection and economic efficiency.

Non-compliance increases the supply of allowances on the market and so reduces the price. Thus non-compliance penalizes entities and governments that own allowances. It reduces the value of the allowances held by entities and governments that have not violated the rules. Thus, a liability provision that is effective in limiting non-compliance protects the value of allowances.

In summary, significant penalties for non-compliance with emissions limitation commitments are crucial to the environmental integrity of emissions trading. Financial penalties significantly higher than the market price for allowances, as proposed by some countries, would be sufficient. If the non-compliance penalties are relatively weak, a rule that effectively limits sales of AAUs by Annex B governments to those that exceed the selling country's compliance needs should be adopted to protect environmental integrity because such a rule:

- enhances environmental effectiveness with minimal impact on compliance costs, and
- protects the value of the allowances held by entities and governments against devaluation due to non-compliance by others.

E. International Review of Projects

Article 12 requires the establishment of an international process for independent certification of the emissions reductions achieved by CDM projects. Article 6 is silent on how to certify the reductions achieved by JI projects. Some countries have proposed that the determination of the ERUs to be awarded for a JI project be left entirely to the host government. Other countries have proposed that the ERUs awarded for JI projects be subject to the same international review process as CDM projects.

The participants in a CDM project benefit financially if the number of CERs awarded exceeds the emissions reductions actually achieved, because they receive more CERs for their investment. But the environment suffers because the extra CERs will be used to justify higher emissions by an Annex B country. Thus, an international review process by independent experts is essential to the environmental integrity of the CDM.

The host government has an incentive to limit the ERUs awarded for a JI project to the emissions reductions or sequestration actually achieved, provided it faces substantial penalties for non-compliance. Under the Protocol:

- When a JI project receives ERUs, these ERUs are deducted from the country's assigned amount. Thus a project that receives ERUs in excess of the reductions actually achieved leaves the host government with fewer surplus AAUs to sell, or makes compliance with its emissions limitation commitment more difficult. This gives it an incentive to award ERUs only for emissions reductions actually achieved.

- Sink enhancements in Annex B countries contribute to meeting the host country's emissions limitation commitment. Claims for emissions sequestered by sink enhancement projects will be subject to international expert review under Article 8. If the host government awards more ERUs than international expert reviewers do for a JI sink enhancement project, the host government has fewer surplus AAUs to sell, or more difficulty complying with its emissions limitation commitment. Again, the host government has an incentive to ensure that the ERUs awarded do not exceed what the international expert reviewers award.

If the non-compliance penalties are weak, a host government could award ERUs beyond the emissions reduction or sequestration achieved as a means of attracting JI projects with the expectation that the benefits from the project, such as employment, outweigh the non-compliance penalty. Given weak non-compliance penalties, there are two acceptable ways to ensure the environmental integrity of JI projects:

1. JI projects could be reviewed by qualified independent experts with international supervision by a body such as the CDM Executive Board. Then the environmental integrity of ERUs would be equivalent to that of CERs, and countries that do not meet the eligibility conditions for International Emissions Trading could be allowed to host JI projects.

2. Decisions on the quantity of ERUs awarded for JI projects could be left entirely to the host government, if the country has an acceptable emissions inventory and registry. The environmental integrity then depends on the international review process for emissions inventories under Article 8. The environmental integrity of the ERUs is then equivalent to that of AAUs, and the ERUs should be subject to any provisions, such as a liability rule, adopted to protect the environmental integrity of AAUs.

Leaving the approval of JI projects entirely to the host government raises the issue of whether JI should be used in these situations. JI projects could be implemented with the approval of the host

government, which would award AAUs (rather than ERUs) to the investors for the emissions reductions achieved. The AAUs could then be transferred subject to the rules for IET, assuming that legal entities are allowed to participate in International Emissions Trading.

If JI review is left entirely to the host government, similar JI projects will be treated differently in different countries. Also, JI projects will be treated differently from similar CDM projects. Such differences could distort investment decisions, thereby reducing economic efficiency, and could be inequitable.

In summary, the review process for CDM and JI projects should entail the following:

- An internationally-accredited, qualified, independent entity review of the emissions reductions, and sequestration (if allowed) achieved by a CDM project to maintain the environmental integrity of the CERs.
- The same type of review of JI projects implemented in countries whose emissions inventory or registry does not meet the specified standards, if such countries are allowed to host JI projects.
- A host government decision on the quantity of ERUs to award for JI projects, provided that the country has an acceptable emissions inventory and registry, that the projects are covered by the international review of emissions inventories under Article 8, and that the ERUs are subject to the same treatment as AAUs.

F. The Need To Demonstrate Additionality

Both CDM and JI projects are required to generate emissions reductions additional to any that would occur in the absence of the project.[16] This is called "environmental additionality." Demonstrating that the value of the CERs is a significant contribution to financial viability of the project — *investment* additionality — is proposed by some countries as a test for *environmental* additionality. Such a test assumes that the project would not have been implemented without the economic contribution from the CERs, so the reductions achieved are additional to any that would have occurred.

Some countries have also proposed that investors demonstrate *financial* additionality, i.e., that financing for CDM projects is additional to both official development assistance and contributions to the Global Environment Facility.[17] Other countries have proposed that the investors demonstrate *technological* additionality, i.e., that the technology used for the project is the best available for the circumstances. No similar proposals have yet been advanced for JI projects.

The need to demonstrate environmental additionality is critical to the environmental integrity of the Clean Development Mechanism. This is less true for JI projects because they are located in countries with an overall emissions cap. While not required by the Protocol, investment additionality would be sufficient to demonstrate environmental additionality. But investment additionality should not be a necessary condition. A project might be an attractive investment, but be constrained by the availability of capital. The addition of CERs to the project might attract investment capital. Such a project would reduce emissions — meet the environmental additionality test — yet fail an investment additionality test.[18]

Financial and technology additionality are not required by the Protocol, but they address concerns of developing countries. Technology additionality seeks to ensure that CDM projects do not use outdated or inappropriate technology. If this is adopted as a requirement for individual CDM projects, the determination is likely to be left to the host government. That would make the technology additionality requirement superfluous because there is already a requirement for host government approval that gives it the power to determine whether the proposed technology contributes to sustainable development. In addition, there are separate provisions in the Convention and the Protocol related to technology transfer commitments for developed countries.

