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INTERNATIONAL ENERGY AGENCY

KYOTO MECHANISMS, MONITORING AND COMPLIANCE

From Kyoto to The Hague

A selection of recent OECD and IEA analyses on the Kyoto Protocol

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FOREWORD

This document is a compilation of summaries of papers that were prepared by the OECD and IEA Secretariats at the request of the Annex I Expert Group on the United Nations Framework Convention on Climate Change. The Annex I Expert Group oversees development of analytical papers for the purpose of providing useful and timely input to the climate change negotiations. These papers may also be useful to national policy makers and other decision-makers in national settings. Authors work with the Annex I Expert Group in a collaborative effort, to develop analytical papers. However, the papers do not necessarily represent the views of the OECD or the IEA, nor are they intended to prejudge the views of countries participating in the Annex I Expert Group. Rather, they are issued as Secretariat information papers intended to inform Member countries, as well as the UNFCCC audience.

The Annex I Parties or countries referred to in this document refer to those listed in Annex I to the UNFCCC (as amended at the 3rd Conference of the Parties in December 1997): Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America. Where this document refers to "countries" or "governments" it is also intended to include "regional economic organisations", if appropriate.

ACKNOWLEDGEMENTS

The papers on which the summaries in this document are based can be downloaded (in English only) from http://www.oecd.org/env/cc/. Main authors for the different papers are the following:

- Richard Baron (IEA) for *An Assessment of Liability Rules for International Greenhouse Gas Emissions Trading, Market Power and Market Access in International Emissions Trading and Market Access Issues in International Emissions Trading*;
- Jan Corfee-Morlot (OECD) for *Ensuring Compliance with a Global Climate Change Agreement and Monitoring, Reporting and Review of National Performance under the Kyoto Protocol*;
- Jane Ellis (OECD) for *Experience with Emission Baselines under the AIJ Pilot Phase*;
- Jane Ellis (OECD) and Martina Bosi (IEA) for *Options for Project Emission Baselines*;
- Fiona Mullins[1] (OECD) for *International Emissions Trading under the Kyoto Protocol*;
- Jake Werksman (FIELD) for *Responding to Non-Compliance under the Climate Change Regime*; and
- Stéphane Willems (OECD) for *Key Features of Domestic Monitoring Systems and Framework for Baseline Guidelines*.

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1 Fiona Mullins wrote this paper while at the OECD, but has since left the organisation.

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Abbreviations

AAUs	Assigned amount units
AIJ	Activities implemented jointly
CDM	Clean Development Mechanism (defined in Article 12 of the Kyoto Protocol)
CER	Certified Emission Reductions (generated from CDM projects)
CH_4	Methane
CO_2	Carbon dioxide
COP	Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC)
COP/MOP	COP that serves as the Meeting of the Parties to the Kyoto Protocol
EITs	Countries with Economies in Transition
ERU	Emission Reduction Unit (generated from Article 6 JI projects)
GHG	Greenhouse gases
IEA	International Energy Agency
IET	International Emissions Trading
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation (outlined in Article 6 of the Kyoto Protocol)
KP	Kyoto Protocol
LUCF	Land Use Change and Forestry
N_2O	Nitrous oxide
NGO	non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
PAA	Parts of assigned amount
UNFCCC	United Nations Framework Convention on Climate Change
URF	Uniform Reporting Format (form on which countries submit AIJ project-specific information to the UNFCCC)

1. Overview

This publication compiles OECD and IEA analysis undertaken between 1998 and 2000 in support of the Annex I Expert Group. The work covers related sets of issues: the Kyoto mechanisms, monitoring, reporting and compliance under the Kyoto Protocol and the UN Framework Convention on Climate Change.

1.1 Kyoto Mechanisms

The Kyoto Protocol leaves many technical aspects of the Kyoto mechanisms undefined. Analysis by the OECD and IEA Secretariats, in support of the Annex I Expert Group, is helping to assess the pros and cons of different options for design of these mechanisms, i.e. international emissions trading, joint implementation and the Clean Development Mechanism (CDM).

International emissions trading

The objective of the work on emission trading is to develop a practical implementation framework, or options, for an international greenhouse gas emission trading system**.**

International Emissions Trading under the Kyoto Protocol

This paper presents a conceptual framework for an international emissions trading system**.** It assumes minimum international institutional requirements and a strong reliance on national systems for Parties that implement domestic trading systems. This paper also examines technical issues related to implementation of emissions trading under Article 17 of the Kyoto Protocol. Ideally, legal entities such as firms should participate in international emissions trading to improve market efficiency. National systems, backed by domestic law, are the most effective mechanisms available for accounting for changes to assigned amounts as a result of trading and verifying changes in ownership. At the international level, assessment of national compliance with emission commitments requires double-entry tracking of changes to national assigned amounts and effective responses to non-compliance. Some types of non-compliance provisions could be included in the rules for international emissions trading to enhance the range of possible responses.

An Assessment of Liability Rules for International GHG Emissions Trading

This paper outlines possible rules to determine where responsibility lies when trading assigned amount units, and the pros and cons of these rules. Liability rules for international greenhouse gas emissions trading are being considered in order to define clearly where the responsibility lies for a Party that is out of compliance at the end of the commitment period and has happened to transfer parts of its assigned amount during the period. This would encourage Parties not to mis-use emissions trading, i.e. not to sell parts of assigned amount that are not surplus to what they ultimately need to cover their emissions.

This paper asks: What are possible rules to determine where the responsibility lies when a Party "oversold" AAUs to another Party? How could these rules affect the behaviour of participants to an emission trading system (e.g. encourage compliance)? What are the pros and cons of each rule to allocate liability and its ramifications for other elements of the Protocol?

Market Power and Market Access in International GHG Emissions Trading

The Kyoto Protocol, once entered into force, would create a “market” where Annex I Parties with commitments listed in Annex B of the Protocol could acquire and transfer assigned amount units (AAUs).

It is legitimate to ask whether, and how, this new market could function efficiently and deliver the expected economic gains. In particular, any participant, given an opportunity to do so, may exert market power to lower its own economic cost at the expense of overall economic efficiency. This paper aims to highlight the principal issues related to market power and market access in international greenhouse gas emission trading, drawing on modelling and simulation experiments.

Market access Issues in International GHG Emissions Trading

Article 17 under the Kyoto Protocol to the United Nations Framework Convention on Climate Change introduces the possibility for Parties with emission commitments (assigned amounts) to trade emission reductions or assigned amount units (AAUs). The paper presented above discussed whether and how market power exerted by some participants could affect the quantity of traded emissions and reduce the efficiency gains that it theoretically provides. Beyond market power, there is a concern that all Parties (and legal entities, if they were allowed to participate in trading) may not have equal access to internationally traded AAUs in spite of their willingness to pay for these units. This paper explores this issue. It discusses the potential market access problems in IET as well as their possible solutions.

Project based mechanisms

The objective of the work on the project-based mechanisms is to assess design options for Activities Implemented Jointly (AIJ), Joint Implementation (JI) and CDM**,** focussing in particular on baseline design.

Emission baselines are a key element of project-based mechanisms as they form the basis for determining emission reductions from AIJ, JI and CDM projects.

Options for Project Emission Baselines

Project emission baselines are used to estimate what would have happened in the absence of greenhouse gas emission-reducing projects and to assess the "additional" emission reductions resulting from investment in these projects. This paper examines possible options for project emission baselines. It identifies three main approaches - project-specific, multi project and hybrid - and assesses the data, reporting and monitoring needs as well as the cost, transparency and environmental implications of each of these three approaches. The paper also presents quantitative examples that indicate the influence of different assumptions, baseline approaches and national circumstances on the level of an emissions baseline and emission credits.

Emission Baselines under the AIJ Pilot Phase

This study assesses the emission baselines used in AIJ projects. It then draws out lessons that can be used when determining project-specific emission baselines for future AIJ projects and recommends ways to calculate and report these emission baselines so they can be made more consistent and transparent. The similarities between AIJ and the project-based mechanisms contained in Articles 6 and 12 of the Kyoto Protocol (Joint Implementation and the Clean Development Mechanism) means that these lessons from AIJ may also be applicable to JI and the CDM.

Framework for Baseline Guidelines

This framework paper discusses the main methodological issues for baseline setting. It explores some insights that could be valid for all sectors on the key elements needed for baseline determination. These insights are drawn from the different baseline case studies undertaken by the OECD and the IEA on cement, electricity, energy efficiency, iron and steel and forestry. This paper aims to identify the basic elements that might be included in baseline guidelines that could be adopted internationally.

1.2 Monitoring, Reporting and Compliance

Compliance procedures are essential to ensure the effectiveness and fairness of international agreements and should be included at the earliest stages in the design of a global climate agreement. Openness and transparency, informal linkages with stakeholders and non-governmental organisations, shared learning, balancing authority among international and national institutions and providing incentives for greater participation and levels of effort to reduce GHG, are all central to the effort to ensure compliance.

Ensuring Compliance with a Global Climate Change Agreement

This study surveys a range of possible compliance procedures for a climate change agreement, reviewing lessons from the initial stages of implementation of the UN FCCC and from other international agreements. Three types of procedures are important: sound reporting requirements to provide data on national performance; verification and review mechanisms to assess compliance; and enforcement or other responses to address non-compliance. Good quality data on greenhouse gas inventories will be the backbone of the system and data on projections and effects of policies will be essential to encourage corrective action. UN FCCC reporting and verification procedures have shown promising results to date. However, to ensure the implementation of legally binding targets, these procedures will need to be strengthened and new procedures to address non-compliance will be needed.

Responding to Non-Compliance under the Climate Change Regime

Given the legally binding nature of Parties' commitments under the Kyoto Protocol, purely facilitative approaches to non-compliance may not be sufficient. This paper summarises the opportunities to strengthen the regime's ability to identify, prevent and respond to cases of non-compliance. In particular, the paper describes how the Protocol's diverse implementation mechanisms have the potential to create a wide range of legal relationships that make possible more specific and concrete responses to non-compliance than those found in other multilateral environmental agreements.

Commitments under the Kyoto Protocol include several monitoring and reporting requirements. In particular, accurate monitoring and reporting of emissions is crucial in order to be able to assess compliance with emission commitments agreed to in this Protocol.

Monitoring, Reporting and Review of National Performance under the Kyoto Protocol

This paper identifies actions to strengthen the monitoring, reporting and review functions that are needed for compliance assessment under the Kyoto Protocol. Entry into force of the Protocol adds binding targets for Annex I Parties. This will require more critical and careful scrutiny of national inventory data, key policy developments, emission trends and transactions that change assigned amounts as part of the Protocol's "compliance system". The paper emphasises that in the near term, it is important to begin to strengthen these functions under the Framework Convention on Climate Change. Early action can prepare the ground for rapid implementation of the Protocol

Key Features of Domestic Monitoring Systems

This paper highlights the main features of domestic monitoring systems and the key issues that they raise in a compliance context. The paper discusses three types of monitoring systems (national inventory systems, entity and/or project level emissions monitoring systems and assigned amount tracking systems) from a technical, managerial and institutional perspective. The paper also considers to what extent specific guidance can be defined for each of these key features of domestic monitoring systems. Drawing on current efforts to elaborate guidance for each of these systems at national and/or international level, the paper identifies features of monitoring systems that might need further consideration.

2. International Emissions Trading

2.1 International Emissions Trading under the Kyoto Protocol

The Kyoto Protocol provisions on emissions trading and subsequent UNFCCC Conference of the Parties (COP) discussions leave many aspects of the system open for future decisions. The objective of this paper is to clarify several issues that are important considerations in deciding principles, modalities, rules, and guidelines for international emissions trading under Article 17 of the Protocol:

1. participation by legal entities;

2. national and international systems for accounting for changes to assigned amounts as a result of trading and for verifying changes in ownership; and

3. encouraging compliance through the rules of the trading system.

These issues are inter-dependent. The types of participants in the trading system will affect national systems for registering transactions. Requirements for national systems will affect the functions needed at international level. Efforts to encourage compliance may influence decisions on national systems and eligibility to participate.

Conceptual model of a trading system

A conceptual model of an international emissions trading system is developed as a basis for the discussion in this paper. The model is based on Kyoto Protocol provisions as far as possible, and assumes minimum international institutional requirements, and strong reliance on national systems for Parties that implement domestic trading systems. The model is a working example and is not recommended as the best or only possible model.

System-wide emission limit: The Kyoto Protocol places an upper limit on the total quantity of emissions in industrialised countries by establishing quantified national emission commitments or "initial assigned amounts" for the commitment period 2008 to 2012 (Article 3). Assigned amounts for each Party are listed in Annex B of the Kyoto Protocol. Individual Parties' assigned amounts may increase or decrease as a result of transactions; in aggregate, parts of assigned amount will be added to the assigned amount of a Party that buys, and subtracted from the assigned amount of the Party that sells. However, Article 17 emissions trading will not alter the system-wide emission limit among all Parties with Article 3 commitments.

Tradable units: The tradable commodity for international emissions trading is derived from national assigned amounts. The units traded are referred to in Article 3.10 of the Kyoto Protocol as parts of assigned amounts (PAA), expressed in tons of CO_2 equivalent. In the case of Article 6 Joint Implementation (JI) among industrialised country Parties, the tradable commodity is referred to in the Kyoto Protocol as emission reduction units (ERU). Certified emission reductions (CER) is the term used in the Protocol for emission reductions that industrialised countries purchase from developing countries. ERU and CER from these mechanisms will be inter-changeable with PAA once they have been added to an Annex I Party's assigned amount. A global warming potential weighting index will be used to convert other greenhouse gases into CO_2 equivalent units so that they are inter-changeable. Each unit will have a unique identification number that corresponds to information about the country of origin and the commitment period for which the PAA was issued. In this paper, parts of assigned amounts are also referred to as assigned amount units (AAUs).

Gases and sinks: National assigned amounts incorporate emissions of six greenhouse gases (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) from the energy sector, industrial processes, solvents and other product use, agriculture, and waste. Adjustments to assigned amounts for changes in carbon stocks as a result of activities under Article 3.3 (and potentially under Article 3.4) in the land-use change and forestry sector, will also be part of the tradeable commodity. Transfers of AAUs by governments based on national assigned amounts will therefore include emissions of all six greenhouse gases and some sequestration.

