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International Emissions Trading and Compliance with Greenhouse Gas Limitation Commitments

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1. INTRODUCTION

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) includes legally-binding emissions targets for a basket of six greenhouse gases for the period 2008-2012 for the 38 countries listed in Annex B[1] To help countries achieve their emission limitation commitments, the Kyoto Protocol introduces three innovative mechanisms for international co-operation:

- international emissions trading, established by Article 17, will allow trading of assigned amount among Annex B countries;
- joint implementation, established by Article 6, will allow emission reduction units resulting from emission reduction or sink enhancing projects in Annex B countries to be traded; and
- the clean development mechanism (CDM), established by Article 12, will allow emission reduction credits to be created through emission reduction, and possibly sink enhancement, projects in non-Annex B countries for use in meeting Annex B commitments.

Detailed rules for these mechanisms have yet to be adopted.[2]

Discussion on the detailed rules for these mechanisms began shortly after agreement was reached on the Protocol. While considerable progress has been made, a number of issues remaining outstanding. This paper focuses on two of the outstanding issues:

- liability for the validity of assigned amount traded to another Annex B party; and
- supplementarity of the mechanisms to domestic actions in meeting emissions limitation commitments.

Liability is discussed in the context of international emissions trading although it applies equally to joint implementation. Liability is not an issue for certified CDM credits. Supplementarity is an issue for all three mechanisms.

The issues related to liability for the validity of exported emission reduction units created by joint implementation projects are identical to those for the validity of exported assigned

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[1] Annex B countries are OECD countries (less Turkey and Mexico) and countries undergoing the process of transition to a market economy. In addition to the 38 countries, which include all member states of the European Union, the European Union is listed in Annex B.

[2] The Protocol states that the rules for international emissions trading are to be adopted by the Conference of the Parties, which means they could be adopted before the Protocol is ratified. The rules for joint implementation and the clean development mechanism must be adopted by the Conference of the Parties serving as a Meeting of the Parties to the Protocol, which means they can be formally adopted only after the Protocol is ratified.

amount. Under Article 3.11 any emission reduction units transferred to another Party are deducted from the assigned amount of the exporting Party in the same way as a sale of assigned amount. The exporting country is left with a reduced assigned amount regardless of whether it sells emission reduction units or assigned amount.

The CDM will establish a mechanism to certify credits created by emission reduction projects in non-Annex B countries. Once certified, the credits will be valid for use in meeting emissions limitation commitments in Annex B countries. The question of liability for the validity of the credits disappears when the credits are certified. Prior to certification, there is a risk that the emissions reductions anticipated or claimed will not be accepted as credits. This is an investment or business risk for the project proponents, not a liability issue.

2. LIABILITY FOR THE VALIDITY OF ASSIGNED AMOUNT TRADED

Article 3 of the Protocol commits each Annex B Party to limit its actual anthropogenic emissions of the six greenhouse gases to the level allowed by its emissions limitation commitment adjusted for transfers. A Party's initial assigned amount is adjusted for transfers of assigned amount and emission reduction units and for acquisitions of certified emission reduction credits.

Annex B Parties will report their emissions annually, but actual emissions for 2008-2012 will not be known until after the end of the period, probably 2014. Purchasers will want to buy assigned amount prior to the end of 2012, so they can use this additional assigned amount to help them meet their commitments for the period. Since the seller's actual emissions will not be known until after the end of the period, neither the buyer nor the seller can be certain that the assigned amount purchased will be surplus to the seller's compliance requirements at the time of the transaction. Thus the rules for international emissions trading must deal with situations where a buyer has purchased assigned amount from a seller that does not meet its emissions limitation commitments.

2.1 Assigning Responsibility for the Validity of Assigned Amount Traded

Responsibility for dealing with situations where assigned amount has been purchased from a seller that does not meet its emissions limitation commitments can be assigned in either of two ways. These options are called seller liability and buyer liability.

- Seller liability means that the buyer is free to use the assigned amount purchased and the seller is responsible for meeting its emissions limitation commitment with a smaller quantity of assigned amount.
- Buyer liability means that assigned amount sold but later found to be needed by the seller to meet its emissions limitation commitment is returned to the seller leaving the buyer responsible for finding other ways to meet its emissions limitation commitment.

Without further elaboration, the current provisions of the Kyoto Protocol imply seller liability. Each Annex B Party is responsible for ensuring that its actual emissions are less than its adjusted assigned amount, so the seller remains accountable for meeting its reduced limit. A seller that subsequently finds that its adjusted assigned amount is not sufficient to cover its actual emissions must purchase enough "credits"[3] to cover its excess emissions or incur the penalties for non-compliance.[4]

Non-compliance has undesirable consequences. Non-compliance increases aggregate emissions, leading to more environmental damage. Selling assigned amount that does not reflect a reduction in aggregate emissions devalues the commodity; it lowers the prices of assigned amount, emission reduction units and certified emission reduction credits. Thus all Parties are adversely affected by non-compliance on the part of a few countries.

Some analysts and negotiators believe that the risk of non-compliance and its consequences are non-trivial and hence seek to devise detailed rules for international emissions trading to provide an incentive to Annex B Parties to meet their commitments. Other analysts and negotiators oppose changes to the current provisions on two grounds:

- they believe that every Annex B Party will do its utmost to comply with its commitments and hence that the risk of non-compliance is small; and
- they believe that the costs of building into the international emissions trading system an incentive for Annex B Parties to meet their commitments exceed the consequences of non-compliance.