Financial additionality seeks to ensure that the costs to Annex B governments of meeting their emissions limitation commitments do not lead to reduced assistance to developing countries. The proposed operational interpretation of funding additionality is that CDM projects be funded by non-government sources. Such a restriction will not ensure that Annex B countries maintain their levels of official development assistance. It could also mean that CDM projects could not be funded through governmental investments on concessional terms, since such investments are part of the definition of development assistance.

In summary,

- The need to demonstrate *environmental* additionality is critical to the environmental integrity of the CDM. Investment additionality is one way to demonstrate environmental additionality, but the project proponents should have discretion whether to demonstrate environmental additionality in this way.
- The requirement for host government approval already gives it the ability to ensure that the technology is appropriate. Financial additionality is not sufficient to ensure that Annex B assistance

to developing countries is maintained. Thus, requirements for financial and technological additionality provide no additional benefits.

- The proposals outlined in Section II.E for international review of JI projects ensure environmental additionality in a manner appropriate to the circumstances of the host country.

G. Approval by Annex B Parties

The Kyoto Protocol requires that CDM and JI projects be approved by each Party involved. This is generally interpreted to mean formal approval, prior to the start of the project, by all Parties whose governments or legal entities are investing in the project.

Such formal approval may be time-consuming and raises transaction costs. Also, under some proposed financing arrangements it can be difficult to identify the appropriate Annex B government to approve a particular project.[19] And, if the project's allowances can be traded, the Annex B government that approves a project may have no link to the project beyond the initial investment.[20]

The goal of prior approval is to ensure that only cost-effective, environmentally-sound projects go forward. Another way to do this is to make prior approval by an Annex B government optional. Prior approval would be obtained only when required to secure financing for the project. Use of CERs or ERUs from a project by an Annex B government for compliance purposes would be deemed to constitute the approval required by the Protocol.[21]

Prior approval of a CDM or JI project by an Annex B investor government should be optional because:

- It can be difficult to identify the appropriate Annex B government for a particular project under some financing arrangements;
- If the project's CERs or ERUs can be traded, the government that approves a project may have no further link to the project;
- Use of CERs or ERUs from a specific project for compliance by an Annex B Party can be taken as approval of the project; and
- Eliminating the requirement for prior approval by the Annex B investor government reduces transaction costs somewhat.

H. Date When Projects Can Begin To Generate Allowances

A CDM project can begin generating CERs in 2000. JI projects earn ERUs that must be deducted from the host country's assigned amount. Since Annex B Parties do not receive their assigned amount until 2008, JI projects might not be able to generate ERUs until then. Should JI projects generate ERUs from 2000 as well?

The Protocol does not prohibit an Annex B Party from promising to issue ERUs for emissions reductions that occur prior to 2008. Thus, an Annex B government wishing to encourage early JI projects could promise to provide ERUs for reductions achieved before then, assuming compatibility with the rules adopted. Therefore, harmonization is possible, but at the discretion of the governments hosting JI projects.[22] Awarding ERUs for reductions achieved during or after 2000 does not reduce environmental integrity (provided that the government meets its commitment) because the ERUs come under the cap for 2008-2012.

Awarding CERs for CDM projects starting in 2000, but not awarding ERUs for JI projects, would appear to bias emission reduction investment decisions toward CDM projects. However, Annex B countries should begin to implement domestic measures that reduce emissions before 2008 even without explicit incentives such as ERUs. In both Annex B and developing countries, early investments are likely to focus on low-cost reductions. Thus the distortion in investment decisions would likely be smaller than it might appear at first glance.

An Annex B country that issues ERUs for early reductions might create an equity issue for sources within the country. Awarding ERUs for reductions prior to 2008 means that it has to impose more stringent emission reduction burdens on domestic emissions sources operating during 2008-2012. The government must then decide whether sources operating before and after 2008 are treated equitably.[23]

The authors believe that each country should decide whether to award ERUs for JI projects prior to the year 2008, because:

- Awarding CERs for CDM projects starting in 2000, but not awarding ERUs for JI projects until 2008, does not significantly bias investment decisions toward CDM projects, and
- It should be up to each Annex B country to address the equity implications for its own domestic sources of awarding ERUs for emission reductions achieved prior to 2008.

I. Eligibility of Sink Enhancement Projects

The status of sink enhancement projects under the Clean Development Mechanism is ambiguous because Article 12 (on the CDM) has no explicit reference to such projects. In contrast, Article 6.1(b) clearly establishes the eligibility of sink enhancement projects for Joint Implementation.[24] This difference raises the issue of whether to include sink enhancement activities under the CDM — a proposal made by several countries.[25]

Most proposals to include sink enhancement activities in developing countries under the CDM would require them to meet the same requirements as sink enhancement activities in Annex B countries. Establishing different rules for sink enhancement activities under the CDM and JI could distort investment decisions and so reduce efficiency. Different rules for sink enhancement activities in developing and Annex B countries could also be considered to be inequitable. Including sink projects in the CDM would increase the supply of allowances and therefore reduce the costs of meeting the Annex B commitments.

The concern about including sink enhancement projects under the CDM is the impact on environmental integrity.[26] For many sinks, such as forests, sequestered emissions can be released again quickly. And sequestering carbon in one location may lead to higher emissions elsewhere. These two concerns are referred to as "permanence" and "leakage," respectively. The rules governing sink enhancement activities need to keep the environmental risks to a minimum.

Thus sink enhancement projects should be permitted under the CDM, subject to adequate international review that solves the major problems such as permanence and leakage. International review will ensure environmental integrity. The requirements for sink enhancement projects under JI and CDM should be as similar as possible because differential treatment reduces economic efficiency and has equity implications.

J. Levies on Transactions

Article 12 authorizes a levy (a share of the proceeds) on CDM projects to cover administrative expenses and to provide financial assistance to adaptation projects in developing countries particularly vulnerable to the adverse impacts of climate change. The Protocol does not specify such levies for the other Mechanisms. Several developing countries have proposed that the levy be imposed on transactions under all three Mechanisms.[27] Other countries oppose extension of the levy beyond the CDM.

Assuming that a *given amount of revenue* is to be raised, applying the same levy to all three Mechanisms, rather than the CDM alone, would result in a small improvement in economic efficiency for the following reasons:

- Applying a levy only to the CDM would shift investment to JI and IET because they are not subject to the levy. Applying the same levy to all three Mechanisms eliminates this possible distortion of investment decisions.[28]
- Almost any levy leads to a loss of efficiency because it reduces the use of the taxed item. If the supply curve of the taxed item is non-linear, as is likely to be the case for emissions reductions, the efficiency loss increases exponentially with the size of the tax. Under such conditions the efficiency loss associated with collecting a *given amount of revenue* is smaller if a small levy is applied to all three Mechanisms than if a larger levy is applied to the CDM alone.