Limiting trading to certain sources: Individual Parties could choose to limit trading by domestic entities to certain types of emission sources. The rationale would be to limit trading to certain greenhouse gas sources and sinks that can be monitored or estimated accurately. Limitations such as this on domestic firms would be a domestic decision for each Party to make and would not require rules at the international level.

Timing for beginning trading: Trading could begin at any time. Trading that occurs before the first commitment period will be in the form of forward or futures trades (contracts to buy or sell AAUs for the first commitment period). However, only trades formally recorded by a Party according to the defined principles, modalities, rules, and guidelines that are to be agreed under Article 17 will be recognised for the purposes of compliance with the Protocol.

Period of validity: Any part of a Party's allocation that is not used for compliance in the first commitment period will remain valid for use or sale in the future (i.e., it can be "banked"; Article 3.13).

Traders: Under this model, both governments and legal entities will trade. National governments will decide which legal entities they will obligate to reduce emissions and authorise to trade in order to meet their obligations at lower cost. In addition, any individual or an entity that does not have an emission obligation could buy AAUs and hold them or sell them to others.

Domestic trading systems: Parties may devolve some of the responsibility for greenhouse gas mitigation to private entities through a wide range of policies and measures, possibly including domestic trading systems. Under a domestic emission trading system, this devolution of responsibility is typically administered by placing limits on entity emissions, issuing AAUs to entities (e.g., by giving AAUs to entities that are responsible for emission mitigation, or auctioning AAUs to the highest bidder).

A key aspect of domestic emissions trading systems is that Governments allow entities that have an obligation to limit their emissions to use AAUs purchased from other entities (for example an entity with lower mitigation costs) to justify emissions above their initial allowed level. Similarly, national governments accept that if entity emissions are below their allowed level, the entity can sell AAUs to another entity (that may have higher mitigation costs). Any emissions above entities initial allowed levels must be matched by corresponding emission decreases below the initial allowed level of other entities (or increases in sequestration). Entities that are responsible for emission mitigation are required to surrender AAUs equivalent to their emissions to the government at the end of a specified period. The government monitors entity emissions and ensure that entities surrender the correct number of AAUs to match their emissions. If entities do not comply the government could impose penalties under domestic law.

National accounting and recording systems: Each government that has a domestic trading system will implement a system for monitoring entity emissions and ensuring that entities surrender the correct number of AAUs to demonstrate compliance. National governments should keep track of the impact of entity and government transactions on the national assigned amount and periodically report this information to the international community. National governments should also be responsible for ensuring that changes in ownership of AAUs can be verified.

International systems: An important international function is to ensure that national systems meet any international requirements that are agreed under Article 17 of the Kyoto Protocol. It will also be important at the international level to ensure that unique identification numbers are issued by each Party for all AAUs that could potentially be transferred. National governments will be responsible for ensuring that entities comply with their domestic emission obligations and that national emissions are within the final assigned amount. National governments will also report adjustments to holdings of AAUs and to the assigned amount that occur as a result of trading. The international system will compile reports from Parties on changes to assigned amounts as a result of transfers and acquisitions. The international review mechanism could check national records if inconsistencies are found among Parties' reported changes in assigned amount or if ownership of AAUs is disputed.

Participation by legal entities

The participation of private sector entities in international emission trading would increase the number of trades and improve market efficiency through greater liquidity. Private sector participation would also reduce the potential for large sellers or buyers to influence market prices in their favour. Entity trading would not alter the fact that Parties, not firms, are ultimately responsible for meeting the Kyoto Protocol commitments.

Under Article 17 of the Kyoto Protocol, international emissions trading may take place among Parties with quantified national emission commitments, or "(initial) assigned amounts". Participation by authorised legal entities is not included in Article 17, nor is it explicitly excluded. The conceptual model developed for this paper assumes that legal entities will participate, and that international emissions trading will take place between governments of Parties with national emission commitments, between private sector firms, and between firms and governments.

Decisions on which legal entities to authorise to participate in international emissions trading will be a sovereign issue for individual Parties. However, the eligibility of authorised legal entities to trade might be affected under international rules if there were a breach of eligibility requirements by the Party in which they are located.

Domestic emissions trading systems

Parties may devolve some of the responsibility for greenhouse gas mitigation to private entities through a wide range of policies and measures, including domestic emission trading systems. Domestic emission trading systems could link directly to the international emission trading system and the other Kyoto mechanisms. In practical terms, this would mean that national governments would allow authorised entities to use parts of assigned amount (PAA), or tradable units from the other mechanisms, that are purchased from other countries to demonstrate entity compliance with domestic commitments. Similarly, national governments would allow authorised entities to sell AAUs to an entity that is located in another country if their emissions are below their allowed level.

Countries are likely to implement different domestic emissions trading systems, depending on their institutional capacity, policies, and legislation, cultural preferences, and national circumstances. Some might choose not to implement a domestic emissions trading system but might still want to authorise one large legal entity to trade in the international system. Other countries might choose to implement a domestic emissions trading system, allowing domestic trades among entities, but might not to allow these entities to participate in the international emissions trading system.

Key requirements of an international emissions trading system

National systems:

Most aspects of national systems can and should be left to the discretion of individual countries. However, decisions at the international level may affect certain features of national systems. There is a growing consensus that eligibility requirements should be established to ensure that adequate national systems are maintained by Parties that choose to participate in international emissions trading. One key function at the national level is to account for changes to the national pool of AAUs that occur as a result of trading by both government and by private entities. Changes in the national holdings of AAUs throughout the commitment period will, in the aggregate, affect the final level of any Party's assigned amount. A minimum international requirement for national systems is national accounting of changes to government and entity holdings of assigned amount. Another minimum international requirement for national systems is national records of all international transactions by the government or entities. Parties' could then check their records if ownership of AAUs is disputed. These records should be available for international review if necessary.

International systems:

The simplest international system would simply compile and check Party reports of adjustments to their assigned amounts. The international review mechanism could investigate any inconsistencies among Party reports by checking the national records that Parties hold. If minor inconsistencies that are identified, the Parties concerned could rectify them without recourse to international procedures.

A more sophisticated international system, perhaps one that might evolve in the future, could record the change of title for each AAU that is traded. An international registry could receive electronic reports of the identification numbers of each AAU traded. The international registry would hold information about all transactions. A central computer check could then confirm that each AAU is held by only one Party or one entity.

Enhancing compliance through the trading system:

Ratification of the Kyoto Protocol will be an indication that Parties genuinely intend to meet their commitments. However, because of the legally binding nature of these commitments, many analysts and Parties have stressed the importance of responses to non-compliance.

In addition to Article 18 provisions, responses could be included in the rules for international emissions trading to enhance incentives for compliance with the Kyoto Protocol targets and to ensure the integrity of the trading system:

- eligibility requirements and insurance approaches act as preventive measures to encourage compliance by individual countries;
- devolving AAUs (and the responsibility to reduce emissions) to entities that operate under strong domestic systems could help countries to achieve their assigned amounts at lower cost and increase the likelihood that Parties will meet their national emission commitments;
- liability provisions for transfers and suspension of trading privileges could form part of a broader set of responses for Parties that do not comply; and
- making entity eligibility to trade contingent on compliance by the Party in which they are located would create a domestic constituency for compliance.

2.2 An Assessment of Liability Rules for International Emissions Trading

The Kyoto Protocol allows Parties with emission commitments to use international greenhouse gas emissions trading (IET) to fulfil these commitments. Emissions trading is a tool that could help reduce the overall cost of compliance by pursuing emission reductions where they are the cheapest. The Conference of the Parties *shall define the relevant principles, modalities, rules and guidelines for emissions trading in particular for verification, reporting, and accountability for emissions trading* (Article 17 of the Kyoto Protocol).

The issue of liability addressed in this paper can summarised by the following question: Can the buyer of assigned amount units (AAUs) use them for the purpose of its compliance if the Party which issued them turns out to be in non-compliance, i.e. if it "oversold" AAUs? This paper does not address the broader question of whether liability rules are the best means of mitigating the risk of "overselling" and non-compliance.

Without additional rules the Protocol implies that the responsibility of keeping emissions at or below a Party's adjusted assigned amount rests entirely with the Party. Accordingly, a Party which turns out to be in non-compliance at the end of the period and had transferred AAUs that it needed for its own commitment would be held responsible: the buyer of AAUs could use these for its own compliance in all cases.[2] Yet, this is open for debate: the Conference of the Parties at its Fourth session specifically includes liability and matters relating to accountability as elements of the so-called Buenos Aires plan of action.

Liability rules are being considered in order to:

- define clearly where the responsibility lies for a Party which is out of compliance at the end of the commitment period and has happened to transfer AAUs during the period; and in doing so,

- encourage Parties not to mis-use IET, i.e. not to sell AAUs that are not surplus to what they ultimately need to cover their emissions. Misuse of trading may bring it in disrepute and take away an important tool for cost-effective reductions in the future.

This paper asks: what are possible rules to determine where the responsibility lies when a Party "oversold" AAUs to another Party? How could these rules affect the behaviour of participants to an emission trading system (e.g. encourage compliance)? What are the pros and cons of each rule to allocate liability and its ramifications for other elements of the Protocol?

Coverage and approach

The paper provides a technical assessment of the following liability rules for IET:

- **"Issuer Beware":** The issuer of AAUs is entirely liable for transferred AAUs in case of non-compliance with its Article 3 commitment. Buyers are assured that all AAUs issued on the market can be used to comply with their Article 3 commitments.

- **"Buyer Beware":** The ability to use acquired AAUs for compliance depends on compliance by the issuing Party. In case of non-compliance by the issuing Party at the end of the commitment period, some or all of the transfers of its AAUs are invalidated to put the issuing Party back into compliance.

2 This applies overall, except for a clause under Article 6.4 on joint implementation projects, whereby credits transferred after an implementation issue has been raised may not be used for compliance.

The market determines the price of AAUs based on the issuing Party's situation towards compliance. It encourages issuing Parties to demonstrate compliance early.

- **"Shared Liability":** In case of non-compliance by the issuer, the burden is shared between the buyer and the issuer, based on an agreed percentage.

- **"Double Liability: Issuer and Buyer":** In case of non-compliance, the issuer is responsible for not holding enough AAUs to match its emissions (issuer beware). In addition, a portion of the transfers AAUs from the defaulting Party are also invalidated, as under buyer beware. Double liability augments artificially the quantity of AAUs that buyers and sellers "owe" to the system.

- **"Traffic Light Option":** As a default, Parties trade under issuer liability (green light). The default could change if non-compliance problems are identified. Buyer liability applies to a Party if a non-compliance problem is identified (yellow light). A red light (Party prohibited from transferring AAUs) is turned on if the non-compliance problem is not addressed. This option requires definitions of indicators and procedures to trigger yellow / red lights, and possibly more frequent expert reviews for Parties with a non-compliance problem.

- **"Issuer + Tons in Escrow":** For each trade, a percentage of the total traded must be set aside, to cover the risk of default by the issuer. If the issuer has oversold, the set-aside tons are used to offset the surplus. Ideally, the set-aside tons must be certified emission reduction units.

- **"Issuer + Annual Retirement":** At the end of every year, a Party must set aside an incremental quantity of AAUs either to cover its cumulative emissions, or a percentage of its annual assigned amount.[3] This would guarantee that Parties hold enough AAUs to cover their past emission level. It is allowed to trade the remaining of its assigned amount under issuer beware. Non-compliance with the reserve will prohibit the Party from selling AAUs until the reserve has been restored.

- **"Issuer + Permanent Reserve":** A limit is imposed on transfers by Parties. Each Party must hold permanently a reserve expressed as a share of its total assigned amount. It is allowed to transfer the rest. The reserve is based on the Party's last inventory: it is equal to five times the emission level of the last inventory. A Party without enough AAUs in reserve would not be allowed to transfer AAUs.

- **"Annual Surplus Trading (post verification)":** Parties wishing to trade must define an allocation of their assigned amount for every year of the commitment period. The UNFCCC Secretariat would issue certified tradeable AAUs to Parties whose cumulative assigned amount allocation from 2008 through the given year is above its cumulative emissions for the same period. All certified AAUs are valid for compliance by buying Parties, regardless of whether the seller is in compliance at the end of the commitment period or not.

- **"Buyer + Insurance":** Buyers acquire AAUs under buyer beware. Buyers must be insured when they acquire AAUs first issued by a Party. The insurance aims to cover the buyer in case of non-compliance by the issuer. Issuers have an incentive to demonstrate compliance to lower the insurance premium applied to their AAUs, and maximise revenues from the sale.

These options are either based on issuer liability, buyer liability, or a combination of both. In short, issuer liability puts responsibility on the Party which has transferred parts of its assigned amount. Any AAUs issued on the market are therefore valid for use by the acquiring Parties; this would create a homogenous

3 The Protocol does not define annual assigned amounts. What is meant here is one fifth of a Party's assigned amount, supposed to represent on average its annual emissions over the commitment period.

commodity. Issuer liability requires governments to monitor the validity of any transferred AAU, as they are responsible for ensuring that their emissions are less than or equal to their adjusted assigned amount at the end of the period. Issuer liability is likely to depend on the strength of the non-compliance regime that is agreed under Article 18 of the Kyoto Protocol and domestic enforcement mechanisms to encourage compliance.

Buyer liability, in case the issuer is in non-compliance, would result in the cancellation or devaluation of trades. Potential buyers would therefore be careful to acquire primarily from Parties which are most likely to meet their emission objectives. Different prices would emerge for AAUs, depending on the Party which issued them. A relatively high price would be paid for AAUs sold by Parties which appear to be able to comply with their emission objectives. Buyer liability, or buyer beware, puts pressure on governments to monitor the validity of the acquired AAUs: they would be held responsible for non-compliance if the emissions of the issuing Party exceed its adjusted assigned amount and the AAUs could not be fully used for compliance.

As the Protocol currently stands, Parties are responsible for ensuring that their emissions do not exceed their adjusted assigned amount at the end of the period, irrespective of whether they have participated in trading.

The different liability rules are assessed with the following criteria:

- environmental effectiveness;
- cost for participants;
- market confidence;
- institutional requirements and feasibility;
- participation of legal entities.