These divergent views raise several questions:

- What are the benefits and risks of leaving liability under international emissions trading as currently defined?
- Is it possible to devise rules for international emissions trading that provide Parties with an incentive to limit sales of assigned amount to levels consistent with compliance with their commitments?
- What are the consequences of rules to encourage Parties to sell only assigned amount surplus to their emissions limitation commitments?

The next three sections address these questions.

2.2 Benefits and Risks of Current Liability Provisions

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[3] Credits can be assigned amount, emission reduction units or certified emission reduction credits.

[4] The penalties for non-compliance with the commitments under the Kyoto Protocol (Article 18) remain to be negotiated. Traditionally, the penalties for non-compliance with an international agreement are weak and difficult to enforce.

As noted above, the current provisions of the Kyoto Protocol lead to a simple system of seller liability for international emissions trading. The environmental and economic integrity of this system rely on effective penalties for non-compliance.

Almost every domestic emissions trading program in the United States uses such a system of seller liability. The regulatory authorities responsible for these domestic emissions trading programs appreciate the importance of compliance to the integrity of an emissions trading program. The programs tend to have stringent monitoring and reporting requirements, severe penalties for non-compliance, extensive audit programs to verify compliance, and active enforcement of penalties for non-compliance. Thus, the expected penalties are much higher than the potential gains from non-compliance.

With international emissions trading, the current provisions of the Kyoto Protocol may reward non-compliance. An Annex B Party, or legal entities within the country, can benefit financially from the sale of assigned amount that is not surplus to its emissions limitation commitment.[5] A legal entity can benefit if assigned amount is distributed to participants in a domestic emissions trading program and the penalties are weak or not effectively enforced.[6] That could leave the national government with a difficult choice between the costs of compliance and the penalties for non-compliance.

The penalties for non-compliance with a national emissions limitation commitment under the Kyoto Protocol remain to be negotiated, but it is unlikely that they will exceed the financial benefits of non-compliance. Experience with other international agreements suggests that the penalties will be weak and difficult to enforce. Furthermore, the financial benefits accrue at the time of the sale while the penalties for non-compliance are only imposed some time after the end of the commitment period.

The main benefit of the current liability provisions is that they are simple to administer so the transactions costs are low. Transfers of assigned amount must be tracked so that the adjusted assigned amount of each Annex B Party is known. But this must be done in any case as part of the emissions trading system. At the end of the commitment period each Annex B Party must demonstrate that its actual emissions are less than its adjusted "assigned amount." This again must be done in any case to establish compliance with the national commitments. The only added administrative burdens are increased verification to establish compliance and increased enforcement in the case of non-compliance.

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[5] Article 17 does not specifically allow or exclude legal entities from participating in international emissions trading. Some Parties wish to allow legal entities to participate in international emissions trading.

[6] Non-compliance in the domestic trading system may be difficult to detect or to prove and, if proven, the penalties may be weak or difficult to enforce. If the penalties do not include a requirement to reduce future emissions by an amount equal to the excess emissions the emissions limit for the domestic trading program will not be met.

The main risks associated with the current liability provisions are an increase in environmental damage and financial losses to other participants in the trading system. Selling assigned amount that is not surplus to actual emissions leads to higher total emissions and, hence, more environmental damage. Selling assigned amount that does not reflect a reduction in actual emissions devalues the commodity and leads to financial losses for other participants.

Assigned amount has value because it is scarce. The price should reflect the cost of reducing emissions to meet the aggregate commitment of Annex B Parties. If one Party sells assigned amount that does not reflect a reduction in actual emissions, aggregate emissions will be higher than expected. The cost of meeting this higher emissions level should be less than the cost of meeting the aggregate commitment. So the price of assigned amount should fall and assigned amount becomes less scarce. As a result, entities or Parties that own assigned amount, or that invested in emission reduction actions with the expectation that the aggregate commitment would be met, suffer a financial loss.

A lower price for assigned amount also means lower prices for emission reduction units created through joint implementation projects and for certified emission reduction credits under the CDM. Since any of these "credits" can be used by Annex B Parties to meet their emissions limitation commitments, developments that reduce the price of one also reduce the prices of the others. Thus all Parties are vulnerable to financial losses due to non-compliance by an Annex B Party with its commitment.

If a few Parties are seen to benefit by selling assigned amount that is not surplus to their actual emissions without incurring significant penalties, it encourages others to follow suit. Unless effective measures are implemented to ensure compliance, this would trigger a downward spiral in the price of "assigned amount."[7] Ultimately, the quantity of assigned amount that is not matched by reductions in aggregate emissions undermines the credibility of international emissions trading and could lead to the collapse of the system.

Estimates of the cost savings due to international emissions trading are in the order of trillions of dollars. Thus the consequences of a collapse of international emissions trading, and the other co-operative mechanisms, would be much higher costs for a given level of aggregate emissions reduction and/or significantly slower progress in reducing greenhouse gas emissions.

Possible collapse of international emissions trading is an extreme scenario. It can be argued that before that happened it would be possible to implement effective measures to ensure compliance on the part of sellers. Those measures would probably be rules similar to those discussed below that provide Parties with an incentive to limit sales of assigned amount to levels consistent with compliance with their commitments.[8]

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[7] Prices of emission reduction units and certified emission reduction credits would, of course, also fall.