In principle, the levy could be collected for every transaction or only for the initial transaction. Applying the levy to every transaction would encourage the development of commercial products not subject to the levy. A financial institution, for example, could acquire allowances and issue an equivalent quantity of "certificates" that could be traded without paying the levy. A legal entity or government that wanted an allowance could exchange a "certificate" for it. In practice, then, it may not be feasible to impose a levy on every transaction unless the levy is sufficiently small (say less than 1 percent) to make avoidance unattractive.

Which Mechanisms are subject to a levy for adaptation assistance affects where those funds originate, and hence has equity implications.

In summary, to raise a *given amount of revenue*, it is preferable to apply the same levy to all three Mechanisms than to apply a substantially larger levy to the CDM alone because:

- It eliminates possible diversion of investment away from the CDM to JI and IET, and
- The total economic cost of collecting the levy is likely to be smaller.

Application of the levy to emissions trading should be on the initial transfer of AAUs to an owner outside the country to be comparable to the levy on the CERs/ERUs issued for CDM/JI projects.

K. Contribution to Sustainable Development

One of the purposes of the CDM is to help developing country Parties achieve sustainable development, whereas the only purpose of JI is to help Annex B countries meet their emissions limitation commitments.

Most proposed CDM rules leave it to the host government to determine whether a proposed CDM project contributes to sustainable development, although some proposals specify the procedures and standards the government would be expected to use to make its determination. The main reason for leaving the decision to the national government is that development priorities differ from country to country, so the government is best placed to assess the contribution of a proposed project.

The host government for each JI project must approve the project. Thus the host government of a JI project has the same opportunity as the host government of a CDM project to ensure that each proposed project contributes to sustainable development of the country. Even though determining the contribution to sustainable development is not a formal requirement for JI projects, it is in the interest of the host government to ensure that each project benefits the country. Unless the procedures for determining the contribution of CDM projects to sustainable development are specified in detail, they will vary from country to country. The procedures for approving JI projects will also vary across countries.

Assessment of the contribution of proposed CDM and JI projects to sustainable development should be a responsibility of the host government because:

- Sustainable development priorities differ by country, and
- This provides comparable treatment for CDM and JI.

Although contribution to sustainable development is not an explicit Protocol requirement for JI projects, host government approval is. An Annex B government should be equally concerned that a project contribute to its sustainable development as a non-Annex B government.

III. Coordination of the Kyoto Mechanisms with Domestic Policies

To meet their commitments, most Annex B Parties will need to implement policies to reduce greenhouse gas emissions by domestic emissions sources.

Article 2 of the Protocol gives Annex B Parties considerable flexibility in the choice of domestic policies. This section focuses on issues associated with the use of Kyoto Mechanisms by sources (legal entities) in Annex B countries for compliance with the domestic policies adopted by their governments.[29]

The full economic benefits of the Kyoto Mechanisms cannot be realized unless emissions sources in Annex B countries can use them to achieve compliance with their domestic policy obligations. Access to the Mechanisms by all sources with emissions limitation obligations should yield significant cost savings and reduce adverse impacts on their competitiveness.

Achievement of the Kyoto Protocol's emissions limitation commitments at lowest cost requires that the cost of reducing or sequestering an incremental ton of CO_2 (or an environmentally equivalent amount of other greenhouse gas) emissions — the marginal abatement cost — be the same for all sources in all countries. Use of the Kyoto Mechanisms by Annex B governments equates *national* marginal abatement costs. However, marginal abatement costs could still vary widely across *sources* within each country. To equate marginal abatement costs across sources in all countries, individual *sources* must be able to use the Kyoto Mechanisms for compliance with their domestic policy obligations.

The policies adopted by an Annex B government determine whether a source has specific policy obligations or is only indirectly affected by the country's actions to meet its emissions limitation commitment. Limiting the carbon content of fossil fuels sold in the country, for example, would impose compliance obligations on fossil fuel producers and importers. Fossil fuel users, who are CO_2 emitters, would only be affected indirectly through increases in the prices of fossil fuels. Alternatively, domestic policies could impose limits directly on emissions by large fossil fuel users, such as industrial facilities.

Sources in Annex B countries will be affected, directly or indirectly, by the domestic policies. Similar sources in non-Annex B countries will not be affected since those countries do not have emissions

limitation commitments.[30] As a result, firms in Annex B countries that compete in international markets may be adversely affected.[31] Access to the Mechanisms by sources in Annex B countries would reduce the cost of compliance and, consequently, reduce the adverse impacts on competitiveness.

The nature of the policy imposed on an emissions source determines the ability of that source to use the Kyoto Mechanisms for compliance purposes. Section III.A discusses the opportunity for sources subject to domestic emissions trading, emissions taxes, negotiated agreements, and regulations to use the Mechanisms for compliance purposes (i.e., to buy allowances). Section III.B discusses opportunities for legal entities in an Annex B country to sell Kyoto Mechanism allowances. Finally, coordination of domestic policies with the rules of the Kyoto Mechanisms is discussed in Section III.C.

A. Potential Purchase and Use of Kyoto Mechanism Allowances by Legal Entities

This section discusses the opportunity for legal entities subject to different domestic policies to reduce greenhouse gas emissions – domestic emissions trading, emissions taxes, negotiated agreements, and regulations – to use the Kyoto Mechanisms for compliance purposes.[32]

Many possible domestic policies do not lend themselves to the use of internationally traded allowances to achieve compliance. Some examples are: information, education and outreach; energy auditing; utility demand-side management programs; land-use planning and transportation infrastructure programs; procurement programs; financial incentives for energy-efficient equipment; and removal of subsidies that encourage greenhouse gas emissions. Such policies are not discussed here.

Domestic Emissions Trading

Emissions trading is an efficient domestic policy and can be designed to be compatible with the Kyoto Mechanisms. A domestic cap and trade program places a limit on total emissions of greenhouse gases by a specified set of sources. Domestic allowances equal to the allowable emissions are distributed by the regulatory authority. Each source must remit to the regulator allowances equal to its actual emissions.[33] A source able to reduce its emissions at relatively low cost will do so and can then sell surplus allowances. A source with relatively high-cost emissions reduction options can reduce its cost of compliance by buying allowances.