The liability rules identified in this paper are not ranked as this would involve making political judgements on the relative importance of these criteria. The table below provides an assessment summary for each of these options.

Other elements governing the design of liability rules

The paper also points to the fact that other elements of the Protocol need to be taken into account when designing liability rules for international emission trading. These include:

- Eligibility criteria for participation (as buyer or seller) to international trading, which may reduce the risk of Parties engaging in transfers that turn out to be invalid at the end of the period. Compliance with Articles 5 and 7, and the establishment of a national registry to track trades (domestic and international) have been proposed by a majority of Annex I Parties as possible eligibility criteria.

- The review of transfers and acquisitions during Article 8 expert reviews. These reviews offer the possibility *to identify any potential problems in, and factors influencing, the fulfilment of commitments.* This could include potential problems caused by IET.

- Sanctions, if any, for failing to meet the eligibility requirements or rules for IET, or for trading AAUs that were not surplus. This issue could be discussed under the item on compliance-related issues of emission trading in the Buenos Aires Plan of Action;

- Decisions on a compliance regime under Article 18.

- Domestic legal requirements on entities for Parties which choose to make entities domestically responsible for their emissions. Such obligations have the potential to be significantly more stringent and enforceable than those that can be agreed internationally.

How these elements are tackled can reduce the risk of trades in AAUs that the issuing Party needed to cover its emissions. As liability rules are also being discussed to address this risk, their design will necessarily be affected by potential decisions on those elements.

Table 1: **Summary of liability options**

	Environmental Effectiveness	*Costs*	*Market Confidence*	*Participation of legal entities*	*Comment: requirements and feasibility*
Issuer beware	Depends primarily on Article 18 and other trading rules.	Low transaction costs.	All AAUs valid for compliance. Clear market price for AAUs.	Participation would be relatively easy, given registries	Easy implementation; issue of the feasibility of sanctions under Article 18.
Buyer beware	Incentive for issuer to demonstrate probable compliance in order to obtain a higher price.	Buyers must gather (pay for) information on issuer's compliance to price AAUs correctly.	AAUs are priced differently, according to issuing Parties' prospect for compliance. Market uncertainty.	Acquisition of AAUs requires some information gathering.	Pressure on buyers but with reduced risk for issuers could be problematic.
Shared Liability	Less incentive on issuers to demonstrate compliance than under buyer liability.	Same as buyer beware.	Mixed dynamics, between issuer and buyer beware. Market uncertainty.	Same as under buyer beware.	Same feasibility issues as buyer and issuer beware.
Traffic light option	Triggers restrict transfers once a compliance question is raised.	Same as buyer beware, once a compliance problem is identified.	Depends on whether green, yellow or red lights apply. Market uncertainty.	Change in status (issuer to buyer) may hinder entity participation.	Requires definition and agreement on trigger(s) for yellow/red lights and a speedy process for implementation.
Issuer + annual retirement	Some control of the validity of trades.	Some (low) transaction costs on issuer.	All AAUs valid for compliance	Easy participation, if domestic registries.	No requirements in addition to Article 7.
Issuer + permanent reserve	Medium control of the validity of trades.	Opportunity cost (issuer) if unable to conduct valid trades due to the reserve.	All AAUs valid for compliance. Maybe less market access for sellers than under "annual retirement".	Year-to-year variations in the reserve adds uncertainty on trading prospects for entities.	Same as above.
Annual surplus trading (post-verification)	Depends on restrictions on range of annual allocation of assigned amount.	Low transaction cost (automatic certification) Low opportunity cost if inadequate annual allocation.	All AAUs valid for compliance.	No major barrier to participation, if domestic registries.	Requires annual allocation of assigned amount, which can later be adjusted if necessary.
Buyer + insurance	Possibly higher than under buyer beware, if insurance pool fully covers non-compliance.	Insurance cost imposed on buyer which may not be offset if insurance is not effective.	More liquid if insurance companies trade actively, or less if AAUs are locked up as a hedge against issued contracts.	Buyer beware and insurance requirements may make trading overly costly for entities.	Main issue is the availability of AAUs necessary for insurers to be able to cover risk. Low acceptability given the imposed additional cost.

2.3 Market Power and Market Access in International Emissions Trading

The Kyoto Protocol, once entered into force, would create a "market" where Annex I Parties with commitments listed in Annex B of the Protocol could acquire and transfer greenhouse gas emission reductions, so-called assigned amount units (AAUs), in order to reduce the cost of meeting their emission objectives. It is legitimate to ask whether, and how, this new market could function efficiently and deliver the expected economic gains. In particular, any participant, given an opportunity to do so, may exert market power to lower its own economic cost at the expense of overall economic efficiency. This paper presents the principal issues related to market power for international greenhouse gas emission trading (IET), drawing primarily on emission trading literature.

Definitions of market power

Two types of market power are usually identified in relation to emissions trading:

- "exclusionary manipulation", by which the producer of a commodity hoards tradeable permits to prevent the entrance of competitors on the market of that commodity. The result would be a distortion in competition for that product market. This may not be a significant problem with international GHG emissions trading if many sectors and firms are allowed to trade nationally and internationally.

- capacity to influence the transaction price of traded permits ("cost minimising" or "profit maximising manipulation"). Cost-minimising manipulation *is* a source of concern for some potential participants to IET. Either dominant buyers (monopsony/oligopsony) or sellers (monopoly/oligopoly) in a market could exert market power.

International emissions trading may not deliver its full economic efficiency potential if market power is exerted. Permit price manipulation would entail additional economic costs to achieve the same level of greenhouse gas emission reductions as under the competitive market, and would therefore increase the perceived cost of compliance. This would possibly induce Parties to negotiate less ambitious emission objectives in the next budget period than they would otherwise do. Market power could therefore undermine the environmental effectiveness of the Kyoto Protocol.

The size of market participants is an essential component of market power in IET. A market with few sizeable participants would be more prone to market manipulation. This would be the case if governments were to be the primary actors in IET (Party-to-Party trading). Projections indicate that a large proportion of the projected supply of AAUs by 2008-2012 is likely to be concentrated in two Parties: Russia and the Ukraine.

Some Annex I Parties have already indicated their intent to devolve assigned amounts to their legal entities, which could limit this problem. Whether these Parties would rely on an upstream or downstream approach for allocating AAUs would eventually determine the size of individual participants. In an upstream system, a few fossil fuel producers or importers may be allocated the majority of a Party's assigned amount, and be major players on the international market. A downstream system, where assigned amounts would be allocated to individual emission sources, would generate a larger number of smaller participants.

In any case, not all Parties may wish, or be able to, devolve parts of their assigned amount to their legal entities. A probable scenario is one in which some Annex I Party governments will trade on the market, with some participation by legal entities from other Parties. The nature (governments or entities) and therefore the size of individual participants remain uncertain.

A quantitative analysis

The OECD[4] has analysed maximum economic losses that would result from potential monopoly power exerted by the Russian Federation and Ukraine acting together (a single region, the Commonwealth of Independent States, is used in the model). In order for monopoly power to be possible, CIS trade (sales) of AAUs would be fully centralised rather than via a large number of independent, domestic entities. In addition, trade by other Annex I Parties would need to be carried out by individual firms, and not through centralised institutions (e.g. governments). This scenario assumes that two thirds of the AAUs would come from CIS emission reductions beyond "laissez-faire" trends.

If compared to a fully competitive scenario, CIS monopoly power could result in:

- AAUs costing approximately 20 per cent more by 2010 (91 USD/t carbon versus 75 USD/t C);
- lower domestic emission reductions by the CIS, with other Annex I Parties achieving more reductions domestically, at a higher cost;
- a reduction in the *gains* for OECD countries from emissions trading by about 20 per cent in 2010.

However, a number of factors may undermine the possibility of such market power. Notably, Russia and the Ukraine are two separate countries and may compete on the market, whereas these results assume full co-ordination. Moreover, the ability to use certified emission reductions from developing country participation in the Clean Development Mechanism (CDM) for compliance with Article 3 emission commitments effectively enlarges the number of market participants with emissions credits, and therefore reduces the probable market share of the Russian Federation and Ukraine. This minimises potential disadvantages of CIS market power although participation of developing countries in the CDM could shift potential monopoly power to other regions. In an extreme scenario, excessive pricing may cause some Parties to choose not to comply and not to acquire any AAUs from the market. Last, buyers may unite to gather market power (monopsony) in order to counter monopolistic behaviour if it arises.

Minimising the risk of market power

Allowing industry (entity)-level trading would greatly minimise the risk of market power under IET. However, it is up to individual Parties to decide whether or not they want to set up a domestic trading regime. Some Parties may not want to use this approach, or lack the institutional infrastructure to organise and maintain such a system. There is nevertheless the possibility that some trading be based on projects. This may reduce the risk of market power in a way that is similar to what legal entity trading would imply.

A potential solution for the somewhat less probable problem of a dominant buyer could be in trading AAUs through a system similar to a stock exchange (i.e. a so-called double auction). An exchange could also help to resolve the issue of market transparency.

Market access and transparency

Since governments, and not only economic actors, may participate in IET, transactions could be the result of bilateral bargaining, where AAUs would not be the only element of the transaction[5]. In such a situation,

4 Burniaux, J.-M. (1999): "How important is market power in achieving Kyoto? An assessment based on the Green model". OECD Paper, OECD, Paris.

5 Economic actors (companies) are maximising profits, while government actions can be motivated by other factors than strict economic ones.

access to the IET market may not be completely open as some participants could be excluded from some transactions, as they may not be able to deliver the same "product" to the seller.

If this were the case, the visible price of the transaction would be lower than the real cost of mitigation, which could distort the market signal. If such Party-to-Party transactions were common, they could further reduce the efficiency of trading by sending the wrong price signal to participants and misguide their GHG mitigation and trading decisions.

Prior notification by Parties wishing to buy or sell large amounts of AAUs could alleviate this problem. Allowing all interested Parties and entities to compete for this transaction would improve market access, and could help deliver an efficient economic outcome. If Parties were to agree that a special treatment is indeed necessary for Party-to-Party transactions, the question remains whether prior notification would be enough to avoid transactions that are not driven by economic considerations, or if a more structured mechanism (e.g. exchange, auction) would be required.

Existing literature does not offer any analysis of the issue of transactions that are not based on economic considerations. However, some experiments have been conducted to test the relative efficiency of different types of trading regimes[6], although these experiments may apply more to legal entity trading than to Party trades. These authors tested the generally accepted hypotheses that:

- bilateral trading would be inefficient, and

- disclosure of contract information after trades have been concluded would improve efficiency.

They suggest that neither economic theory, nor empirical evidence, nor experimental analysis support these views. One experiment investigates whether the disclosure of marginal cost curves of different Parties, and whether market prices of AAUs improves the efficiency of trading when only bilateral transactions are possible. While complete information on marginal cost curves may never be fully available to Parties themselves, the disclosure of market prices may matter in the formation of a clear market signal which fully reflects marginal reduction costs. This could be a crucial component of the efficiency of an IET regime.

For bilateral trading, where negotiation is strictly limited to price and quantity (i.e. transaction cost considerations are excluded), the experiments indicate no significant difference in overall efficiency when contract prices are not revealed. Thus, knowing the price of other participants' transactions does not significantly help, nor does it hamper, the efficiency of the trading system.

However, for a trading regime working under a "double auction" system, experiments showed that efficiency is as high as under bilateral trading, which suggests that the disclosure of price and quantity information to all does not improve market efficiency. However, the number of offers to buy or sell is significantly lower under the double auction than under bilateral trading, so if there were to be a transaction cost for such offers, the double-auction regime would be more efficient than bilateral trading.

In brief, experiments conducted by Saijo and Hizen do not argue strongly either in favour or against the disclosure of contract (price and quantity) information. Similarly, trading through an exchange (double-auction) does not seem to improve significantly the efficiency of the trading regime in their experiment. This result may apply more to trading by legal entities than to Party-to-Party trading, where market access may be an issue.

6 Hizen Y., Saijo T. (1999), "Designing GHG Emissions Trading Institutions in the Kyoto Protocol: An Experimental Approach", Environmental Modelling & Software.

2.4 Market Access Issues in International GHG Emissions Trading

Article 17 under the Kyoto Protocol to the United Nations Framework Convention on Climate Change introduces the possibility for Parties with emission commitments (assigned amounts) to trade emission reductions or assigned amount units (AAUs). The paper presented in section 2.3. discussed whether and how market power exerted by some participants could affect the quantity of traded emissions and reduce the efficiency gains that it theoretically provides. Beyond market power, there is a concern that all Parties (and legal entities, if they were allowed to participate in trading) may not have equal access to internationally traded AAUs in spite of their willingness to pay for these units. This paper explores this issue. It discusses the potential market access problems in IET as well as their possible solutions.

Potential market access problems

Circumstances where restricted access to the IET market could occur include the following:

- **Favouring large buyers:** Sellers could tend to give primary access to large buyers in order to minimise transaction costs. A "small" Party, or entity, may fear that other participants with a higher level of demand would corner the market, e.g. by offering to acquire large amounts of AAUs in a single transaction, hence minimising transaction costs for the issuer / seller. That in itself is not a market failure, but rational economic behaviour on both sides.

- **Tied trades:** In the context of IET, governments may rely on levers other than a high price in order to acquire / offer AAUs. Such levers could include international aid, existing foreign debt, etc. The ability of some governments to use these other levers could create an exclusive access to the sellers of AAUs[7]. The result of such exclusive access would be transactions and (lower) prices that are not strictly motivated by mitigation cost considerations, and would affect the overall efficiency of IET. This is probably only a major concern for government-to-government trades, as entities are unlikely to be able to have as significant negotiating power as states on political issues.