[8] If the possibility of a collapse of international emissions trading is admitted, the benefits are reduced administrative costs until, if ever, the need for more effective measures to ensure compliance becomes evident. The risks include the possibility that the collapse could happen too quickly for the international

2.3 Possible Rules that Provide Parties with an Incentive to Limit Sales of Assigned Amount to Quantities Surplus to Compliance with their Commitments

The main risk with international emissions trading is the sale of assigned amount that is not surplus to the compliance needs of the seller. An obvious way to avoid this risk is to not allow any transfers until after compliance has been established. This would mean no trading of assigned amount until after compliance for the 2008-2012 period had been established. The result would be higher costs for Parties that would otherwise buy assigned amount during the first commitment period. But it also does not eliminate the risk, since the surplus assigned amount from the first period might be needed by the seller for compliance during the second period. Thus, mechanisms that address the risk more effectively and allow trading during the first commitment period are needed.

A simple seller liability arrangement consistent with the current provisions of the Kyoto Protocol works well for several domestic emissions trading programs. But it relies on effective enforcement and severe penalties for non-compliance. In principle, effective enforcement and severe penalties for non-compliance could be negotiated for the Kyoto Protocol. However, the history of other international agreements strongly suggests that the penalties agreed will be weak and/or difficult to enforce. The Parties to the Protocol, as sovereign nations, are unlikely to agree to establish a mechanism that has the authority to impose severe penalties on themselves. Thus, the "stick" of effective enforcement of severe penalties is presumed, in practice, to be unavailable.

The challenge is then to devise rules for international emissions trading that provide a "carrot" to Annex B Parties to sell only assigned amount surplus to their compliance requirements. Rules that provide an incentive to sell only assigned amount surplus to their compliance needs only reduce the risk of non-compliance due to trading by sellers. They can not provide an incentive to an Annex B Party that is a net buyer to purchase enough assigned amount to achieve compliance. Nor can they provide an incentive to an Annex B Party that does not trade to achieve compliance.

Two systems that provide an incentive to sell only assigned amount surplus to compliance needs are discussed below:

- **Seller liability with an escrow account**. Funds from the sale are deposited in an escrow account until compliance is achieved. If the seller needs some of the assigned amount sold to achieve compliance, all units sold are reduced *pro rata* by the required fraction. Escrow account funds are used to replace the assigned amount lost by each

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system to respond given that the new rules would need to be agreed through international negotiation and that the measures adopted under such circumstances might need to be more stringent and costly given the need to restore confidence in the international emissions trading system.

buyer. The seller can borrow against the escrow account but lenders are subordinate to the buyers.

- **Buyer liability with insurance**. The initial buyer is required to obtain replacement insurance coverage in case the sale is disallowed. If the seller needs some of the assigned amount sold to achieve compliance, the transactions are undone in reverse order. The insurance replaces the assigned amount for the buyers in the invalidated transactions.

Seller Liability with an Escrow Account

A financial incentive to comply can be created by requiring that the proceeds from sales of assigned amount be held in escrow until compliance is established. This requirement would apply to the first sale of a unit of assigned amount to an entity or government in another country.[9] The assigned amount is held initially by the government, if it sells some assigned amount to an entity or government in another country, the proceeds from the sale would be held in escrow. If the government distributed the assigned amount to participants in a domestic emissions trading program, the requirement would apply to any sale by a participant to an entity or government in another country.[10]

If all of the assigned amount sold to foreign buyers is found to be surplus when compliance for the commitment period is established, the funds are disbursed to the sellers. The rules could include a provision that the national government would need to certify that the seller is in compliance with domestic obligations before the funds are released, if the seller is a legal entity. If the selling entity failed to comply with its domestic obligations but the government had met its national commitment, the funds would be released to the government.

If some of the assigned amount sold is needed to achieve compliance, the quantities held by registered foreign owners on a specified date[11] would be reduced *pro rata* by the fraction required to bring the country into compliance with its national commitment.[12] The

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[9] This requires that units of assigned amount have serial numbers so that transfers to foreign entities or governments can be tracked. But units of assigned amount will probably need to have serial numbers in any case to verify trades and compliance.

[10] It does not matter whether the assigned amount is distributed to participants in the domestic emissions trading program *gratis* or through auction. The price received for assigned amount sold to a foreign buyer by a legal entity should reflect the probability that the country will meet its emissions limitation commitment because it is the country's compliance, not the entity's compliance, that triggers the *pro rata* reduction of assigned amount. Since the funds are held in escrow, the creditworthiness of the seller is not a concern. An Annex B Party concerned with managing compliance with its emissions limitation commitment could impose a requirement to approve all export sales by entities.

[11] The dates would be specified several years in advance. This is similar to the treatment of dividend payments for publicly traded shares; the dividends are paid to the registered owners as of a specified date.

[12] Assume a country had 100 units of assigned amount and sold 15 units to entities and governments in other countries and then found its actual emissions to be 90 units. To achieve compliance it would need to hold 90 units of "assigned amount," the 85 units still held domestically plus 5 of the 15 units sold to foreigners. Thus, all foreign holdings would be reduced by one-third (5/15) to bring the selling Party into compliance. If actual emissions were 105 units all foreign holdings would be reduced to zero, but the

owners whose holdings of assigned amount are reduced receive credits or funds from the escrow account to replace the assigned amount lost.

An escrow account would be established at a suitable financial institution, such as the International Monetary Fund, the Bank of England, or a large commercial bank, for each Annex B Party and each legal entity that exports assigned amount.[13] A condition of registration of the transfer of assigned amount by the Climate Change Secretariat would be documentation that the proceeds had been deposited into the escrow account. The financial institution could be required to use some of the funds to purchase assigned amount or equivalent credits.[14] Interest would be paid on account balances.