An Annex B government that establishes a domestic emissions trading program must decide whether participants can use Kyoto Mechanism allowances toward compliance with their domestic obligations. Allowing the use of Kyoto Mechanism allowances for compliance in a domestic trading program would maintain environmental integrity and improve economic efficiency. Using Kyoto Mechanism allowances means that actual domestic emissions can be higher than they would be if only domestic allowances were permitted. However, if the countries selling the international allowances reduce their emissions by the amount of the allowances sold, global aggregate emissions are not affected and environmental integrity is maintained. A participant would not buy Kyoto Mechanism allowances unless they were less costly than domestic allowances. Thus, participants will purchase international allowances until the price is equivalent to that for domestic allowances. This improves economic efficiency.

Supplementarity restrictions and liability rules adopted for the Mechanisms could affect the use of allowances by participants in a domestic emissions trading program. Ways to address these and timing issues are discussed in Section III.C.

Emissions Taxes

Under an emissions or carbon tax, affected sources must pay a fee per unit of greenhouse gas emissions.[34] Sources subject to such a tax have an incentive to implement emissions-reducing measures for which the cost per unit of emissions reduced is less than the tax rate.[35]

An Annex B government that implements an emissions tax could allow sources subject to the tax to use Kyoto Mechanism allowances to reduce their tax liabilities. Then a source could buy international allowances equal to part or all of its emissions and transfer title of the allowances to the national government instead of paying tax on these emissions.

If the tax rate is less than the international market price for Kyoto Mechanism allowances, there is no incentive to buy the allowances because paying the tax is less costly.[36] If the tax rate is above the international market price, a source subject to the tax can reduce its compliance cost by buying Kyoto Mechanism allowances equal to its actual emissions. In this case, the source would pay no tax. Thus, to protect its revenue, an Annex B government that has imposed an emissions tax higher than the international market price for allowances may choose to limit the use of allowances in lieu of tax payments.

Accepting Kyoto Mechanism allowances in lieu of emissions tax payments can improve economic efficiency without affecting environmental integrity.[37] It allows a source faced with a tax rate above the international market price to comply at a lower cost, thereby enhancing efficiency. Assuming that the countries selling the allowances reduce their actual emissions by the amount of the allowances sold, aggregate emissions are not affected and environmental integrity is maintained. A tax rate lower than the international price for allowances is inefficient, and does not allow for efficiency improvement, because it provides no incentive for sources to buy allowances in lieu of making tax payments.

If an Annex B government decides to implement a GHG emissions control policy that raises revenue, a domestic emissions trading program with auctioned allowances is a better policy than an emissions tax applied to the same sources. If sources are allowed to use domestic allowances or Kyoto Mechanism allowances for compliance, the auction price for domestic allowances would be close to the price for international allowances. This would achieve economic efficiency and generate revenue for the government. Government revenue would be uncertain due to fluctuations in the auction price. However, government revenue from a tax is also uncertain due to variations in emissions.

Negotiated Agreements

A government can negotiate an agreement with an individual source, or a group of sources, to take specific actions that will have the effect of reducing GHG emissions. If the consequences of the actions can be directly measured in tons of GHG emissions, sources could be allowed to use Kyoto Mechanism allowances to help fulfill their commitments. Whether the sources choose to use the Mechanisms will depend, in part, on whether they are subject to penalties for failing to live up to their agreements, and whether those penalties exceed the cost of purchasing the necessary allowances. If the actions the sources agree to undertake can not be easily expressed in terms of GHG emissions, use of the Mechanisms for compliance purposes may not be feasible.

Regulations that Specify Means of Compliance

Means-specific regulations require sources of greenhouse gas emissions to install specific controls or equipment or to meet mandated performance standards. Such regulations are a useful tool for assigning responsibility to sources for reducing their emissions, but they do not control aggregate emissions precisely.

Use of Kyoto Mechanism allowances for compliance with a regulation is possible only if the regulation defines the quantity of emissions allowed by a source. Thus, a building code or a regulation to reduce landfill waste would not allow use of Kyoto Mechanism allowances. But a regulation that established a corporate average fleet efficiency standard, for example, could be structured to allow use of such allowances. Total fuel consumption corresponding to the standard can be estimated for the vehicles sold over their projected lifetime. Actual lifetime fuel consumption of the vehicles sold can be estimated from the fuel efficiency tests. If the actual fuel consumption exceeds the standard, the vehicle manufacturer could transfer an equivalent quantity of Kyoto Mechanism allowances to the government to achieve compliance with the regulation.[38]

Structuring a regulation so that Kyoto Mechanism allowances can be used for compliance can improve economic efficiency without affecting environmental integrity. Sources whose cost of compliance exceeds the international market price could purchase allowances and use them to comply at lower cost.[39] Aggregate emissions are not affected if the countries selling the allowances reduce their actual emissions by the amount of the allowances sold.

Box 2

Possible Use of Kyoto Mechanism Allowances by a Transnational Entity

Assume that a transnational entity, such as a major oil company, has operations in several Annex B and developing countries. The Annex B countries adopt different domestic policies, including domestic emissions trading; emissions taxes; and regulations, some of which allow the use of international allowances for compliance. The entity's operating unit in each Annex B country will need to demonstrate compliance with the applicable domestic policy. Any of the operating units might invest in sister operations in other countries to reduce emissions where these investments meet the criteria for Clean Development Mechanism or Joint Implementation projects and are approved by the host government. The certified emissions reductions or emission reduction units created might be used in the Annex B countries with policies that allow the use of international allowances for compliance. Alternatively, the certified emissions reductions or emission reduction units created might be sold to other firms. The emission reduction projects and the ability to use the allowances, then, are subject to the international rules for the Mechanisms as well as the rules established by the governments involved. The transfers will be subject to international and national rules and may be subject to various levies and fees.

B. Potential Sales of Kyoto Mechanism Allowances by Legal Entities

The ability of a legal entity to sell IET or JI allowances internationally depends on the domestic policies of the country where the firm is located as well as the international rules.[40] An entity's ability to sell CERs will only be constrained by the international rules.

A legal entity in an Annex B country that has reduced its emissions below the level required to comply with its domestic policy obligations could sell allowances to a buyer in another Annex B country either through International Emissions Trading or Joint Implementation. The ability to use these Mechanisms will depend on the international rules and the domestic policies governing the emissions source. Allowing legal entities to sell AAUs or ERUs to buyers in other Annex B countries improves economic efficiency. Environmental integrity is maintained as long as the exporting country meets its emissions limitation commitment, taking into account the sale of the AAUs.