- **Domestic markets/international access:** Access to emission reductions traded within a country may be reserved to domestic sources and/or to the government of that country. Governments may not systematically allow their legal entities to transfer any devolved domestic emission rights in the form of AAUs to other Parties. As a result, domestic markets may not be fully integrated with the international emissions trading regime, and possibly restrict access to the supply of reductions generated on these markets. However, to a large extent, the specific question of access by foreign sources to domestic emission trading markets—more precisely, their ability to acquire from these markets—can be perceived as a domestic question. Annex I Parties have not decided to systematically co-ordinate domestic mitigation policies, and this would also apply to domestic trading systems. It is therefore difficult to see why a Party which adopted domestic trading should be obliged to open its domestic market to foreign sources, when, in theory, another Party without domestic emission trading could retain full control over the international transfer of its AAUs.[8]

- **International transactions within multinational companies:** These companies may give priorities to their affiliates when transferring or acquiring AAUs, *de facto* excluding others from their internal markets, even if it were efficient to do so. Interestingly, GHG mitigation projects under joint implementation or the clean development mechanism bear some resemblance with the multinational transactions described here. The fact that the host Party could agree to transfer certified emission

7 See, for example, the possibility to exchange debt for AAUs, through debt-for-carbon swaps.

8 The banking provision of the Protocol (Article 3.13) also recognises the right that Parties have to hold their excess AAUs regardless of market conditions.

reduction units or emission reduction units to the investor at a mutually-agreed price—which may be lower than the market price—can hardly be interpreted as a discriminatory trade practice. In the case of multinationals, it seems natural that corporations look first within their boundaries—where they have most detailed cost information—to see whether there is not a potential to invest capital to reduce emissions inside before acquiring AAUs from the market. This could well be the purpose of trades inside multinationals, if they are possible.

From the above discussion, the only significant concern with market access in international emission trading could be the role of transactions initiated by governments, because governments may trade another "commodity" for assigned amount units, and obtain exclusive access in that way. From an economic efficiency standpoint, this does not necessarily imply a market distortion, but these tied-trades would give unequal access to traded AAUs as not all governments may have the same "commodity" to offer.

In some cases however, other participants to IET may be willing to offer a higher price for the traded AAUs. The seller is then at a disadvantage, as it will obtain a lower total payment for the transferred AAUs. If an active market were existing at the time, such transactions would be difficult to conclude, as both Parties to the transaction would know the regular market price. In the case such markets were not to emerge naturally, what form of rules or guidelines could be envisaged to solve this potential market access problem?

Possible solutions

Exchange-based trading

Exchanges generally monitor trading to detect price distortions or market manipulation that are deemed non-competitive. Penalties, suspension or exclusion from membership are used to discourage such behaviour. Most commodities, currencies, stocks, etc. traded on an exchange are also traded in bilateral arrangements, or via brokers, but also on the floors of other exchanges. One key characteristic of exchange-traded goods is their homogeneity.

Exchange-based trading works via so-called double-auction, whereby supply and demand for a stock / commodity meet on a centralised market (electronically or physically). Transactions are concluded once both the buyer and seller agree on a common price. Traded commodities must be homogenous to be traded in a double auction.

Transactions are usually, although not always, anonymous until the transaction has been completed. Members of an exchange agree, when posting bids and offers, to buy from / sell to whoever is willing to match the offered price. This offers some guarantee of market transparency and full price competition and largely prevents market manipulations and market power.

Anonymous AAU transactions through an exchange would help remove the concern about pre-arranged transactions: any buyer willing to pay the highest price for offered AAUs will obtain the quantity for which it bid, provided it is not above the offered quantity. So the exchange offers some protection against what could be tied transactions: exchanges provide a framework to encourage competitive pricing and avoid gaming.

Exchanges may have some disadvantages, however. In case the buyer is made partly liable for the acquisition of AAUs issued by a Party that does not comply, it should know the identity of the issuing Party before it can decide on the appropriate price. This implies that AAUs issued by different Parties could not be traded in the same double-auction: buyers ought to know the identity of the issuer in order to offer a price that reflects the risk attached to its AAUs.

In theory, there could therefore be as many markets as there are Parties listed in Annex B of the Protocol, as the probability of compliance may differ from one Party to the next, and so would the value of AAUs.[9] Instead of a single market and a homogenous commodity (AAUs), the exchange would need to organise several markets (AAUs from country A, B, C…), in a way that resemble stock markets, where one can trade separately stocks from different companies listed on the exchange.

There is also a specific market issue raised by the *modus operandi* of exchanges. Exchanges only allow their members to trade on their markets. Membership comes at a price, and requires certain financial guarantees. Not all governments (or entities) may be willing to become member of an exchange, especially if their needs in terms of AAUs and the number of transactions that they want to conduct are small. They would need to trade through official members of the exchange and pay a fee for each transaction. In the meantime, brokers, who usually arrange over-the-counter (bilateral) transactions, may offer a more flexible, and sometimes less costly alternative to an exchange, depending on the size and number of transactions that a Party / entity wants to engage in.

There is no example of a good or service that is exclusively traded on exchanges. The natural evolution of markets seem to be from bilateral transactions to brokers and then to exchanges. In the end, all three means co-exist as they each offer specific features that meet the needs of the buyer and seller. Brokers are often members of an exchange themselves.

Prior notification of transactions by governments

If a government were to wish not to issue its AAUs on an exchange, other mechanisms could be envisioned to assure some degree of market transparency and guarantee fair access to the market for all participants. Most importantly, the concern to be addressed is that of large trades in AAUs initiated by governments, and the risk of tied transactions.

Governments that wish to issue AAUs on the market could be required to announce their intent in advance, hereafter referred to as prior notification. For instance a government could post an offer to sell 50 $MtCO_2$ a few days before it is to be brought on the market. Posting would indicate the offered or asked quantity, give a date of issuance / acquisition, and possibly contacts for offers (a broker, exchange, or otherwise). Such measure alone would not guarantee that the selection of buyers would strictly be based on price considerations, but it would at least give all participants an opportunity to bid for AAUs they need at what they think is the right price.

Other possible options to assure fair access and market transparency include a prior notification followed by a period during which bids would be publicly posted: all participants will be aware of each others' offers. After this open bidding phase, buyers would send sealed proposals to the seller, based on which the final selection would be done. If none of the prices offered in the sealed proposals were above the public bids, the public bids would be used to determine which participants would acquire the offered AAUs and the corresponding price(s). Acquiring governments could use a similar method. The seller could also organise a standard auction, via an exchange or else, along the lines of SO_2 allowances auctioned by U.S. Environmental Protection Agency through the Chicago Board of Trade.

9 Only a few Parties may be net sellers of AAUs, but this would not prevent legal entities—those that are allowed to trade—from all Parties to both buy and sell AAUs on the international market. AAUs from Parties that are net buyers would also be traded on the market.

Large versus small transactions

Not all international transactions may warrant the use of exchanges or prior notification. Such requirements may impose overly high transaction costs on small transactions whereas these are unlikely to have significant effects on the efficiency of the regime. Small transactions could be conducted as buyers and sellers see fit (bilateral, via brokers, exchanges or else). In other words, the obligation of a prior notification and/or exchange-based trading could only apply to large transactions, i.e., transactions beyond a certain threshold. The risk of setting such threshold is that Parties who want to conclude tied or preferential transactions do so by setting the size of each transaction under the agreed threshold.

Another approach could be to simply forbid transactions above a certain size, without any requirement on the way transactions should be conducted, regardless of whether the parties to the transactions are governments or not. Yet the same caveat applies about the possibility to bypass this rule with forward contracts. On the cost side, it should be noted that brokers, exchanges and other intermediary usually apply lower percentage fees on larger transactions. The transaction cost would therefore be higher if all transactions were below a certain size.

In conclusion, forcing all transactions to go through a specific mechanism is likely, if anything to increase transaction cost by limiting competition. Will the benefits in terms of reduced market access problems—and potentially less risk of market power—outweigh the cost? If international emissions trading is characterised mostly by government transactions, the answer is “maybe”. If legal entities are the primary participants in the system, access to the market will not be a problem and the answer is “probably not”.

3. Project-based Mechanisms

3.1 Options for Project Emission Baselines

The Kyoto Protocol establishes two project-based mechanisms: the clean development mechanism (CDM) and Joint Implementation (JI). Emission baselines for JI and CDM projects aim to quantify "what would have happened" in terms of greenhouse gas emissions in the absence of those projects. Actual emissions from JI or CDM projects are measured against baseline emissions, and, if lower, can generate emission credits. Baselines are, by definition, hypothetical reference cases and are subject to a number of uncertainties.

There are differing views about whether or not CDM and JI require the same framework for setting baselines. This paper does not attempt to prejudge the outcome or potential implications of political negotiations on this issue. The paper focuses on the *technical* aspects of baselines.

Once established, rules and/or guidance for JI and CDM under the Kyoto Protocol are expected to cover many aspects of the mechanisms and not just the baseline. The linkages between the emissions baseline and other aspects of project-based mechanisms, such as eligibility criteria and monitoring and reporting requirements means that the rules for one may influence others.

There are different ways to set up an emissions baseline. Ideally, baselines should be credible, transparent, simple and inexpensive to set up. In practice, drawing up baselines is likely to involve tradeoffs among these criteria. Moreover, the level of baseline aggregation and standardisation can vary widely. Baselines can be established so they apply to one project only ("project-specific"), aggregated to a sub-sector or sector level ("multi-project"), or be in a grey area somewhere between these two levels of aggregation ("hybrid"). The literature also mentions the possibility of aggregated nationwide baselines ("top-down"), but this paper focuses on the three other approaches.

Baseline approaches

Project-specific baselines are the least aggregate type of emission baselines, and evaluate emission reductions generated from one particular project (rather than a group of similar projects). These baselines are established by using project-specific assumptions, measurements, or simulations for all key parameters: they tend to take output levels into account implicitly rather than explicitly. Most AIJ projects to date have used project-specific baselines when calculating the emission benefits of those projects.

Multi-project baselines seek to standardise emission levels or rates, and are designed to be applicable to multiple projects of a similar type. Individual projects would be measured against these baselines to see whether or not they were eligible for emissions credits, and, if so, how many credits they would generate. Multi-project baselines may be calculated based on assumptions about the emissions *rate* (e.g. g CO_2/kWh) as well as on an absolute emissions *level*. Multi-project baselines can be highly aggregate and be applied to many projects, or fairly disaggregated and applied to a smaller range or number of projects.

Hybrid baselines would be designed for projects that do not quite "fit the mould" for a multi-project baseline, or would simplify the process of collecting and monitoring data for projects which are unique and thus require individually tailored baselines. Hybrid baselines would be more aggregate and standardised than project-specific baselines and less aggregate and standardised than multi-project baselines. Hybrid emission baselines would, like project-specific baselines, be made up of various components. But the parameter values, or the methodology used to determine one or more of the baseline's underlying data

points, would be standardised. This would mean that establishing a hybrid baseline would be a more streamlined process than establishing a project-specific baseline.

Cross-cutting issues

Some cross-cutting issues are relevant to all baseline approaches. These include the length of time emission credits can accrue, and whether or not the baseline is fixed at the start of the project (static) or revised during the project operation (dynamic). Static baselines are predictable and reduce the uncertainty surrounding the level of credits generated from a project. Dynamic baselines may better reflect actual trends, but would need to be re-estimated and re-reported at certain intervals. A number of analyses suggest that dynamic baselines may be more appropriate for some project types.

Comparison of baseline approaches

The total number of credits generated by a project is very sensitive to the length of time over which they can accrue (the emissions timeline). If a standard methodology to calculate an emissions timeline could be agreed, it would increase the comparability between projects, and also offers a potentially simple way of limiting the effects of free riders and gaming.

The approach used to determine an emissions baseline for a JI or CDM project has consequences for the project's transaction cost, transparency and administrative feasibility (including data, monitoring and reporting requirements) as well as for its environmental additionality. This study considers each of the main baseline approaches against these performance "criteria".

Data, monitoring and reporting requirements are important because they affect the costs and administrative feasibility of project preparation and review. These requirements vary across different baseline approaches. Project-specific baselines have relatively heavy data requirements and may require some monitoring of current activities before the actual JI/CDM project or activity starts. Using multi-project baselines requires less or no monitoring of the pre-JI/CDM project situation for project participants. However, data are required to establish these baselines.

Different baseline approaches also have different cost implications[10]. Using a baseline approach that incorporates either standardised methodologies or assumptions will be cheaper and easier than developing a project-specific approach. While there are costs involved in developing all baselines, who pays for their development may differ depending on the approach. By lowering the costs of project preparation, an agreement on standardised approaches could increase the number of JI and CDM projects. In turn, this could help increase the effectiveness of JI and CDM by increasing their contribution to cost-effective emission abatement.

The transparency of a baseline also varies with different baseline approaches. In general, the more assumptions related to an individual project or to a system that are included in a baseline, the more documentation is needed with that baseline to make it transparent. Increased transparency may help to increase participation, and may also facilitate any verification and certification.

The environmental additionality of a JI/CDM project can be affected by the baseline approach as this can influence the potential level of gaming, free riders and leakage. Increased levels of gaming, free riders and leakage would artificially inflate the number of credits resulting from a project. For the CDM, this would

10 The cost of establishing an emissions baseline is one component of the transaction costs associated with JI and CDM projects, but should ideally be kept as low as possible to encourage investment through these mechanisms.

mean that not all credits accruing from CDM projects would represent actual emission reductions and may lead to higher total Annex I emissions. Artificially high credit levels for JI projects will not affect the overall Annex I assigned amount[11], although it could make it more difficult for some host countries to meet their individual Kyoto commitments. The potential for gaming may be particularly high for CDM project-specific baselines. Multi-project baselines may be more vulnerable to potential free riders in some cases, although the level at which the baseline is set – and this is true for all baseline approaches- is crucial in this regard.

The environmental additionality of individual projects is clearly correlated to the level or stringency of the baseline. The stringency of an emissions baseline varies depending on the assumptions used in setting it up. This paper presents a preliminary survey of analyses done on the effect that different baseline approaches and/or assumptions have on the level of credits generated by a particular project. This paper also presents case studies that illustrate the influence of national circumstances on the absolute level of the baseline and the relative level (compared to other technologies/processes). For example, if both India and Brazil use the same multi-project baseline approach to set a baseline for new electricity projects at the level of their current average emissions, gas-fired electricity projects could generate certified emission reductions (CERs) if they were undertaken in India, but not in Brazil.