Only the proceeds of the initial export sale are held in escrow. Any subsequent sale is unaffected by the escrow requirement. The proceeds from a resale go to the seller. Assume the first foreign buyer is an entity that later wishes to sell the assigned amount it purchased. It is free to negotiate a sale with any other buyer at any price.[15] The initial foreign buyer (and now seller) receives the revenue from that sale. These transactions have no effect on the escrow account.[16] Only the proceeds from the original export sale go into the escrow account.

Annual reports of actual emissions and information on sales and purchases of assigned amount provide potential buyers and lenders with information on the prospects for

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selling Party still would not meet its commitment because its actual emissions (105 units) exceed its assigned amount (100 units). But the non-compliance is not due to, nor aggravated by, international emissions trading.
Conceptually it is possible to invalidate transactions in reverse chronological order or to adjust the holdings in proportion to the price paid, rather than to adjust the quantity proportionally. Those approaches would create a different market price for the assigned amount sold in each transaction. A proportional reduction of the quantity creates a single market price for the assigned amount of a given country. Although prices will differ by country, this is a much simpler situation than one where market prices differ by country and transaction.

[13] For convenience, each Party would have a single account for each commitment period. Ideally, all accounts would be held by the same institution.

[14] Purchasing assigned amount or equivalent credits (emission reduction units from joint implementation projects or certified emission reduction credits from the clean development mechanism) ensures that a reasonable quantity of credits will be available to buyers whose holdings have been reduced so that they can achieve compliance. These holdings also enhance the environmental integrity of the international emissions trading program. The administrator(s) of the escrow accounts could be required to hold enough credits to cover the expected devaluation in the holdings of buyers. This could be determined periodically by the auditors for the administrator(s).

[15] The price could be higher or lower than the price at which the original export sale was made. That is irrelevant. The original buyer (and now seller) receives the revenue from the subsequent sale, whatever that might be, and earns the resulting profit or loss.

[16] The only exception is a unit of assigned amount that was sold to a foreign entity or government and is subsequently purchased by an entity or the government of the original exporting country. Then the funds held in escrow could be released because the assigned amount is no longer owned outside the originating country. In other words, if assigned amount A was sold to a foreign entity or government by (an entity in or the government of) country X and was subsequently purchased by (the same or a different) entity in, or government of, country X the funds could be released because the assigned amount is no longer exported.

compliance. Although the prospects differ from country to country and over time, the market price of assigned amount would be affected only if the risk of non-compliance and the market price of assigned amount increased to the point that owners of assigned amount from a particular country might not be fully compensated for their reduced holdings from the escrow account.[17]

In principle sellers receive no money from export sales of assigned amount until after the end of the commitment period when compliance is established. This would be a strong disincentive to international emissions trading. To reduce the disincentive to trading sellers could borrow from other financial institutions using the escrow account balance as security.[18] Lenders would probably be willing to advance only a small share of the balance initially because future emissions and sales could cause non-compliance. But the share could rise over the course of the commitment period as actual emissions are reported and the prospects for compliance become clearer.[19]

To get more revenue than financial institutions are willing to lend against the escrow account balance, a seller might be tempted to negotiate sales that lead to immediate payment and smaller escrow account deposits. For example, if the market price for assigned amount is $5 per tonne, the seller might suggest that $1 per tonne be deposited in the escrow account and that the buyer pay the seller $3 per tonne directly to get immediate payment. Assume the buyer and seller agree to such a transaction, deposit the $1 per tonne in an escrow account, and register it with the Climate Change Secretariat.

A sale at an unusually low price would probably be interpreted as a signal that compliance was unlikely. That would reduce the market price, limit additional sales, and limit the ability to borrow against the escrow account.[20] The total price would need to be less than the market price since the risk to the buyer is increased because there is less money in the escrow account to compensate owners for any reduction in the quantity of assigned

[17] As long as the exports from a country are assigned amount that has a high probability of being surplus to its commitments, the risk that owners will not be fully compensated for any devaluation of their holdings will be low. Assigned amount for all countries for which that is true should have virtually the same market price.

[18] The financial institution holding the escrow accounts should not be eligible to lend funds to Parties using those accounts as security.

[19] The amount financial institutions would be willing to lend depends on the likelihood of the country meeting its emissions limitation commitment with its adjusted assigned amount. This creates an incentive to submit credible reports of annual emissions to the Climate Change Secretariat on time. If legal entities are involved in exporting assigned amount, they will have an incentive to support actions by the national government to increase the probability of compliance with the national commitment.

[20] Financial institutions would probably include a provision in their loan agreements that a sale at an unusually low price could trigger a requirement to repay existing loans immediately. An unusually low price indicates an increased risk of non-compliance, a higher probability of payments from the escrow account to owners of assigned amount, proportionately less money deposited into the escrow account to make such payments, and hence reduced security for the lenders.

amount held.[21] To provide the seller with a substantial immediate payment, the reported price would need to be very low, which would have a significant adverse impact on the market price for the seller's assigned amount. Thus, circumvention of the escrow account is unlikely to be a major problem.

When compliance is established after the end of the commitment period the funds in the escrow account are disbursed. Owners of devalued assigned amount (who need not be the original buyers) would have first call on the credits and funds in the escrow account. They receive credits or funds to replace the assigned amount lost through the devaluation of their holdings. Secured lenders would rank second. Outstanding loans secured by the escrow account would be repaid. The balance would be paid to the seller.