A legal entity in a non-Annex B country can participate in CDM projects approved by its government. Some of the resulting CERs may accrue to the non-Annex B partners in the project. Developing country legal entities could sell their accrued CERs to governments or legal entities in Annex B countries if allowed by the rules for the Clean Development Mechanism.

Sale of Assigned Amount Units through International Emissions Trading

To sell AAUs to a buyer in another Annex B country, a legal entity must first obtain title to these units from its own government. Assume that the government is willing to issue AAUs to legal entities able to demonstrate that their emissions are lower than required by the applicable domestic policy.[41] Then the ability to earn AAUs depends on the domestic policy that applies to the entity.

- If the legal entity is a participant in a domestic emissions trading program, it should be easy to demonstrate that the entity has made larger reductions than required because it will have surplus allowances. If AAUs are used as allowances in the domestic trading program, the entity will be able to sell its surplus AAUs directly. If separate domestic allowances are used, the surplus allowances could be exchanged for an equal quantity of AAUs that the legal entity could sell to a buyer in another Annex B country.[42]
- To earn AAUs, a legal entity subject to an emissions tax would need to demonstrate that it has made larger reductions than required by the tax, but this is likely to be difficult.[43]

- A legal entity that is subject to a negotiated agreement or regulation can demonstrate that it has made larger reductions than required only if the regulation is formulated so that such a calculation is possible. Then the entity could request AAUs equal to this surplus reduction from the government and sell them abroad.[44]

- A legal entity subject to other domestic policies would not be able to demonstrate that its reductions are lower than required by the policy and therefore would not be able to earn AAUs.

- A legal entity that implements an eligible sink enhancement project could earn AAUs equal to the quantity of emissions sequestered as approved by the international review process.

Several of the liability proposals would limit the quantity of AAUs an Annex B country could export. Such provisions could also limit exports of AAUs by legal entities.

Sale of Emission Reduction Units through Joint Implementation Projects

A legal entity with a low-cost emissions reduction or sink enhancement opportunity might be able to get a higher price for the reductions in another Annex B country. To do this it could structure the action as a JI project and transfer some of the ERUs to its foreign partners.

A JI project must be approved by the host government. An Annex B government that is asked to approve a JI project presumably will want to ensure that ERUs are issued only for reductions beyond those required by domestic policies. Otherwise, the government risks non-compliance with its own national commitment.

Demonstrating to the government that the reductions exceed the requirements of the applicable domestic policy is likely to be easy for sources participating in a domestic emissions trading program, but difficult for sources subject to any other domestic policy. For a participant in a domestic emissions trading program, exporting surplus reductions as AAUs rather than ERUs is likely to be simpler and less costly.[45]

As a result, the host government is likely to approve JI projects only for actions not covered, directly or indirectly, by any domestic policy to reduce greenhouse gas emissions.[46] Thus, JI projects might be restricted to relatively unique situations in countries that implement a broad range of policies to meet their national commitment. On the other hand, Annex B countries whose assigned amount exceeds their projected emissions could implement narrowly targeted domestic policies, leaving considerable scope for JI projects.

JI projects do not endanger environmental integrity as long as the host country complies with its commitment. Such projects can improve economic efficiency by enabling implementation of low-cost emissions reduction and sink enhancement projects not subject to domestic policies.

C. Coordination of Domestic Policies with the Rules of the Kyoto Mechanisms

The Length of the Compliance Period

An Annex B country could adopt the five-year commitment period under the Kyoto Protocol as the compliance period for its domestic policy. This would give legal entities subject to a domestic emissions trading program or an emissions tax the full flexibility offered by the Protocol.

Alternatively, an Annex B country could require annual compliance by legal entities with their domestic policy obligations. An annual compliance period:

- reduces the risk of non-compliance by emissions sources that cease to operate;
- can provide the same flexibility to accommodate fluctuations in emissions as a five-year compliance period if the policy allows banking and slightly higher emissions during the first year;
- is the standard for many other emissions reporting, environmental compliance, and other compliance requirements, such as income taxes; and
- makes it easier for the government to meet its annual reporting obligation under the UN Framework Convention on Climate Change.

Annual compliance has been adopted for the carbon taxes implemented by some European countries and CO_2 emissions trading program in Denmark that will begin operation in 2001.

Supplementarity

If the international negotiators adopt supplementarity limits on the use of international allowances by Annex B countries, the domestic policies of Annex B countries must take this restriction into account. If a country adopts domestic policies that do not allow legal entities to use Kyoto Mechanism allowances, the supplementarity restriction has no effect. But if an Annex B country allows legal entities to use the Kyoto Mechanisms, then the legal entities might purchase more international allowances than the government would be allowed to use.[47]

A simple way to ensure compliance with such a supplementarity limit is to create distinct domestic allowances for compliance with domestic policy obligations. Legal entities that purchase Kyoto Mechanism allowances can exchange them for domestic allowances on a first-come, first-served basis until the supplementarity limit is reached.[48] The exchange transfers title to the international allowances to the government, which can then use them toward its national emissions limitation commitment. The legal entity receives title to domestic allowances it can use toward compliance with its domestic policy obligations. The government could publish information regularly on the quantity of international allowances received and the maximum quantity consistent with the supplementarity provisions.

A liability proposal that requires each Annex B country to maintain a reserve of AAUs for compliance purposes may require the use of distinct domestic allowances in a domestic emissions trading program. The AAUs would need to be kept in the government's reserve account, so there might not be enough AAUs available to cover the allowable emissions of the participants in the domestic trading program. Distinct domestic allowances, then, could address both the supplementarity and liability provisions.

Liability

Liability provisions are intended to encourage Annex B countries to transfer only those AAUs they do not need to cover their actual emissions. Under some liability proposals, allowance transfers could be disallowed if the selling country subsequently does not meet its national emissions limitation commitment. Can sources use allowances for compliance with domestic policy obligations if there is a risk that the transfer will subsequently be disallowed?

The national government would need to decide which allowances to accept toward compliance with domestic policy obligations. The most prudent policy is to accept only allowances that have no risk of disallowance under the liability rule adopted. Then there is no risk that the country will not meet its national emissions limitation commitment if some of the transfers are subsequently disallowed.[49]

However, an Annex B government could decide to accept allowances with a risk of disallowance if:

- the allowances are from another country in the same "bubble" (i.e., a group of countries that have accepted collective responsibility for compliance by the countries in the group as defined in Article 4 of the Protocol); or
- means of replacing disallowed allowances with valid allowances, such as replacement insurance, were provided.