The assessments presented in this paper indicate that **assumptions used to develop baselines and baseline approaches (e.g. project-specific, multi-project) are independent variables. Both can influence the level of credits for a particular project**. In the examples examined here, the range in different possible assumptions within one baseline approach can be as large as the range in assumptions between different baseline approaches. However, not all approaches may be equally appropriate in all circumstances, and different approaches may be viewed more or less suitable for different types of projects (e.g. forestry, electricity or landfill).

Both baseline assumptions and approaches will have an impact on the overall environmental effectiveness of the mechanisms[12]. The baseline approach will influence the effectiveness of the mechanism through its impact on the complexity of setting up an emissions baseline. All other things being equal, more complex methods are likely to limit the number of projects initiated by adding to the transaction costs associated with developing a CDM or JI project (see *Figure 1*).

Within each approach, baseline assumptions are also likely to have an impact on the effectiveness of the project-based mechanisms through their impact on the baseline stringency, which affects the level of credits, and through this the number of projects initiated. Regardless of the approach used, stringent baselines could limit the number of projects initiated due to their effect on the cost of credits while lax baselines could obviously have a negative environmental effect.

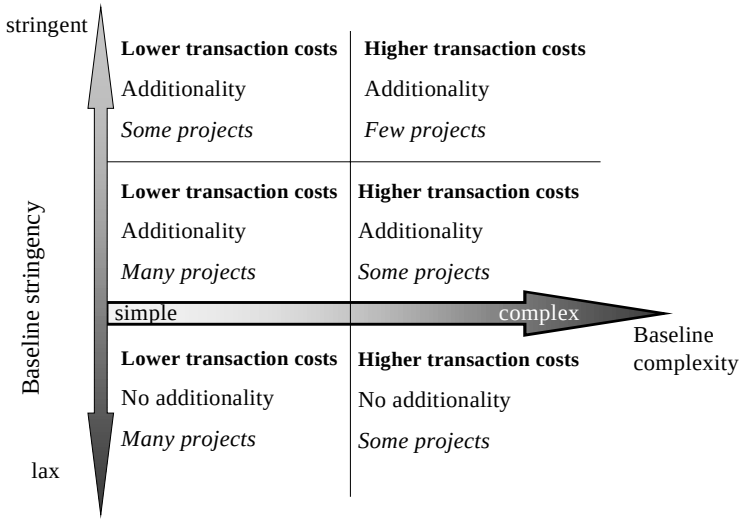
In circumstances where different baseline approaches are plausible, the independence of baseline stringency and approaches suggests that **maximum environmental effectiveness across the project-based mechanisms (as opposed to individual projects) is likely to be achieved by optimising baseline stringency and reducing baseline complexity**. In practice, this means: (i) seeking to minimise baseline complexity, as long as the ability to determine "what would have happened otherwise" is not compromised; and (ii) optimising the baseline stringency so that it maximises the overall global environmental effectiveness from the project-based mechanisms. The optimal strategy takes into account that a high volume of projects will be needed to deliver strong environmental effectiveness from the mechanisms: a

11 As long as each Annex I country meets its emissions commitment.

12 Unlike the CDM, JI is a zero-sum game in which transfers and acquisitions of emission credits will not affect the total Annex I emissions, as allowed by the Kyoto Protocol. The implications on environmental effectiveness are thus different.

greater number of good projects will be more beneficial for the environment (in terms of total GHG reductions) than a lower number of individually better projects.

Figure 1. **Possible effect of baseline stringency and complexity on project numbers and projects' environmental additionality**



Conclusion

Progress on technical issues would be greatly facilitated if policy makers decided which baseline approach(es) are to be used for each JI and CDM project/project type. Such an agreement would allow analysis to focus on how such approach(es) could be applied in a comparable manner or, in the terminology of this paper, on finding assumptions that provide the balance between the environmental effectiveness and encouraging participation given different circumstances. An agreement would also facilitate the resolution of other outstanding questions (e.g. reporting formats) which could also help in the development of the mechanisms. In addition, understanding of the issue would be improved if common definitions and a common vocabulary for key baseline-related parameters could be reached.

A decision on baseline approach(es) would open the door for assessment and eventual agreement on other credit-related aspects of JI and CDM projects, such as:

- how to determine the value of key assumptions;
- how long any project should be allowed to generate emission credits for (the emissions timeline);
- whether or not emissions baselines should be static or dynamic;
- maximising the environmental effectiveness of the project-based mechanisms by minimising the level of leakage, free riders and gaming; and
- assessing how to determine the environmental additionality of a climate-friendly project in a country that has low emission levels.

3.2 Experience with Emission Baselines under the AIJ Pilot Phase

This paper assesses the emission baselines used in Activities Implemented Jointly (AIJ) projects. It then draws out lessons that can be used when determining project-specific emission baselines for future AIJ projects and recommends ways to calculate and report these emission baselines so they can be made more consistent and transparent[13].

There are some similarities between AIJ and the project-based mechanisms outlined in Articles 6 and 12 of the Kyoto Protocol (Joint Implementation and the Clean Development Mechanism). This may mean that some lessons and recommendations from analysis of project-specific emission baselines used in AIJ projects are also applicable to JI and the CDM.

Current experience with emission baselines

AIJ emission baselines are project-specific. Emission baselines are also difficult to validate, as by definition they never happen. Yet they are extremely important as they form the basis for determining emission reductions from AIJ projects, and may also form the basis for determining emission credits for JI and CDM projects. Emission baselines for JI and the CDM therefore translate into a means of assessing the potential environmental and financial performance of a proposed project.

There is currently no internationally agreed methodology on how to calculate emission baselines for AIJ projects. However, general guidance is available in some investor countries. Given this lack of centralised guidance, and inherent project-specific variations, it is therefore unsurprising that the methodologies used to calculate emission baselines in AIJ projects are highly diverse. The detail in which emission baselines were reported also varies.

Many AIJ project reports include a quantified emissions baseline. Some reports presented more than one possible baseline for the same project, and some reports did not present any, or only outlined the total projected emission benefits over the project lifetime. There may be many feasible options from which to choose when determining an emissions baseline. This is particularly true when considering emission baselines for "greenfield" (new) projects, where no direct comparison is available with pre-AIJ project parameters that are key determinants of emissions, such as fuel and technology type. However, even emission baselines for "replacement" projects are subject to significant uncertainties, although the range of feasible baseline possibilities is limited.

The variation in emission baselines between different AIJ projects could hardly be wider: some go down, others go up, many stay constant, and a few are a combination of all three. While some diversity in emission baselines is to be expected because of the wide variation in different AIJ project types, there is also significant variation even within similar projects. This is due to the importance of site-specific variations and to differences in key assumptions such as the time over which the project would generate emissions benefits. These variations mean that the anticipated environmental benefits from comparable projects sometimes vary considerably. It also means that many potential baseline shapes are valid for a given project type. This does not facilitate inter-project comparison, but is unavoidable in a system where project-based emission baselines are used exclusively.

13 "Project-specific emission baselines" is used in this paper to mean emission baselines that have been drawn up by examining a project on a case-by-case basis.

Lessons and recommendations

Where project-specific emission baselines are required in future, they could be made more consistent, comparable and transparent by setting out guidance on how they should be calculated and reported.

Any future methodological guidance on estimating project-specific emission baselines could address:

- the length of time over which different project types generate emissions benefits;
- the issue of uncertainty (possibly by requiring some sort of "safety margin" or environmental conservatism in baseline estimation);
- whether emission baselines should be calculated in the same manner for greenfield and replacement projects;
- how to deal with learning issues; and
- how to calculate the environmental benefits of energy efficiency measures.

Other site-specific information that influences the assumptions underlying the emission baseline estimation methodology should also be included, such as vegetation types for biotic projects, and distance of the project site from alternative fuel sources (e.g. electricity/gas grids) for energy projects.

Simple improvements to the current Uniform Reporting Format could improve the transparency and comparability of different project-specific emission baselines reports. These improvements could be applicable to future AIJ, JI and CDM reports, and would include providing:

- a more detailed disaggregation of current project classifications;
- separate reports for sub-projects;
- references to the availability of more detailed information elsewhere (if applicable); and
- an agreed accounting convention on the sign of emission benefits from projects.

In addition, reports should distinguish between projects actually operating from those at the planning stage.

Other changes could also improve the reporting of project-specific emission baselines for AIJ, JI or CDM projects. These include:

- differentiated reporting requirements for different project types;
- including relevant and readily available data and information, and justification for these data;
- recommended units in which to present the total emissions benefits of the project; and
- independent verification/validation of data in the project report.

In the AIJ project reports examined for this paper, experience with emission baselines is limited to a project-specific (i.e. case-by-case) approach. Other, more standardised, means of drawing up emission baselines are also possible, and may need to be explored for use under JI and/or the CDM. These

approaches could have both advantages and disadvantages when compared to the project-specific approach, and will be explored in future work.

Baseline rules are important, as they will influence the complexity and cost of setting up project-based mechanisms and therefore the number of JI and CDM projects in operation. Baseline rules will also determine the incentives available for certain project-based activities, and through this, their environmental integrity. Any future recommended baseline method(s) should be set up in such a way as to balance the encouragement of widespread use of project-based mechanisms with the need to ensure that their use does not undermine the ultimate objective of the UNFCCC.

3.3 Framework for Baseline Guidelines

This framework discusses the main methodological issues for baseline determination. The paper explores some key insights that could be valid for all sectors. These insights are drawn from the different baseline case studies undertaken by the OECD and the IEA on cement, electricity, energy efficiency, iron and steel and forestry[14].

Choice of approach

Different approaches are possible for project developers in setting up baselines. They can use a baseline that is drawn up for multiple projects (so-called multi-project baseline) or they can draw up a baseline that is valid only for their particular project (so-called project-specific baseline). It is also important to note that the baseline could be drawn up using either an already existing baseline methodology or a new methodology.

One option is that baseline guidelines recommend circumstances in which project specific or multi-project baselines might be preferable. One criterion for using multi-project baselines, suggested in other studies, could be whether the project is very similar to other projects within a project category (for which the multi-project baseline was developed). This prescriptive approach might be difficult to implement in practice, because it would require clear criteria that specify when projects can be considered "similar" to other projects and when they are considered one-of-a-kind. Another option is that project developers would themselves choose the best option for their particular project, but would require them to justify their choice, i.e. whether the baseline proposed conforms to the circumstances of that project activity.

Even if project developers are allowed to choose the best option for their project, it is expected that such a choice would face scrutiny during the baseline approval process as part of the project validation process. More specifically, it is expected that the host country and the operational entity would assess the conformity of the baseline to the circumstances of that project activity, whatever baseline approach has been used. Here a distinction might be made between new multi-project baselines and multi-project baselines that have already been approved. A similar distinction could be made between new and already approved baseline methodologies. Project developers would be free to use new methodologies rather than already approved methodologies. However, new methodologies would face greater scrutiny in the approval process.

Project categories

Project categories might be used for two main purposes. The first one is reporting, the other is to determine the appropriate methodological guidance for a particular project, as it may vary according to project categories. Although these case studies provide some interesting insights as to how project categories might be defined, elaborating a detailed list of categories in baseline guidelines might prove too complex. Indeed, all the methodological implications of different project categories are not yet clearly understood.

Project boundaries

Baseline setting needs to be consistent with the determination of project boundaries. In theory, it would be desirable to include all greenhouse gases and sources (and/or sinks) within the project boundaries. However, case studies suggest that greenhouse gases and sources (and/or sinks) that make up a small percentage of total emissions (and/or removals) would not need to be accounted for in the baseline. For

14 . The case studies on electricity, energy efficiency, cement and iron and steel are available as OECD and IEA Information Papers and can be downloaded from the OECD web site (http://www.oecd.org/env/cc).

example, energy-related projects may not need to include emissions of N_2O and/or CH_4 in their boundary if CO_2 emissions make up more than 99 per cent of GWP-weighted emissions (see e.g. Bosi 2000 or Ellis 2000 for sector-specific discussions on this topic). Simple rules might be developed to allow for that possibility.

The definition of a project boundary itself is a more difficult issue and case studies provide sector-specific guidance that is difficult to generalise in this respect. As a practical rule, case studies have considered that direct emissions as well as indirect emissions from electricity generation should be included in the project boundary. Other indirect emissions, such as transport related emissions, might be either included or excluded (and in the latter case therefore treated as positive or negative leakage), but should in any case be somehow accounted for in the project evaluation.

Project crediting lifetime (and baseline revisions)

All case studies indicate the difficulty in finding one single criterion for determining the crediting lifetime, because of the necessary trade-off between investor certainty and environmental additionality. The recommendations made are usually presented as a rule of thumb (or expert judgement) that takes into account different considerations.

The crediting lifetime is intrinsically linked to the possibility of baseline revisions, i.e. changes in the baseline that are required for a particular project after a fixed period of time[15]. The case studies suggest two options: (1) that baselines are fixed for a project for the entire crediting lifetime (i.e. the project developer can use the agreed baseline for the whole crediting lifetime of the project), and (2) to allow and/or require baseline revisions at certain time intervals (e.g. 5 years). The case studies do not provide consistent recommendations in this regard.

Deciding on the crediting lifetime (and on baseline revisions) is also related to other issues, like the stringency of the baseline (investors might more easily accept a short crediting lifetime if the baseline were less stringent). But no general rule can be defined that could apply to each sector and/or project category. A decision on whether baselines should be fixed or revisable might also depend on the institutional process for baseline revisions: would it be a procedure equivalent to approving a new baseline or would it be a less complex type of procedure? For instance, baseline revisions could consist in revising regularly one specific parameter, while other elements of the baseline would remain the same. Any decision and/or recommendation on the crediting lifetime might therefore best be taken once there is more clarity on the other methodological and institutional issues.

Baseline units

All case studies recommend that baselines should be expressed in terms of emissions (or removal) rates, rather than absolute emissions (or removals). Baselines expressed in terms of emission rates would simplify the development of baselines and the process for project crediting since ”absolute” baselines would need to include assumptions on what the activity level is expected to be (in the absence of the project activity. Such forecasting is usually very uncertain. However, it is unclear at this stage whether rate-based baselines could be applicable to all project types. For instance, projects that are not related to one single (unit of) activity might need to provide baselines in terms of absolute emissions only.

15 Baseline revisions can be distinguished from baseline updates, in the sense that the former would be required for one particular project, while the latter refers to updates of multi-project baselines, which are independent from any particular project.