The owners of devalued assigned amount would receive credits from the escrow account holdings up to the quantity of assigned amount lost. If the available credits do not fully offset the loss of assigned amount, the affected owners would receive compensation equal to the greater of: (1) a proportional share of the funds in the escrow account, and (2) the cost of purchasing enough credits on the market to make up the balance of the assigned amount lost.[22]

Owners planning to use purchased assigned amount to achieve compliance might find themselves in non-compliance because the amounts they purchased had been reduced. The rules could allow owners a few extra months to purchase additional assigned amount or equivalent credits to come into compliance.

In short, holding the proceeds in escrow creates a financial incentive for sellers -- governments and entities -- to meet their emission limitation commitments. The market price for assigned amount will be very similar across countries except where the probability of non-compliance is high. Requiring the administrator(s) of the escrow accounts to invest some of the funds in assigned amount or equivalent credits can preserve environmental integrity. Owners of exported assigned amount are largely protected from devaluation of their holdings. They may need to be given a few extra months to come into compliance.

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[21] A buyer might be more willing to do this late in the commitment period if there is already a large balance in the escrow account, but then the immediate payment is less attractive for the seller since it could probably borrow more against the balance in the escrow account.

[22] This puts as much of the liability as possible on the seller. The owners receive enough credits or revenue to fully offset the devaluation of their holdings given the market price of assigned amount at the time compliance is established. The owners have some risk of a loss if the market price of assigned amount rises significantly and there is not enough revenue in the escrow account to fully compensate them for the devaluation of their holdings.

Basing the compensation on the price of assigned amount at the time compliance is established places the price risk on the seller and simplifies the administration. If owners were only compensated for the price originally paid for the assigned amount purchased it would be necessary to track the price of each export sale. This original price would affect the resale value of the assigned amount because it would affect the compensation and that would lead to a very fragmented market where prices of assigned amount differed by country of origin and original sale price.

Buyer Liability with Insurance

With buyer liability, the buyer must decide whether the exporting country is likely to comply with its emissions limitation commitment before purchasing the assigned amount. If the buyer agrees to purchase assigned amount and the seller later needs this assigned amount to achieve compliance, the sale will be invalidated. If the buyer was relying on the purchased assigned amount to achieve compliance, failure to consummate the transaction means the buyer will not comply with its commitments.

Buyers can protect themselves by insisting on insurance to replace the assigned amount from a transaction that is subsequently disallowed.[23] Such insurance coverage would be mandatory for the initial export sale of assigned amount whether by the government or a legal entity. The cost of the insurance will rise with the risk of non-compliance. At some point, coverage will not be available and the seller will be unable to export any more assigned amount.

This could be implemented as follows. A buyer and seller would notify the Climate Change Secretariat of a proposed transaction as soon as the details have been negotiated. In addition to the units of assigned amount covered by the transaction,[24] the buyer and seller would need to provide evidence of suitable insurance coverage.[25] When the necessary information has been provided, the trade is registered by the Climate Change Secretariat.

Trades would not be consummated until after the end of the commitment period when compliance with the emissions limitation commitment is established. If the exporting country's adjusted holdings of assigned amount exceed its actual emissions for the 2008-2012 period; all of the registered sales can be executed. If the exporting country's actual emissions for the period exceed its remaining assigned amount some (or all) of the registered sales must be invalidated to bring the seller into compliance.[26] Transactions would be invalidated in reverse chronological order as necessary to bring the seller into compliance.

Invalidating transactions in reverse chronological order until the seller achieves compliance is important for three reasons. First, disallowing transactions in reverse order

[23] Although the discussion assumes insurance coverage, any equivalent financial instrument, such as a performance bond, would serve equally well.

[24] This requires that units of assigned amount have serial numbers, which will probably be needed in any case, so that transfers to foreign entities or governments can be tracked.

[25] The Climate Change Secretariat might establish conditions that insurers must meet; standard policy provisions and financial tests to establish creditworthiness, for example.

[26] If all transactions are disallowed and the Party is still not in compliance, then it would be subject to the penalties for non-compliance. But emissions trading has not contributed to the non-compliance.

minimizes the number of transactions affected.[27] Second, it creates an incentive to register transactions quickly because earlier sales have a lower probability of disallowance than later deals. Since transactions are registered quickly, insurance companies will have accurate current information about the seller's commitments when calculating the premium for a proposed sale.

Third, it does not change the risk of default from what it was at the time of the transaction. If all transactions were reduced proportionally to bring the seller into compliance, the risk associated with an early transaction would be affected by subsequent sales. It would be very difficult to establish premiums because later sales would increase the risk of disallowance. Invalidating transactions in reverse chronological order means that the risk associated with a proposed sale is not affected by subsequent sales.

The insurance coverage must be transferable and remain in effect until the seller's compliance is established.[28] Once a quantity of assigned amount enters the market it could be resold many times. The insurance coverage for the initial transaction should remain in effect, regardless of the number of times the assigned amount is resold, until the seller achieves compliance after the end of the commitment period.[29]

Since Parties report their actual emissions annually, companies can update their assessment of the probability of compliance with the cumulative budget each year.[30] Parties will also have an incentive to register transactions quickly. Thus insurance companies will be able to adjust the premium for each Party to reflect the risk of non-compliance at the time of the transaction.