Assuming that Annex B governments accept only allowances with no risk of disallowance toward compliance with domestic policy obligations, will such allowances be available in 2008 when sources will need them? The availability of allowances from Annex B countries will depend upon the liability provisions adopted, but since CDM projects can begin in 2000, a supply of valid CERs from non-Annex B countries should be available before 2008.

IV. Conclusions

The Kyoto Protocol contains Mechanisms that have the potential to dramatically reduce the costs of meeting the Kyoto targets. The broader the possible use of the Mechanisms, the lower the costs of control. Proposed rules for the Mechanisms include a number of restrictions that are intended to achieve equity or environmental objectives. Those restrictions would increase compliance costs. Negotiators will need to balance the equity, environmental integrity, and economic efficiency objectives where they involve trade-offs.

The key conclusions of this report are:

- The rules for the three Kyoto Mechanisms should be harmonized to the extent possible.
- Allowances generated from the three different Kyoto Mechanisms should be interchangeable (fungible).
- The rules for International Emissions Trading should allow "legal entities" (emitters, emissions brokers, etc.) to participate.
- Strong and easily enforceable penalties for non-compliance would be preferable to a liability provision as a means of protecting the environmental integrity of the Protocol provisions. However, if the non-compliance penalties are weak or difficult to enforce, a carefully designed liability provision can provide environmental integrity with little or no increase in cost.
- The Mechanisms are most amenable to use by countries that adopt domestic cap and trade systems. However, international and domestic rules could enable these Mechanisms to be used, albeit with some difficulty, by sources subject to other kinds of domestic policies.

Additional conclusions follow.

A. Proposed Rules for the Kyoto Mechanisms

- Environmental additionality is crucial to the integrity of CDM projects. Investment additionality may be sufficient, but should not be necessary, as a test of environmental additionality. Proposals to require financial and technology additionality yield no additional benefits for developing countries.
- JI projects implemented in countries whose emissions inventory or registry does not meet the specified standards should be subject to the same international review process as CDM projects, if such countries are allowed to host JI projects.
- The decision on the quantity of ERUs to award for JI projects could be delegated to the host government, provided that the country has an acceptable emissions inventory and registry, that the projects are covered by the international review of emissions inventories under Article 8, and that the ERUs are subject to the same treatment as AAUs.
- Prior approval of a CDM or JI project by an Annex B Party could be optional. Use of allowances awarded for a particular project for compliance with its commitment by an Annex B government could be deemed to constitute approval.
- Sink enhancement projects should be permitted under the CDM, subject to adequate international review that solves the major problems such as permanence and leakage. Sink enhancement activities under the CDM should meet the same requirements as sink enhancement activities in Annex B countries.
- Rules that restrict market liquidity by limiting participation of legal entities, imposing fees on every transaction, or restricting who can engage in transfers could be circumvented by the creation of new financial instruments, such as an "obligation to transfer," not subject to the rules of the Mechanisms.
- A binding supplementarity limit involves complex environmental integrity, economic efficiency, and equity issues. Thus a completely new approach may be required to reach agreement on this issue.

B. Coordination of the Kyoto Mechanisms with Domestic Policies

- The full economic benefits of the Kyoto Mechanisms cannot be realized unless emissions sources in Annex B countries can use them to achieve compliance with their domestic policy obligations.

- A government that adopts an emissions or carbon tax as its domestic policy may limit the use of the Kyoto Mechanisms to protect its tax revenue. If revenue generation is an objective of a government's GHG mitigation policy, a domestic emissions trading program with auctioned allowances is better than an emissions or carbon tax applied to the same sources.

- Use of Kyoto Mechanism allowances for compliance with a negotiated agreement or regulation is possible only if the agreement or regulation defines the quantity of emissions allowed by a source. Formulating an agreement or regulation to limit greenhouse gas emissions in such a way would improve its efficiency.

- Domestic policies could adopt the commitment period or use an annual period as the compliance period. An annual compliance period can reduce the risk of non-compliance, facilitate reporting, and provide the same flexibility as a five-year compliance period.

- The supplementarity and liability rules adopted for the Mechanisms may limit the extent to which they can be used toward compliance with domestic policy obligations by sources in an Annex B country. This would reduce the potential cost savings, but could be implemented through the use of domestic allowances, rather than AAUs, for domestic policies.

In summary, negotiators need to agree on rules for the Kyoto Mechanisms that enable them to fulfill their role of helping Annex B Parties meet their emissions limitation commitments cost-effectively. Annex B Parties will also need to implement domestic policies that allow legal entities to use the Mechanisms for compliance to the extent allowed by the Mechanism rules.

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Endnotes

1. In addition to the three Kyoto Mechanisms, the Protocol includes a number of features that reduce compliance costs by giving Annex B countries more flexibility in meeting their commitments. These features are a five-year commitment period, coverage of six greenhouse gases, inclusion of specified sink enhancement activities, and the ability to form "bubbles" among Parties to fulfill commitments jointly. This report is limited to proposed rules for the three Kyoto Mechanisms.

2. See, for example, Edmonds *et al.*, Ellerman and Jacoby, Weyant and Hill.

3. See United Nations Climate Change Secretariat, para. 338, p. 118.

4. An "obligation to transfer" is similar to a government bond. Instead of promising to pay the holder specified amounts of interest and principal on prescribed dates, the government promises to transfer AAUs to the Annex B government designated by the holder before a specified date. Once the AAUs have been transferred, the "obligation" is cancelled just as a bond is cancelled once the principal is repaid.

5. Article 3 defines a Party's adjusted assigned amount as follows:

Adjusted assigned amount

= initial quantity of assigned amount units consistent with the Kyoto target in Annex B

+ assigned amount units acquired from other Annex B Parties

- assigned amount units transferred to other Annex B Parties

+ emission reduction units acquired from other Annex B Parties

- emission reduction units transferred to other Annex B Parties

+ certified emission reductions acquired from non-Annex B Parties

6. This assumes that none of the allowances are disallowed under the liability provisions or for other reasons.

7. Some proposed liability provisions create a risk that transfers of AAUs or ERUs from a country that does not comply with its emissions limitation commitment could be disallowed. This could cause prices for AAUs or ERUs to vary with the perceived risk of disallowance.