Case studies also investigated what units should be used to define rate-based baselines. Conclusions were that the numerator should be consistent with the project boundaries (in terms of gases covered). In principle, it should be expressed in terms of emissions (or removals) of all greenhouse gases (GHG). But, as already indicated, some case studies recommended excluding minor gases in the project boundary. As for the denominator, it is commonly expressed in terms of the unit of activity (e.g. ton of steel, kWh). However, the unit of the denominator may not necessarily be the final product of the activity (e.g. ton clinker produced for cement projects).

Baseline methods and assumptions

The choice of baseline methods and the choice of key assumptions within each type of method lie at the core of baseline determination. There are many different methods and assumptions for constructing both project specific and multi-project baselines. These methods and assumptions are likely to differ considerably between project categories and it remains an open question as to whether any general guidance can be provided that spans all possible methods and assumptions.

Case studies have mainly focused on so-called comparison-based methods, and more specifically, on methods based on determining baselines on the basis of the *past performance of a reference group*. Case studies provide preliminary insights regarding four distinct assumptions that need to be made (when using such a method) in order to select what data set should be used as a reference and how it should be used. The choice of assumptions should best represent what would otherwise occur in the absence of the project activity[16].

1. Geographic aggregation

The common recommendation across case studies is that, when a project activity has very similar characteristics in the different world regions in terms of homogeneity of product or processes, the correct level of aggregation for the baseline is the world wide performance of the (sub-) sector. This is the assumption used in the cement and iron and steel case studies. When a project activity tends to differ across countries in terms of products, processes and levels of performance, nationally-based performance should be used[17]. This is the assumption used in the electricity generation case study, which provides estimates of country-specific baselines to take into account different national circumstances.

2. Sectoral aggregation

Another assumption regarding the level of aggregation relates to the choice of sector level or subsector (or process, or source specific) level to set the performance benchmark for a project. Case studies suggest very different levels of (sectoral) aggregation, which at least partly reflect sector differences. The electricity generation case study investigates both a sectoral baseline and source-specific baselines[18]. The iron and steel and cement case studies recommend different baselines for different manufacturing processes, but the cement case study also suggests that for some projects, (multi-project) baselines be set for some process steps only (e.g. clinker production).

16 The issue of which data set best represents what would otherwise occur is different from the issue of whether such data is available and, if not, how it should be collected. However, there are obvious links between both issues. The choice of assumptions regarding the appropriate data set may be dictated by data availability, particularly if such data cannot be collected at reasonable cost.

17 With slightly narrower or broader geographic definition, depending on the country examined.

18 Different baselines for peak-load and base-load power plants are also examined.

As a general rule, the lower the homogeneity in the inputs, processes and products within a sector, the more disaggregated should be the level at which a baseline is set. However, this inevitably leaves room for interpretation about what can be considered homogeneous in each sector (or project category). It may be difficult to ensure a consistent interpretation across sectors about what level of homogeneity should be required for determining (sectoral) aggregation.

It may also be particularly important to recognise that this type of assumption may have large implications in terms of which incentives are given to project activities within a sector. Selecting the "wrong" aggregation level might lead to over-crediting of projects or acceptance of projects that are not additional or, alternatively, under-crediting of projects or rejection of projects that are additional. For instance, in the case of electricity generation, a sectoral baseline (e.g. based on all recent fossil fuel fired power stations) could in some countries give a relatively large amount of credits to low carbon or carbon free technologies, because of the large share of coal fired power stations, even though they may have become a normal process route in this country (e.g. gas-fired power stations). It is therefore be important for project developers to provide a clear justification for selecting a specific level of aggregation.

3. Average vs recent practice

The case studies generally indicate that most recent performance within a reference group (at the appropriate aggregation level) would better reflect what would otherwise occur than an average value for that reference group (at least for new or "greenfield" projects). However, there are different ways to define "recent" performance levels and this may vary depending on the size and growth of the sector concerned. The electricity generation case study suggests using the (average) performance of the pool of most recent capacity additions in the last five years as the reference data set. The cement case study uses as a reference the most common plant type currently installed (essentially best available technology), while the iron and steel case study uses a technology performance standard. The energy efficiency case study uses the average performance of new equipment sold as a reference. These different choices seem to be driven by how much variability there is in each project category as well as the type, quality and quantity of data available.

A number of case studies suggest, however, that a formula based on the average performance of existing plants in a particular country would be used for refurbishment projects, rather than a formula based on recent performance. A number of questions emerge from a distinction between greenfield and refurbishment projects. It may create in some cases an incentive to refurbish existing installations rather than building new ones, or vice versa. It may even be difficult to distinguish between some greenfield and refurbishment projects. One way forward might be to distinguish further between different project types, for instance by distinguishing between different types of refurbishment projects (e.g. whether the entire process is refurbished, or only some process steps; whether there are capacity additions or not).

4. Static vs dynamic performance

Case studies provide different suggestions as regards the use of a trend in the baseline to reflect the change in performance levels over time. One suggestion is that the baseline would vary through time with a trend indicator that would be based on the evolution of past performance (within a reference group, covering 5 to 10 years). It would allow the construction of a "dynamic baseline" with a built-in evolution in performance that is specified at the outset. In this case, a dynamic baseline would only be possible if there is a discernible trend that can be derived from the past. This does not seem to be the case for all sectors (e.g. the electricity generation sector). Indeed, such an indicator might be better suited to baselines whose level of aggregation goes down to the process level (where there is an expected trend in technology improvement).

A trend based on past performance may not always reflect, however, at what rate technologies are expected to develop in the future. In some cases, the baseline is also inherently dynamic (e.g. in the case of a reforestation project on land where the carbon stock is naturally regenerating, but at a lower rate) and should be modelled accordingly.

Conclusion

Case studies provide some consistent generic recommendations for baseline determination, but also leave many other questions unanswered at this stage. A possible "minimum" solution is to define in the decisions to be adopted at COP6 the appropriate baseline terminology as well the list of key methodological elements (project boundaries, project crediting lifetime, baseline units, methods and assumptions). These elements would need to be addressed by project developers and further elaborated in the future methodology development process. Another option is to further elaborate these methodological elements prior to COP6. In this case, however, any methodological guidance will need to be very precise and carefully drafted in order to avoid misinterpretations, yet be flexible enough to avoid pre-empting future methodological development.

4. Monitoring, Reporting and Compliance

4.1 Ensuring Compliance with a Global Climate Change Agreement

The Kyoto Protocol strengthens the commitments of industrialised countries to reduce greenhouse gas (GHG) emissions within agreed time frames (2008-2012). This paper reviews and assesses possible procedures to facilitate and ensure compliance with the UNFCCC and the Kyoto Protocol, focusing on approaches to ensure compliance with targets and timetables. However, much of the discussion applies to other obligations, such as reporting, adoption of mitigation policies and measures, and financial obligations. The paper provides an overview of main compliance approaches, including brief treatment of approaches that might be used in connection with emission trading and transfer mechanisms.

There are three main elements of a compliance system for international agreements: a) monitoring and reporting; b) review and verification; c) non-compliance responses and enforcement. National monitoring and reporting gathers information to enable compliance assessment. Review and verification uses the information reported to ascertain compliance. Non-compliance responses and enforcement are triggered by the verification process and aim to address unambiguous failures to comply with treaty obligations.

The responsibility for different stages of the compliance system will fall on different participants in the system. Monitoring and reporting is largely the responsibility of Parties to the agreement. An independent body, often the secretariat to the agreement, may best conduct review and verification. Non-compliance responses and enforcement actions need to be authorised by the supreme body of the agreement (e.g., the Conference of the Parties). Informal approaches can also be critical to move countries towards compliance with international obligations. Both the formal and informal various elements of compliance approaches must be seen as part of an integral system, all moving in the same direction, to encourage full implementation of the agreement.

Experience with other international agreements shows that effectiveness and compliance can be enhanced by:

- unambiguous and specific treaty language;
- transparent and open procedures and information;
- informal linkages with non-governmental organisations and other stakeholders;
- graduated management and enforcement responses to address different types of problems;
- treaty provisions that encourage new entrants.

Including compliance procedures at an early stage in the development of an international agreement has several benefits. A compliance system can build Parties' confidence that the agreement will be effective and fair; can encourage shared learning to improve implementation of the agreement, and add weight to an international agreement by demonstrating the intent of Parties to meet its terms. Compliance procedures may also shape the participation in the agreement by making Parties seriously consider the binding nature of new commitments, and their ability to comply, before accepting the obligations. As a result, the design of a compliance system should be a priority task for climate change negotiators in the post-Kyoto period.

Monitoring and reporting

National reporting by countries is an essential part of a compliance system and enables efficient monitoring and transparency. The Convention's system for Annex I Parties already contains some essential reporting procedures to monitor compliance with national targets and other obligations (e.g. requirements to adopt national programmes, policies and measures to mitigate greenhouse gases). Data on inventories are central because they provide the basis for the assessment of compliance with national targets. Parties (in Annex I) are already required to report inventory data annually, updating if necessary base year figures and compiling the latest historical data. Other information, now required on a periodic basis, assists Parties to understand and review implementation of the agreement. This includes national emission projections, descriptions of policies and measures and estimates of their effects on emission trends. These data may be essential to early identification of problems and to corrective action to encourage compliance.

For reporting to be effective as a tool under the Protocol, Parties must take relevant obligations seriously. Better inventories might result from the use of agreed "good practice" standards in inventory preparation. Independent auditing of national inventory systems, data and reports might also enhance implementation of such standards and could provide an objective "third party" assessment of national data quality. Non-compliance response measures (facilitative or management options) and enforcement options could apply to reporting obligations as well as to more substantive obligations of the agreements. In this way, the Subsidiary Body for Implementation could actively identify Annex I Parties with reporting problems and work together with these Parties to improve reporting and data quality. Incentives or procedures should be dynamic and flexible to encourage better information over time and allow solutions to be tailored to the different needs of individual Annex I Parties.

Comparability of information becomes even more critical under the Protocol, where the Kyoto mechanisms are prominent features, as trading entails the creation of a new commodity that needs to be standardised to be traded successfully in an international market. Comparability of data is also important because trading will mix the inventories from different countries.

Issues in data quality: six greenhouse gases, sources and sinks

The Kyoto Protocol targets are for at least a 5 per cent overall reduction in emissions from 1990 levels among industrialised country Parties for the period 2008 to 2012. Questions about data quality, which greenhouse gases and which sources and sinks to include, were key issues in the negotiation of the Protocol. The Protocol's targets clearly covers six groups of greenhouse gas sources and also brings potential sinks of greenhouse gases into its environmental management framework. However, uncertainty in emission estimates varies among the different greenhouse gases and among source and sink activities. Data quality also varies among countries. Unless carefully addressed in the design of monitoring procedures, poor data quality could cast doubt on Parties' performance with respect to emission targets.

Obtaining complete accuracy of inventory data would be ideal, but is unlikely. Inventory data are estimates, at best based on field-work and statistical sampling of diverse socio-economic activities in every country. Given the structure of emissions targets in the Protocol, an accurate assessment of emission *trends* is more important than the accuracy of point *estimates* in any given year. Yet, point estimates will be the basis of determining what is available to trade in any one year. So it will be important to improve the accuracy and quality of trend and of point estimates in the implementation of the Protocol.

A number of approaches can be used to account for uncertainty in emission inventory data. An important question post-Kyoto is whether the approaches to address uncertainty should be different for the Kyoto mechanisms and to monitor national performance with emission reduction targets. Three main criteria are relevant in selecting an approach to address uncertainty. These are whether the approach: 1) stimulates

environmental management of all greenhouse gases; 2) provides incentives for improving the quality of information over time; and 3) applies universally to all Parties in a consistent way.

Rules to account for uncertainty could be complex to develop and difficult to implement. This is because they would have to rely on our present understanding of error associated with inventory estimates, which is partial at best. The study assesses possible approaches and concludes that good practice standards offer the most promise to reduce uncertainty about trend and point inventory estimates, and they may also offer a standard that can enhance verification or "certification" procedures.

Review and verification

Verification of performance under an international agreement includes at least two steps. First is the technical review of national information or national report(s), which may also include verification of data. Second is a final assessment of the status of the Party with respect to its international obligations -- for example, a statement by the Conference of the Parties or a subsidiary body on whether a Party is in compliance with the terms of the agreement.

The Climate Convention's in-depth review of national reports provides a reasonable basis for the technical verification of compliance with Kyoto targets. However, to date the review process has not included in-depth verification of national data. In addition, no procedure under the Convention handles the task of final verification and assessment of compliance. Therefore, the Kyoto Protocol may need stronger verification and review procedure(s). These might include extending the in-depth review activities to include corroboration of national data with independent sources. The in-depth reviews might also identify specific problem areas in advance for discussion, thus initiating a "problem-solving" dialogue with individual Parties. As follow-up, the role of the Subsidiary Body on Implementation (SBI) could be strengthened to assess compliance of individual Parties with specific obligations; this role could be developed initially to focus on "soft obligations" such as national reporting. Other intergovernmental organisations and non-government review processes could also assist with verification tasks under the Convention and the Protocol. Contributions from such organisations do not need to be formally recognised under the Convention but could contribute informally to the verification and compliance process.

Non-compliance responses and enforcement

Significant or persistent failure to comply with the provisions of an international agreement will undermine confidence in the agreement and may have significant political and economic consequences. A wide spectrum of possible responses to compliance problems is available, ranging from management approaches (soft) to enforcement approaches (hard). Views differ on the value of soft and hard approaches to respond to non-compliance. As more stringent environmental standards are set internationally, the demand may increase for legal enforcement based on international law. At present, however, there are few examples of successful enforcement procedures in multilateral environmental agreements.

Because enforcement procedures are difficult to apply at the international level, international procedures should first aim to encourage strong domestic enforcement, e.g. by finding solutions, providing incentives and establishing a plan to return to compliance. Instances of persistent non-compliance might call for enforcement approaches. At the international level, the range of enforcement options is much narrower than that available at the national level. Sharing of information and ideas among Parties might facilitate this or, more concretely, Parties may agree on guidance for domestic enforcement action.[19] Parties might also simply agree under the treaty to adopt effective enforcement regulations at the domestic level.