Insurance companies would be required to use some of the premium revenue to purchase a portfolio of assigned amount and equivalent credits from different countries. The purchases should be roughly equivalent to the quantity of assigned amount it expects it will need to replace.[31] This helps preserve the environmental integrity of the international emissions trading program.

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[27] If the insurance companies do their job well relatively few transactions will be affected because sales become financially unattractive as the risk of non-compliance, and eventual disallowance, rises.

[28] The registry that records international transactions of assigned amount would need to note the insurance company and policy number for each transaction.

[29] Further research is needed to confirm that insurance coverage with the required features would be considered an attractive product by a number of firms. A number of firms would need to offer these products to ensure that premiums are competitive. Research is also needed to confirm that the total exposure is manageable for the firms involved, or to identify ways to reduce the total exposure.

[30] Since companies will rely on annual reports, which include emissions inventories, to establish their premiums, Parties that wish to export assigned amount have an incentive to submit high quality reports on time.

[31] An insurance company could create its own reserve of assigned amount and equivalent credits or contribute to an industry fund that is invested in a portfolio of assigned amount and equivalent credits. Company auditors would assess the adequacy of these reserves periodically.

Buyers will compare the cost per tonne of CO_2 equivalent of valid assigned amount or equivalent credits from different sources.[32] The cost of valid assigned amount from another country will include the cost of the necessary insurance coverage. So revenue to the seller from the sale of assigned amount is reduced by the insurance premium. The premium can differ for each sale depending upon the risk that the country will not meet its emissions limitation commitment. Thus, the cost of the insurance coverage creates an economic incentive for sellers to comply with their national commitments.

Subsequent sales of assigned amount that has been exported do not need new insurance coverage. The insurance coverage on the initial transaction remains in effect until compliance is established.[33] Thus the commodity traded is insured assigned amount. While there could be price differences due to the possibility that the insurer might default on its coverage, the quantity of assigned amount affected should be small. Thus, the commodity traded should be virtually homogeneous and the price should be the same regardless of the country of origin or date of sale.

The owners of exported assigned amount will want to use it to achieve compliance. If a transaction is invalidated the insurer should provide the owner with valid assigned amount or equivalent credits from its reserve to replace the assigned amount from the disallowed transaction. If the insurance company's reserves of these credits are not sufficient to replace all of the assigned amount from invalidated transactions, the owners should receive financial compensation sufficient to buy enough assigned amount or equivalent credits to make up the balance. Owners would need to have a reasonable period of time to buy the necessary assigned amount or equivalent credits to achieve compliance.

The insurance coverage or performance bond may need to remain in effect for up to seven years. The commitment period runs from 2008 through 2012 and it will likely be two years later before actual emissions are reported and compliance can be established. Thus a transaction initiated early in 2008 could require coverage for about seven years.[34] But a transaction initiated in 2012 would only require coverage for two years.

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[32] Valid assigned amount or equivalent credits can be acquired in any of the following ways: purchasing valid assigned amount from Parties in compliance with their commitments, purchasing certified emission reductions credits through the clean development mechanism, purchasing emission reduction units created by joint implementation projects in countries in compliance with their commitments, or purchasing valid domestic allowances or credits of the importing country to replace the imported assigned amount.

[33] The premium for the insurance coverage should be a single payment when coverage is obtained. This premium should be paid from the proceeds of the sale. This ensures that the cost of insurance coverage is deducted from the revenue received by the seller and so provides an incentive to the seller to reduce the perceived risk of non-compliance. A single initial premium for the insurance also ensures that the coverage will remain in force through subsequent sales until compliance is established.

[34] Although the rules for international emissions trading remain to be agreed, there may well allow provisional transactions prior to 2008. In that case, the period for which insurance coverage would be required is correspondingly extended. But the costs of obtaining coverage for such a long period of time may discourage early transactions.

The amount of assigned amount transferred and the market price can not be accurately predicted at this time. Rough estimates suggest that the value of assigned amount transferred could range between $1 and $16 billion per year; say $8 billion per year as a central estimate.[35] Total exposure would be the equivalent of seven years of sales $7 to $112 billion with a central value of $56 billion.

Financial institutions providing insurance coverage could reduce their exposure by purchasing futures or options for assigned amount. The International Petroleum Exchange has announced that it proposes to launch a CO_2 emissions futures contract as soon as a primary market has been established. The clean development mechanism can begin to certify emissions reductions created by projects in developing countries beginning in 2000.[36] So a primary market and futures trading could be established before 2008.

In summary, requiring insurance coverage on the initial export sale to replace the assigned amount involved in invalidated transactions creates a financial incentive for sellers, governments and entities, to meet their emission limitation commitments. Transactions are registered as they occur, and are invalidated in reverse chronological order as necessary to bring the selling country into compliance. Prices of insured assigned amount should be virtually identical for all sellers. Requiring insurance companies to invest some of the premiums in assigned amount or equivalent credits preserves environmental integrity. Owners of assigned amount from invalidated transactions may need to be given a few extra months to purchase additional assigned amount or equivalent instruments to come into compliance.