8. See United Nations Climate Change Secretariat, para. 108(k), p. 40.

9. However, Buonanno *et al*. concludes: "Our analysis provides little support to quantitative restrictions on emissions trading. Even if the introduction of ceilings increases the R&D efforts of buyer countries and fosters technological innovation, the overall effect on abatement costs and economic growth is negative. The reason is that the benefits from technological innovation are lower, even in the long run, than the costs of adopting a more costly approach to climate change control...Even equity is not positively affected by ceilings. We find that flexibility mechanisms in the presence of endogenous technical change increase equity and that the highest equity levels are achieved without ceilings, both in the short and in the long run." (p. 15)

10. This has been proposed by Jan Pronk, Dutch Minister of Housing, Spatial Planning and the Environment, in a speech at a conference organized by RIIA/Chatham House entitled *The Kyoto Protocol: The End of the Beginning?* London, June 20, 2000.

11. For example, assuming that quantitative restrictions are adopted, use of Joint Implementation and International Emissions Trading together could be limited to no more than 50 percent of a country's emission reduction actions. But allowances from all of the Mechanisms could be used for up to 85 percent of a country's emission reduction actions.

12. Chayes, p. 32.

13. In general "liability" refers to the assignment of responsibility in the event a trade cannot be completed. The focus of the proposed rules is to limit sales to AAUs surplus to the seller's compliance needs. The assignment of responsibility for ensuring that the AAUs sold are surplus to the seller's compliance needs is only one element of each proposal. Many of the proposals also include quantitative limits on sales.

14. See Haites and Missfeldt.

15. Emissions for 2008-2012 can be estimated from a trend line calculated from emissions data available prior to 2008. Since national greenhouse gas emissions do not increase rapidly from year to year (increases have almost always been less than 3 percent per year), five times 2006 emissions (probably the latest data available prior to 2008) provides a reasonable estimate of emissions for 2008-2012. The reserve could be adjusted during the commitment period to reflect actual performance as data become available. To cover cases where an Annex B government believes it will not need all of its reserve to achieve compliance, the rules could allow sales from the reserve on a user liability basis. Alternatively, such sales could take the form of forward contracts for delivery of surplus allowances. Since the forward contracts would be commercial contracts, specific rules to deal with this situation would not be needed.

Countries whose projected 2008-2012 emissions exceed their total assigned amount would need to have a small amount of allowances, say 5 percent of their assigned amount, available to accommodate international emissions trading. Even if a country is a net buyer, an entity may wish to export AAUs if it is in compliance with its domestic obligations. A float of 5 percent should be sufficient to handle such transactions given that purchased allowances can also be re-exported and so increase liquidity. The float creates some environmental risk, so it should be kept as small as possible.

16. Danish et al. argue that the language for Article 6 is permissive while language for Article 12 is binding. This would mean that demonstration of environmental additionality is mandatory for Clean Development Mechanism projects, but could be made discretionary for Joint Implementation projects.

17. Overseas development assistance is aid provided by one government to the government of, or organizations in, a developing country. It is often called foreign aid or international development assistance. The Global Environment Facility (GEF) is the designated financial mechanism for the Framework Convention on Climate Change. Developed countries contribute funds to the GEF, which distributes funds to developing countries to help them prepare their national communications and to support mitigation actions and technology transfer.

18. In addition, the data needed to demonstrate investment additionality can be manipulated by the project developer, so it could be difficult to implement such a test in practice.

19. Identifying the appropriate Annex B government could be difficult if the project is financed by a multinational institution or by a non-Annex B country. The latter possibility has been proposed for Clean Development Mechanism projects, but not yet for Joint Implementation projects.

20. Retaining a requirement for prior approval by an Annex B government could give rise to a few small countries offering "flag of convenience" approval for a fee.

21. Another option is that all Annex B Parties agree on guidelines for Clean Development Mechanism and Joint Implementation project eligibility, and any project that meets the guidelines is deemed to have Annex B investor country approval. See Haites and Yamin.

22. Leaving the decision to award emission reduction units for emissions reductions by Joint Implementation projects between 2000 and 2008 to each host government does not fully coordinate the provisions for Joint Implementation and the Clean Development Mechanism. Certified emission reductions are available for all qualified Clean Development Mechanism projects from 2000, but emission reduction units would only be available for Joint Implementation emissions reductions before 2008 at the host government's discretion.

23. If a government awards ERUs to Joint Implementation projects, it must decide whether similar projects implemented with domestic financing should also receive ERUs or other incentives.

24. Anthropogenic enhancement of specified sinks in an Annex B country can also contribute to meeting its emissions limitation commitment. Thus sinks effectively increase the host country's assigned amount and so implicitly increase the quantity of AAUs available for trade under Article 17.

25. See United Nations Climate Change Secretariat, para. 137(b), p. 49.

26. See Intergovernmental Panel on Climate Change, pp. 8-10, and Schlamadinger and Marland.

27. See United Nations Climate Change Secretariat, paras. 29 and 30, p. 17 and paras. 350 and 351, p. 126.

28. How to define "a share of the proceeds" for CDM projects has yet to be determined. One option is to define this share as a percentage of the CERs created, but this is only one of several proposals. The same definition could be applied to JI projects. Extending this definition to International Emissions Trading is more difficult. A share could be a percentage of the AAUs issued, the AAUs transferred to another country (initial transfer only), or the AAUs involved in each transaction. Applying a levy only to the initial transfer of AAUs appears to be closest to imposing a levy on the CERs awarded to CDM projects.

29. An Annex B government, as distinct from a legal entity in the country, could choose to meet part of its commitment by buying AAUs from another Annex B government, investing in a Joint Implementation project in return for a share of the ERUs awarded, or investing in Clean Development Mechanism projects to earn a share of the CERs created. An Annex B government could also decide to sell some of its AAUs or to award ERUs for Joint Implementation projects implemented in the country. Such purchases and sales by Annex B governments can be made regardless of the domestic policies adopted. The domestic policies need to be designed to meet the country's assigned amount adjusted for purchases and sales by the government.

30. Although not subject to domestic policies to reduce emissions, sources in non-Annex B countries can implement low-cost emission reduction measures under the Clean Development Mechanism to create CERs for sale to sources in Annex B countries.

31. See Ellerman and Jacoby, and Weyant and Hill.

32. In principle, subsidies could be paid for emission reduction actions. The revenue to pay the subsidies would need to be raised through taxes. Other policies — emissions trading, emissions or carbon taxes, and regulations — impose the cost of reductions on the emitter rather than the taxpayer. Given these options and the scale of the reductions to meet the Kyoto commitments, subsidies are likely to play only a limited domestic policy role.