19 An example of such action is explained in OECD (1997), *Experience with the use of trade measures in the Montreal Protocol on substances that deplete the ozone layer*, COM/ENV/TD(97)107. It concerns

International management approaches will also play a role to assist Parties to comply. Relevant approaches include consultation, mediation, and conciliation; issuing cautions or warnings; providing funding or technical support. Management responses might be developed now, starting with the Convention reporting provisions, in order to build capacity to improve basic data and information on compliance performance. This might be done through an expert group designated to facilitate exchange of information and capacity building among national experts in these areas. This group could make recommendations on methods and best practice and data quality issues. For example, Parties not in compliance with reporting obligations might be required to work with the expert group to design a plan to bring themselves into compliance with these obligations.

Management options with incentives ("carrots") and penalties ("sticks") are potentially powerful tools to encourage compliance. Incentives are usually in the form of technical or financial assistance. While penalties are used less frequently they can be used in a soft way, thus being considered among the management options. For example, to publicly recognise failure could be seen as a penalty. Issuing cautions is perhaps the most easily implemented and politically acceptable of possible penalty approaches. Although it would not need to be a formal element under the agreement, linking with outside financial institutions could also provide strong incentives for performance. Making some funding from international financial institutions contingent upon compliance with major obligations of the agreement, might be as effective as any formal economic sanction that might be devised under the agreement. Non-governmental organisations can also play a valuable role to promote observance by Parties of their treaty obligations. Connections to external institutions or stakeholders, therefore, can create new, strategic alliances to reinforce international norms and compliance.

The range of enforcement approaches includes the following: making funding conditional upon compliance; suspension of rights or privileges; trade measures or economic sanctions; and financial penalties. The use of such enforcement measures under a climate change agreement would take time to develop. Making funding conditional upon compliance is technically possible, but would only apply to Annex I Parties that are eligible for financial support (i.e. transition countries). Thus, it could not be universally applied to encourage better performance. If emission trading were adopted, suspension of rights or privileges to trade could be a powerful enforcement response. [20]

Trade measures are sometimes used in environmental and other international agreements to address problems of compliance (e.g. the Montreal Protocol and in the Convention on International Trade in Endangered Species) and experience with their design and implementation is growing. At this stage, however, it is difficult to envisage their use in a global climate agreement.

Financial penalties remain an interesting option, but in practice they have been much less widely used than trade measures in international agreements. It is possible to imagine a system that levies a financial penalty on a Party out of compliance with an agreed target emission level, but a critical problem is how to enforce the penalties. Dispute resolution is another response option, but it tends to be more confrontational and thus is an option that operates in parallel with management and enforcement approaches.

It will be important to find a balance in the use of management and enforcement approaches. The compliance system should draw from the continuum of options to respond to the full range of compliance problems. The UNFCCC and Kyoto Protocol will undoubtedly require new institutional mechanisms to identify problems and devise solutions. The effectiveness of management approaches appears to depend

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guidance for domestic customs data collection on trade in controlled substances under the Montreal Protocol.

20 Some argue that only the right to sell should be suspended, since the right to buy will allow a Party to come into compliance with the agreement.

on the availability of resources and, in particular, on access to expertise and financial assistance for capacity building. Linkages to external institutions and organisations may be critical. Some observers note the potential for the use of enforcement approaches, however these will take time to develop. Overall, it will be important to ensure that all of the compliance approaches work together in a consistent way to cast as wide a net as possible around compliance problems.

4.2 Responding to Non-compliance under the Climate Change Regime

This paper builds on previous OECD work and describes options that may be available to Parties in designing responses to the non-compliance of Parties with their commitments under the emerging climate regime. This analysis draws from the existing provisions in the Convention, the Protocol and general international law; review proposals by Parties, by academics and NGO observers, and precedents from other international legal regimes.

Given the early stage of the development of the climate regime, this exercise is necessarily abstract and speculative. Nonetheless it is crucial that issues related to non-compliance responses be drawn to the fore. A growing interest in a more robust compliance system for the climate regime, including tougher responses to non-compliance, was reflected in the negotiations of the Kyoto Protocol. Parties began to bring forward proposals for "mandatory" and "binding" procedures empowered to impose both automatic and discretionary penalties. The main justifications for these proposals were:

- legal character of commitments: the need to back the Protocol's binding targets with a means of enforcing them;

- competitiveness concerns: the need to ensure all Parties would pull their weight;

- market-based instruments: the need to assure buyers of allowances and offsets that their investments would be sound.

This trend may be due in part to a growing perception that positive incentives may not be sufficient to ensure compliance with a toughening climate regime. If the costs of compliance with the Protocol prove to be high, an overuse of compliance "carrots" in the Kyoto Protocol could provide a perverse incentive for Parties to overplay the difficulties of compliance, in order to negotiate easier targets in the future or to secure financial assistance. This concern may be heightened by Kyoto Protocol's application of market mechanisms to sovereign obligations. Although these mechanisms may substantially reduce the costs of compliance, some observers have expressed the concern that they could potentially provide an incentive for Parties to understate emissions or overstate emissions reductions in order to better exploit the opportunity to trade. This could have a negative effect on overall Annex I emissions levels and compliance.

If properly structured, the Protocol's implementation "mechanisms" should increase the likelihood of compliance by providing lower cost opportunities for achieving emissions reductions. Implementation mechanisms could provide one of a number of "safety valves" under the Protocol, that would allow Parties experiencing difficulties in meeting their commitments through domestic action, to bring themselves into compliance by acquiring part of another Party's assigned amount (allowance), or carbon offsets generated by projects in other countries.

However, introducing too lenient a safety valve within any commitment period could have a longer term detrimental effect on certain Parties' compliance, and on the progressive evolution of the regime. An Annex I Party that chose to achieve a significant portion of its QERLC abroad, rather than making efforts at home, may find it more difficult to undertake and to fulfil more rigorous domestic commitments in a later commitment period.

Provisions for determining and addressing non-compliance under the Convention and the Protocol and for providing an effective means for imposing and enforcing binding consequences for non-compliance have yet to be agreed. Negotiations on a Multilateral Consultative Process under Article 13 of the Convention,

and Non-compliance Procedure under Article 18 of the Protocol provide an opportunity for strengthening the regime.

The obligation to comply with the commitments under the UNFCCC and the KP will run between and among states. These commitments are first and foremost subject to the rules, procedures and mechanisms of public international law. It is, however, anticipated that the KP's implementation "mechanisms" will generate derivative legal relationships whereby emissions allowances and offsets are transferred between states. These transactions may also fall under the jurisdiction of domestic law, including the private international law which governs transboundary commercial transactions. Furthermore, the authorisation by the Protocol of the involvement of private or legal "entities" suggests that commercial relationships of direct relevance to the implementation of the Protocol may arise between states, between states and private entities, and between private entities.

The derivative legal relationships made possible by the Protocol's implementation "mechanisms" may prove to be the regime's greatest strength. They allow negotiators to entrust the enforcement of the Protocol to rules, procedures and mechanisms of more than one legal system. Many of the proposals reviewed in this analysis suggest that new rules agreed at the international level should aim not only at strengthening international responses to non-compliance, but also at encouraging states to strengthen the non-compliance response and enforcement capacity at the regional and domestic level.

The Protocol's derivative legal relationships may be more concrete and specific than the multilateral commitments that run between all the Parties to the Protocol. Depending on what rules on transactional responsibility are set by the Protocol or agreed ad hoc, a Party that has acquired allowances or offsets from another Party will have a greater interest in ensuring the other Party's compliance than might otherwise have been the case. These more concrete and specific relationships increase the likelihood that Parties will seek both traditional and innovative means for enforcing compliance.

Article 18 of the Protocol calls for development of an indicative list of consequences, depending on the cause, type, degree and frequency of non-compliance. Developing a detailed matrix with applicability to the Protocol as a whole is likely to prove problematic, and indeed may not be necessary. Associating specific levels of responses to particular commitments would require negotiators to develop an explicit hierarchy of commitments from a subtly nuanced text. Disagreements could arise, for example, over whether the consequence for violating an emissions reduction commitment should be treated more severely than failing to honour a commitment to transfer financial resources or technology.

While an Implementation Committee would no doubt consider the underlying causes of the non-compliance when recommending an appropriate response measure, it may be both difficult and inappropriate to categorically associate specific causes with specific response measures in advance of a particular case. In cases of non-compliance, the Committee could consider whether the Party should have been able to anticipate the events causing the breach, whether adequate precautionary measures were taken, and whether the shortfalls are easily reparable, before deciding to apply a punitive response. However, it may not be appropriate to require the Committee to carry the evidentiary and the political burden of having to establish and accuse a Party of wilful non-compliance before imposing the maximum consequence. For these reasons, the Parties may consider agreeing a full range of non-compliance responses, but leaving the equivalent of an Implementation Committee the discretion to tailor the non-compliance response to the particular facts before it.

This last point raises again the issue of what procedures and mechanisms will be "effective and appropriate" in determining and addressing non-compliance under the Protocol. In particular, delegations will have to decide the extent to which either the determination of non-compliance, or the application of a

particular response should take place automatically, or should be subject to the consideration of one of the Protocol's institutions.

The design of the Protocol's non-compliance response system will require procedures and mechanisms that strike a balance between discretion and automaticity. Allowing a non-compliance system broad discretion to determine and address non-compliance on a case-by-case basis may imbue the regime with a sense of fairness, but may cause uncertainty and delay. Automatic responses carry a deterrent punch and provide certainty to the market place but heavy reliance on automatic penalties may, in the high stakes game of climate change, drive participants who feel they have been dealt with unfairly, from the regime, and discourage others from joining.

4.3 Monitoring, Reporting and Review of National Performance under the Kyoto Protocol

The design of effective monitoring, reporting and review functions for the Climate Convention and the Kyoto Protocol is a priority task for the international community. Entry into force of the Kyoto Protocol will add binding, quantified emission limitation or reduction commitments for industrialised countries (i.e. "Annex I" Parties under the Climate Change Convention). These commitments will necessitate a shift in emphasis in the Convention's current compliance system. They will also require some new functions. At a minimum, the Protocol requires a co-ordinated effort to account for national performance with respect to Kyoto targets in an accurate and transparent way.

This paper considers ways of tailoring the existing UNFCCC compliance system to the substantive commitments created under the Protocol. The paper focuses on monitoring, reporting, review and related functions in the context of a wider compliance system. Possible responses to non-compliance are addressed in the papers presented in sections 4.2 and 2.1.

Monitoring, reporting and review functions figure prominently in the Protocol. Although the Protocol may not enter into force until 2001 or later, a number of actions may be possible in the near term to begin to strengthen the existing compliance system under the Convention. Early action can prepare the ground for rapid implementation of the Protocol once it enters into force, avoiding the need for a radical transition later. Effective national systems for monitoring, reporting and review will also be important. This paper explores the connections between international compliance functions and national systems.

The paper considers the new issues presented by the provisions of the Protocol that refer to monitoring, reporting and review and explores their relationship to existing functions under the Convention. The paper's conclusions are necessarily preliminary. This paper is intended to help governments consider ways in which the compliance-related functions under the Convention might evolve between now and when the Protocol enters into force.

Relevant provisions of the Protocol

The Kyoto Protocol allows Annex I Parties to meet their emission targets through a mix of domestic and international actions. Participation in joint implementation, emissions trading and the clean development mechanism will alter Parties' emission targets and the allowable domestic emissions. Accounting for changes in national targets (assigned amounts) due to the transactions occurring under these mechanisms, and verifying that the overall Annex I target is achieved, will be a key monitoring function under the Protocol.

Parties will have the primary responsibility for monitoring both their national emissions and transactions that effect their target emissions level. It is likely that reporting systems to be established under Article 7 will require countries to report information on all international transactions that affect assigned amounts (trading, joint implementation or the clean development mechanism). As the central repository of this information, the UN Climate Change Secretariat may be best placed to verify national information on transactions and the overall international accounting of assigned amounts. To allow for accounting of assigned amounts, national and international monitoring systems will need to be modified. Work should begin as soon as possible to allow development of these systems so that they will be effective once the Protocol comes into force.

The Protocol outlines other new monitoring and reporting requirements for Annex I Parties, which explicitly link national reporting and review to compliance assessment (Article 5 and 7). These include the requirement for governments to have national systems for inventory preparation and to expand annual

reports on inventories to include relevant supplemental information to ensure compliance. COP/MOP decisions on how to define national systems could make a critical difference to improving inventory data. Such decisions could be based on recommendations expected from the current IPCC assessment of "good practice" approaches to manage inventory uncertainty. The Protocol also requires Annex I Parties to continue to submit national communications on a periodic basis (less than annual). The information presented in these reports will cover the full set of Parties' commitments in the Protocol and the Convention and, in addition, will include "supplementary information necessary to demonstrate compliance."

Finally, the Protocol (Article 8) also requests the UN Climate Change Secretariat to co-ordinate and expand the review process. This will include expert review of annual reports (inventories and supplemental information) "as part of the annual compilation and accounting of emission inventories and assigned amounts." The Protocol makes it clear that review of national communications is one of the activities that is necessary for assessing implementation and compliance. The mandate for the review process is to perform "a comprehensive technical assessment of all aspects of implementation" by individual Parties and report to the COP/MOP on any potential problems influencing the fulfilment of commitments. Specific implementation questions are to be brought to the attention of the COP/MOP for further consideration.

Article 8 is important as the first step towards a full compliance system that identifies and addresses compliance problems. The Article calls for separate reviews of the national annual inventory reports and the national communications. It extends the use of expert teams to the review of implementation of the Kyoto Protocol. It also calls on the COP/MOP to consider implementation questions stemming from the performance of individual Parties, and to take decisions to address these questions. Both the Secretariat and Parties are asked to bring questions concerning implementation by individual Parties to its attention. This is an important departure from the present procedures under the Convention which emphasise facilitative and non-confrontational "shared learning."

A prompt start under the Convention

While the Protocol is not likely to enter into force until 2001 or later, a number of actions may be possible in the near term to begin to strengthen the existing system under the Convention. Early action can prepare the ground for rapid implementation of the Protocol once it enters into force, avoiding the need for a radical transition later. This might include:

- modifying reporting requirements for annual inventories and national communications;

- extending the review of these reports to include problem identification and collaboration to explore possible solutions for their resolution;

- compliance assessment for some of Convention commitments such as reporting obligations.