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[35] International Energy Agency, *World Energy Prospects to 2020*, G8 Energy ministers' Meeting, Moscow, 31 March 1998, Table 3, p. 24, shows energy-related CO_2 emissions for groups of Annex I countries for 1990 and for "business as usual" in 2010. The reduction from BAU emissions required to meet the Kyoto commitment in Annex I countries other than transition economies is shown as 3,803 million tonnes of CO_2. Assume that the supplementarity provision limits the amount of assigned amount these countries can purchase to half of the total reduction, say 1,900 million tonnes of CO_2. The projected BAU emissions for transitional economies in 2010 are 3,769 million tonnes of CO_2, which is 657 million tonnes below 1990 levels. Thus, these countries should be able to sell at least 650 million tonnes of assigned amount. Implementing energy efficiency measures to reduce demand by 25% in 2010 would make another 950 million tonnes of assigned amount available. Thus, the supply of assigned amount is probably between 650 and 1,600 million tonnes of CO_2 while the demand could be as high as 1,900 million tonnes of CO_2. Prices currently range from less than $1 to about $3 per tonne of CO_2. The U.S. Council of Economic Advisors has estimated the price to be between $18 and $23 per tonne of carbon -- about $5 per tonne of CO_2 -- assuming international emissions trading. Using a range of $1 to $10 per tonne of CO_2, the value of assigned amount transferred could range from $0.65 to $19 billion per year. Consider a "central" price estimate of $5 per tonne, if the quantity traded ranged between 650 and 1,900 million tonnes the value would be between $3.25 and $9.50 billion. Consider a "central" estimate of 1,600 million tonnes traded, if the price ranged between $1 and $10 per tonne the value would be between $1.6 and $16.0 billion. A central value for these ranges is approximately $8 billion per year.

[36] International Petroleum Exchange, *A Proposal to reduce CO2 Emissions in the European Union through the Introduction of an Emissions Trading Programme*, May 1998, p. 9.

2.4 Consequences of Rules to Encourage Parties to Sell Only Assigned Amount Surplus to their Emissions Limitation Commitments

Rules to encourage Parties to sell only assigned amount surplus to their emissions limitation commitments increase the administrative complexity and transactions costs of international emissions trading. As a result the volume of trades and the net savings due to international emissions trading might be reduced. But by increasing compliance on the part of Annex B sellers, such rules reduce enforcement costs and enhance the integrity of international emissions trading.

The proposed rules discussed above could shift the timing of trades. Requiring funds to be deposited in an escrow account, for example, would probably limit trading activity until near the end of the commitment period. The proposal to require insurance coverage provides an incentive to register transactions early, but the cost of insurance coverage for a longer period of time may be higher, so the net impact on the timing of trades is difficult to predict.

The proposed rules apply only to the initial export sale; subsequent sales are not affected. A system of seller liability with escrow accounts can be structured so that the market prices for assigned amount are essentially the same except for countries where the probability of non-compliance is high. A system of buyer liability with insurance coverage should lead to uniform prices for assigned amount except where there is a risk of default by the insurer.

The proposed rules can apply to both national governments and entities that sell assigned amount to foreign buyers. Since it is compliance with the national emissions limitation commitment that determines whether trades are affected, the price received by an entity will be determined primarily by the country's performance. Thus entities that wish to export assigned amount would tend to support domestic policies to increase the probability of compliance with the national commitment.

If entities can export assigned amount the national government may want to implement an approvals process to ensure that the sellers are in compliance with their domestic obligations when the sales are made. This can be done by requiring government approval for exports of assigned amount or by creating separate domestic allowances that are convertible to and from assigned amount for international trading purposes.

The liability provisions, then, involve choices among different levels of compliance by Annex B sellers and associated transactions costs (and compliance cost savings). There is no obvious best choice. But to be effective the provisions must provide appropriate incentives to the national governments of Annex B Parties, since they are the ones that receive the assigned amount initially and they are the ones responsible for achieving compliance with their Kyoto commitments.

Finally, note that it is not buyer or seller liability *per se* that provides the incentive to comply with the emissions limitation commitment; it is the incentives built into the rules. The current provisions of the Kyoto Protocol establish a simple system of seller liability that is likely to be ineffective in promoting compliance because the penalties are likely to be weak and/or difficult to enforce. Escrow accounts also establish seller liability but provide an incentive to exporting countries to meet their national commitments.

3. SUPPLEMENTARITY

Each of the articles dealing with the cooperative implementation mechanisms includes wording to the effect that use of the mechanism must be supplemental to domestic action to mitigate greenhouse gas emissions.

- Article 12.3(b) states that Annex I Parties may use certified emission reductions from CDM projects to contribute to compliance with "part" of their quantified emission limitation and reduction commitments.
- Article 17 states that emissions trading (of assigned amount) "shall be supplemental to domestic actions for the purposes of meeting their fulfilling their quantified emission limitation and reduction commitments".
- Article 6.1(d) states that emission reduction units from joint implementation projects "shall be supplemental to domestic actions for the purposes of meeting commitments [their quantified emission limitation and reduction] commitments.

The merits of different interpretations of these supplementarity provisions are still being debated. This paper does not join that debate. Rather the purpose is to argue that, regardless of how it is defined, supplementarity should be a single test applied collectively to the use of all three mechanisms at the time of compliance. Supplementarity should not affect individual transactions under the different cooperative mechanisms. The reasons for this view are that:

- Instruments under the three mechanisms are substitutes in terms of achieving compliance with national commitments, so a restriction on the use of one mechanism leads to a shift to other mechanisms. Hence, only the aggregate restriction on the use of the three mechanisms is binding in practice, so it is simplest to formulate the supplementarity provision in those terms.
- The requirement that reliance on the cooperative mechanisms be supplemental to domestic action applies to Parties not to legal entities that may participate in the different mechanisms. Hence, it is appropriate to apply the provision to Parties at the time of compliance. Application of the provision to individual transactions is not appropriate because they may involve legal entities to which it does not apply and because the supplementarity effects of a given transaction can be offset by subsequent transactions.