33. In a baseline and credit system, the baseline for each source is its allocation of permits; the aggregate limit is the sum of the baselines of the participating sources.

34. An emissions tax for greenhouse gases is often called a carbon tax because CO_2 emissions due to combustion of fossil fuels are a major source of greenhouse gas emissions in most countries and emissions of other greenhouse gases are often expressed in terms of CO_2 equivalents.

35. The tax can be imposed on actual emissions or on substances that ultimately lead to emissions. For example, a tax on carbon dioxide (CO_2) emissions from fossil fuels could be imposed on sources that burn fossil fuels and thereby generate CO_2 emissions, or on the carbon content of the fuels. In the latter case, the tax increases the price of fossil fuels and provides an incentive to reduce consumption and switch to less carbon-intensive fuels.

36. For convenience, this discussion assumes there is a single price for all Kyoto Protocol allowances. In practice, there may be different prices for AAUs, ERUs, and CERs or for allowances from different countries.

37. Economic efficiency requires that the marginal cost of abatement be the same for all sources in all countries. A source subject to an emissions tax will reduce its emissions as long as the cost is less than the tax rate. Thus the tax rate is the marginal cost of abatement for every source subject to the tax. If the tax rate is above the market price and allowances can be used to offset the tax liability, sources will buy allowances rather than pay the tax, thus equalizing the marginal cost across all countries with access to the market for international allowances. If allowances cannot be used to offset the tax liability or if the tax rate is less than the market price for international allowances, the marginal cost of abatement differs for sources in different countries, which is inefficient.

38. The Kyoto Mechanism allowances relate to the 2008-2012 commitment period while the emissions from the vehicles will be experienced over their lifetimes. If the actual emissions were greater than the standard, only part of the extra emissions would occur during the 2008-2012 period. Accepting international allowances toward compliance in this case would provide a compliance margin for the 2008-2012 period and allow surplus allowances to be banked for future periods. However, providing allowances to the manufacturer if actual emissions were less than the standard could create problems. The allowances would be awarded for reductions that occur after 2012, but they could then be used to justify higher emissions during the 2008-2012 period. This creates a risk of non-compliance with the national emissions limitation commitment.

39. The cost of compliance with a given regulation is likely to vary by source. If a regulation allows the use of allowances to comply and all sources face compliance costs that exceed the international market price, then the marginal cost will be equalized for these sources. If some of the sources have compliance costs less than the international market price, the use of allowances to achieve compliance does not achieve an efficient outcome unless the low-cost sources are able to create and sell emissions credits. Different regulations are likely to have different ranges of compliance costs. And not all regulations will allow the use of allowances for compliance. Thus, regulations are unlikely to achieve a completely efficient outcome even if the use of allowances is permitted.

40. A country could decide to apply its domestic policy separately to each operating unit or to the legal entity that owns all of the operating units in the country.

41. A government might not wish to award assigned amount units to legal entities under any condition, preferring to retain the units in case (1) some sources do not comply with their obligations, (2) some policies are less effective than predicted, or (3) uncontrollable factors such as economic growth and weather lead to higher-than-predicted emissions.

42. Liability provisions that require each Annex B government to maintain a reserve prevent the use of AAUs as allowances for a domestic trading program because the AAUs have to be kept in the government's reserve account and so can not be distributed to legal entities.

43. A firm subject to an emissions tax would need to demonstrate to the satisfaction of the government that it has made a larger reduction than warranted by the tax and that it should receive AAUs equal to the extra reduction. It would have an incentive to make the extra reduction and export the AAUs only if the tax rate is lower than the international price for allowances. Then exporting the AAUs would improve economic efficiency.

44. The source would only have an incentive to reduce emissions below the level required by the regulation if the international price for allowances were higher than the marginal cost of making reductions in excess of those required by the regulation.

45. A participant in the domestic emissions trading program that makes reductions beyond the requirements imposed by domestic policy will have surplus domestic allowances. To export these surplus domestic allowances, the participant would exchange them for AAUs and sell them on the international market. If the same emission reduction action is implemented as a JI project, the ERUs awarded for the project would presumably be less than or equal to the host entity's surplus domestic allowances. As a JI project requires prior approval by the governments involved, the cost would be higher than making the same transaction through International Emissions Trading.

46. A JI project that applies to emissions covered by domestic policies risks double-counting the reductions achieved and thereby not attaining the national emissions limitation commitment. The risk of double-counting reductions from sources whose emissions are covered *directly* by domestic policies is illustrated by the following example. Assume that tractors manufactured or imported into country Z must meet minimum energy efficiency standards to reduce CO_2 emissions from the fuel used. Now assume that a farm cooperative launches a Joint Implementation project, financed by foreign investors, that provides incentives to farmers in country Z to buy energy-efficient tractors. Every farmer who buys a tractor more efficient than the minimum standard receives an incentive payment and the associated emissions reduction is attributed to the JI project. But it is likely that some of the participants would have purchased the more efficient models without the incentive. The JI project would count some reductions that would have been achieved anyway. The risk of double-counting is so high that such a project probably would not be approved.

This risk of double-counting is even higher for sources whose emissions are regulated *indirectly*. Assume that a domestic emissions trading program is implemented for the carbon content of fossil fuels sold in country Y. Emissions are reduced as a result of energy efficiency and fuel switching measures implemented by energy users responding to price increases caused by the trading program. A JI project to improve the energy efficiency of buildings runs a significant risk of double-counting because it is difficult to determine which measures would have been implemented in response to price increases. Thus some of the energy efficiency measures implemented by the JI project probably would have been implemented anyway.

47. The supplementarity limit would restrict the quantity of allowances the government could use to meet its national emissions limitation commitment. The government might therefore limit the quantity of international allowances it would accept from legal entities toward compliance with their domestic obligations. Legal entities could choose to hold more international allowances.

48. The exchange would be on a ton-for-ton basis. The cost of making an exchange should be minimal, preferably zero. This might lead to a speculative rush to import allowances before the supplementarity limit has been reached, in order to resell them afterward. Michaelowa and Dutschke (1998) argue that this would distort the types of JI and CDM projects sources would choose to implement.

49. Disallowance of the transfer may occur several years after the allowances have been used by the legal entity for compliance with the domestic policy obligation. Disallowance means that the allowances are no longer available to the government to meet the national emissions limitation commitment. The government might seek to have the legal entity replace the allowances, but this may not be feasible if the entity no longer exists.

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