Assume that the supplementarity provision is applied separately to each of the three mechanisms. If a Party has reached its limit, however defined, on the use of certified emissions reductions under the clean development mechanism (CDM), entities in that country will simply sell further CDM credits that accrue to them and use the funds to purchase emission reduction units from joint implementation projects or assigned amount. This adjustment continues until the provision on the use of each of the mechanisms is binding. Obviously, it does not matter in which sequence the supplementarity provision for the different mechanisms restricts further use of that mechanism. In practice only the restriction on aggregate use of the three mechanisms matters, so it is simplest to define the provision in those terms.

The provisions of the Protocol apply to Parties. Parties are responsible for meeting their commitments, including implementing domestic policies. Thus, the supplementarity provision applies specifically to Parties. The appropriate time to apply this provision is when Parties demonstrate compliance. They are already required to report actual emissions, the policies and measures implemented, the estimated impacts of the policies and measures, and any transfers or acquisitions of assigned amount, emissions reduction units or certified emission reduction credits. Most of this information will be reported annually. It should be relatively simple then for a Party to track its status relative to the supplementarity provision over the course of the commitment period and to adjust its policies if necessary. Determining whether, at the end of the period, each Party is in compliance with the supplementarity provision should also be a relatively simple matter.

Annex B Parties may authorize legal entities to participate in the generation, transfer or acquisition of emission reduction units from joint implementation projects (Article 6.3). Similarly, private and/or public entities may engage in the creation or acquisition of certified emission reduction credits under the CDM subject to guidance provided by the executive board (Article 12.9). Participation by legal entities in emissions trading is not explicitly mentioned in Article 17, but is widely assumed.

Some, but not all, of the legal entities participating in the creation, acquisition, or transfer of instruments under any of these mechanisms will have obligations to implement measures to reduce their emissions. Applying the supplementarity provision defined for Parties to individual entities unnecessarily restricts their flexibility to meet their obligations. Since not all domestic sources will rely on these mechanisms, the limits for the sources that do wish to use them can be much less restrictive (in percentage terms) than for the country as a whole. Determining a supplementarity provision that can be applied to individual sources that does not unduly restrict flexibility and yet meets the overall supplementarity provision is virtually impossible. Attempting to apply a supplementarity provision to individual transactions, rather than individual entities, is even more problematic because the supplementarity effects of a given transaction can be offset by subsequent transactions.

In short, supplementarity, regardless of how it is defined, should be a single test applied collectively to the use of all three mechanisms by a Party at the time of compliance. Supplementarity should not affect individual transactions under the different cooperative mechanisms.

4. SUMMARY

The Kyoto Protocol provides for transfers of assigned amount (international emissions trading) among Annex I Parties. Purchasers will want to buy assigned amount prior to the end of 2012 so that it can be used to help meet their commitments for the 2008-2012 period.

Without further elaboration, the current provisions of the Kyoto Protocol imply seller liability. The main benefit of the current liability provisions is that they are simple to administer so the transactions costs are low. The main risks associated with the current provisions are an increase in environmental damage and financial losses to all Parties. The risks stem from the probability of non-compliance by Annex B Parties because the penalties are likely to be weak and difficult to enforce.

The challenge is to devise rules for international emissions trading to provide an incentive to Annex B Parties to sell only assigned amount surplus to their compliance requirements. Neither the buyer nor the seller can be certain that the assigned amount purchased will be surplus to the seller's compliance requirements for 2008-2012 until some time after the end of the period, probably 2014. However, the selling country has accepted the emissions limitation commitment and is able to implement measures to meet that undertaking, so incentives to comply must focus on the seller.

Holding the proceeds of export sales of assigned amount in escrow creates a financial incentive for sellers to meet their emission limitation commitments. The market price for assigned amount will be very similar across countries except where the probability of non-compliance is high. Requiring the administrator(s) of the escrow accounts to invest some of the funds in assigned amount or equivalent credits can preserve environmental integrity. Owners of exported assigned amount are largely protected from devaluation of their holdings. They may need to be given a few extra months to come into compliance.

Requiring insurance coverage on the initial export sale to replace the assigned amount involved in invalidated transactions also creates a financial incentive for sellers to meet their emission limitation commitments. Transactions are registered as they occur, and are invalidated in reverse chronological order as necessary to bring the selling country into compliance. Prices of insured assigned amount should be virtually identical for all sellers. Requiring insurance companies to invest some of the premiums in assigned amount or equivalent credits preserves environmental integrity. Owners of assigned amount from invalidated transactions may need to be given a few extra months to purchase additional assigned amount or equivalent instruments to come into compliance.

There is no obvious best choice. In addition to providing an incentive to the national governments of Annex B Parties to limit export sales of assigned amount to quantities surplus to achieving compliance with their Kyoto commitments, the provisions should be designed so that the assigned amount traded internationally is not differentiated by country of origin, date of sale or other characteristic. Such fragmentation reduces the efficiency of the market and increases transaction costs.

Each of the articles dealing with the cooperative implementation mechanisms includes wording to the effect that use of the mechanism must be supplemental to domestic action to mitigate greenhouse gas emissions. The merits of different approaches to implementing these supplementarity provisions are still being debated. It is argued here that supplementarity, regardless of how it is defined, should be a single test applied collectively to the use of all three mechanisms by an Annex B party at the time of compliance. Supplementarity should not affect individual transactions under the different cooperative mechanisms.