Annual inventory reporting before the Protocol enters into force might also be improved by requiring more detailed reporting of inventories by source and sector, which would facilitate a more meaningful and informative review of this information. A first step in this direction could be taken by the COP to revise guidelines for the annual inventory reports so that the reports are better adapted to the evolving needs of the Convention.

A variety of other changes in annual reporting would be possible under the Convention and would begin to lay the foundation for implementation of the Protocol. Firstly, IPCC recommendations on "good practice" in inventory preparation are expected to be available in 2000 and, eventually, these could be used to

strengthen the reporting guidance under the Convention. These recommendations might be tested under the Convention. Secondly, guidance on adjusting base year inventory estimates before the first commitment period is also essential. This could begin to emerge through decisions under the Convention bodies that could be confirmed later by a COP/MOP. Thirdly, Parties might be encouraged to report supplemental information on transactions in order to begin to gain some experience with what is likely to be important to the longer run monitoring needs. Finally, Parties may also work towards shortening the time delay for preparation of inventories. All of these possible changes in the reporting system are likely to be useful. Parties will need to learn how to adapt their current national reporting systems to the needs of the Protocol. An early start will limit delay and help to have a functioning system in place when the time comes for implementation of the Protocol.

As for other reporting, national communications could also be made more focused, limiting the type of information being required from Parties. Reported information should correspond with the major obligations under the Convention, which would, in turn, make for a more targeted and effective in-depth review of national communications.

A number of improvements in the existing review and verification functions of the Convention are also possible. These include:

- technical verification of annual inventory data;
- identification and assessment of implementation problems related to commitments under the Convention;
- stronger links to independent research and review activities;
- exploring the use of an independent audit function; and
- use of the internet to share information and open the review process.

Compliance assessment under the Convention is currently weak, reflecting the non-binding nature of the Convention's aim to stabilise emissions in Annex I Parties. To gain experience with compliance assessment, and to underscore the importance of reporting under the Convention, the COP could begin to assess national compliance with reporting obligations. Although these are only procedural obligations, this would serve two purposes: advancing the implementation of Convention monitoring and reporting requirements; and beginning to establish a function for the legal and political assessment of compliance which will become even more important under the Kyoto Protocol.

4.4 Key Features of Domestic Monitoring Systems under the Kyoto Protocol

Implementing the Kyoto Protocol will require Annex I Parties to set up different kinds of domestic monitoring systems. At least four types of monitoring systems can be envisaged, either as distinct or as integrated systems:

- **National inventory systems** monitor greenhouse gas emissions (and removals) at national level.

- **Entity-level emissions monitoring systems** and **project-level emissions monitoring systems** provide a framework for entities to monitor and report greenhouse gas emissions (or removals) resulting from their activities or from specific projects, such as joint implementation projects.

- **Assigned amount tracking systems** track changes in a Party's assigned amount. A Party's assigned amount may change pursuant to various provisions of the Protocol and, in particular, from the use of the flexibility mechanisms established under the Protocol.

In the context of the Kyoto Protocol, these systems can serve many different purposes, whether at international or at national level. In view of the central role that monitoring plays in implementing the Kyoto Protocol, a key concern that arises is the one of data quality, particularly when monitoring systems are used for compliance purposes. Ideally, this case requires the best quality standard. In practice, even in a compliance context, errors, uncertainties, omissions, inconsistencies or lack of transparency may never be completely eliminated, but should be minimised as much as possible.

The main objective of this paper is to identify key functions, processes and/or institutions to ensure high data quality. The paper also considers to what extent specific guidance can be defined for each of these key features of domestic monitoring systems. Drawing on current efforts to elaborate guidance for each of these systems at national and/or international level, the paper identifies features of monitoring systems that might need further consideration.

This paper provides general (background) information on monitoring systems. It does not prejudge the need for international guidelines on each of the systems considered. Indeed, international guidelines under the Kyoto Protocol are only foreseen for monitoring systems that are needed for compliance assessment under this Protocol. However, sound development of all types of domestic monitoring systems considered in this paper will reinforce the Kyoto Protocol's credibility, in helping build confidence that Parties are actually implementing their commitments under it.

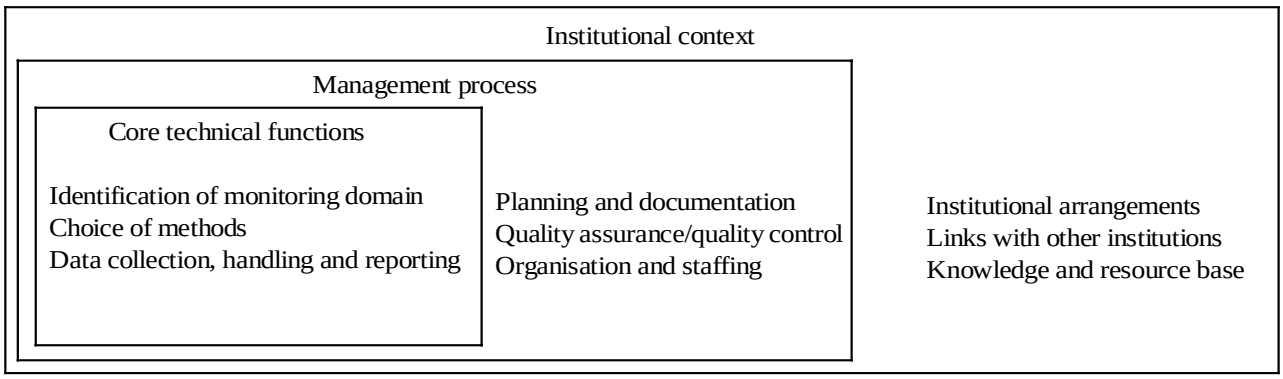
Other approaches (than internationally agreed guidelines) might underpin the development of these monitoring systems. In some cases, assistance for capacity building may prove a better way to ensure a continuous process of data quality improvement. If Parties wish so, consideration of these monitoring systems might also become part of the national communication review function. This step could build understanding among Parties about the efforts being made by national governments to implement the Kyoto Protocol commitments. It could also raise awareness among Parties about the importance of the domestic monitoring function, facilitate the sharing of information on good practice and help to identify where individual Parties may need assistance. This paper might therefore be useful to identify priorities for capacity building programmes or for the international review process.

Domestic systems: an analytical framework

The paper mainly draws on current efforts to define good practice standards at national and/or international level. The IPCC has developed recommendations for good practice guidance for national inventories[21]. In the case of entity and/or project level emissions monitoring, there are a certain number of initiatives by private companies, non-governmental organisations and governments to develop guidance for such systems at national and international level. As for assigned amount tracking, no domestic system has yet been established for greenhouse gases. However, a standard might emerge internationally, possibly based on proposals made by some Parties in the framework of current negotiations.

Although these different initiatives vary in scope and purpose, the paper uses a common analytical framework for all types of monitoring systems, emphasising similarities and differences between them. This framework identifies three distinct levels of analysis, a technical level, a managerial level and an institutional level.

Table 2: **Domestic systems: analytical framework**



Sound development of the different monitoring systems at these three levels is needed to ensure sufficient data quality. Basic technical functions, in particular the choice of monitoring methods, set the overall level of quality monitoring systems can aim for. An efficient management process minimises the risk of errors and inconsistencies in performing these basic technical functions. A strong institutional framework makes it possible to improve the quality of monitoring activities and to set up an efficient management process.

The development of these different features raises common, but also different, sets of issues for each of the monitoring systems considered in this paper.

Core technical functions

Core technical functions raise different issues for each of the three types of monitoring systems.

The choice of methods is the main concern for national inventory systems. For each greenhouse gas and each source/sink category, there is likely to be a range of possible methods from the most detailed (e.g. frequent field measurements) to more or aggregate estimation techniques. Measurement-based and other

21 IPCC (2000). *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*.

data intensive methods are considered to be the most accurate, but also the most resource intensive. It may not be useful or feasible to prescribe the use of specific methods for each emissions source as it could limit the continuous development of methods that best suit specific circumstances in a particular country or entity/project. One possible option is to identify "key sources" in each country for which more complex methods might be required. The IPCC provides the tools for Parties to define which are these key sources.

The same methodological issue might arise with entity/project level emissions monitoring systems, unless their monitoring domain is restricted to those emissions sources that can be estimated with relatively simple methods. Defining the boundaries of the monitoring domain for this type of monitoring systems is likely to be a critical issue for entities, since it may be linked to specific emission reduction programmes.

As regards assigned amount tracking systems, the choice of methods is not really an issue, since there is only one possible method for tracking changes in assigned amounts. A clear identification of the tracking domain, timeliness (in processing trades) and compatibility between systems seem to be the most relevant issues in setting up such systems. Electronic data processing, much like on-line banking systems, would make monitoring much easier. More generally, electronic data collection, handling and reporting would benefit the development of all types of monitoring systems.

The management process

The general characteristics of an efficient management process are common to all monitoring systems discussed in this paper. Pertinent standards and guidelines already exist at international level and apply to all data quality management systems. They should be supplemented by procedures that are adapted to the specific characteristics of emissions monitoring and assigned amount tracking systems. These procedures might be more or less resource intensive.

The IPCC has provided "good practice" guidance on quality assurance/quality control and documentation for national inventories. It has identified different tiers for QA/QC, with increasing levels of complexity. This effort might also be useful for developing entity/project level emissions monitoring systems. A similar exercise could be undertaken for assigned amount tracking systems.

Developing an efficient management system may be quite costly, in particular when new systems need to be set up, or when new methods need to be used. However, it helps reduce the burden of data quality assessment and review by end users of data, which might in turn save resources.

The institutional context

The different institutional features of monitoring systems are very country-specific. However, a number of issues might pertain to most institutional frameworks within which monitoring systems operate. The main issues identified in this paper are common to all types of monitoring systems:

Are there institutional arrangements that establish monitoring systems? Is responsibility clearly defined? Is the support from higher management sufficient? Are there formal arrangements, or even legal authority, for collecting and verifying data from different sources? Is monitoring part of a domestic compliance and enforcement system (in particular, for entity/project level monitoring systems)?

Which are the institutions that collaborate in the monitoring process? What are the strengths and weaknesses of these institutions?

What are the strengths and weaknesses in the country in terms of expertise needed to set up monitoring systems? Are there many forms of co-operation between government, industry and research institutions to exchange information on monitoring activities?

Guidance might be defined for some of these key institutional features. At a minimum, Parties might want to require that the responsible institution(s), as well as institutions that collaborate in the monitoring process, be clearly identified. Other options for guidance might be requirements that monitoring systems have a clear and permanent status within the institutional structure, be reviewed by independent third parties and that they have legal authority to collect necessary data.

An assessment of the strengths and weaknesses of institutions might also provide insights into the specific capabilities of each Annex I Party in achieving good practice in their monitoring systems.

A possible way forward

There are generic characteristics of monitoring systems that cut across differences between them and for which guidance could be developed at national and/or international level. Priorities for the further development of each system may differ, depending on what has already been achieved, at national and/or international level.

For **national inventory systems**, the IPCC good practice work covers a wide range of relevant issues. It is mainly concerned with providing guidance on methodological choice, uncertainty assessment, quality assurance/quality control and reporting and documentation. The IPCC provides tools to select methods and procedures. However, it is up to Parties to the Convention (UNFCCC) to define minimum requirements for these different elements. Difficult political choices may need to be made on how to use IPCC good practice work. As regards other management functions, like planning, organisation and staffing, and institutions, more analytical work may be needed to further develop what guidance might look like on these issues. In view of the specific circumstances of each country, it may be that guidance can only be very general on these matters.

There exist some (non-governmental and governmental) initiatives at this stage to develop guidance for **entity/project level emissions monitoring systems**. Common approaches might facilitate the development of the Kyoto Mechanisms. For entity level monitoring, it is unlikely this would be in the UNFCCC framework, since it is not required under the Kyoto Protocol. The IPCC good practice guidance is also relevant for entity level monitoring and may provide some insights into project level monitoring systems as well.

Assigned amount tracking systems are the least developed of all systems, but also probably the simplest to develop and implement. Current proposals focus on a clear identification of the monitoring domain, reporting and public accessibility. Further elaboration of registry systems might focus on the data acquisition and handling process, in particular on how systems in different countries link up as well as on timeliness of data processing. Management and institutional issues may also be discussed, although they may not be as critically important for these systems as they are for national inventory systems.

5. References

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6. Glossary

Activities implemented jointly (AIJ)	Since 1995 pilot phase AIJ activities can be carried out through partnerships between a private or public investor from a developed country and a counterpart in a host country. The purpose is to transfer technology and know-how for the reduction of greenhouse gases through mitigation or sequestration and to gain experiences for the development of Joint Implementation and Clean Development Mechanism.
Adjusted assigned amount	A Party's assigned amount, plus any acquisition and minus any transfers of AAUs that this Party has realised for a given commitment period. At the end of the commitment period, the Party's emissions should be less than or equal to its adjusted assigned amount.
Annex I Parties	The developed countries listed Annex I to the Convention that have a non-binding commitment to reduce their greenhouse gas emissions to 1990 levels by the year 2000. They include the 24 original OECD members, the European Community and 14 countries with economies in transition.
Annex B Parties	The developed countries listed in Annex B of the Kyoto Protocol that have committed themselves to quantitative reduction targets for the period 2008-12. Annex B countries include all OECD countries except Turkey, Korea and Mexico, as well as Bulgaria, Croatia, Estonia, Latvia, Lithuania, Romania, Russian Federation, Slovakia, Slovenia and the Ukraine; Annex B also includes one regional economic organisation, the European Economic Community.
Article 3	Kyoto Protocol provisions on national emission commitments.
Article 5	Kyoto Protocol provisions on emissions inventories.
Article 6	Kyoto Protocol provisions on project based trading among Parties with quantified national emission limits (industrialised countries).
Article 7	Kyoto Protocol provisions on reporting of information for the purpose of ensuring compliance with Article 3.
Article 8	Kyoto Protocol provisions on review of information submitted under Article 7.
Article 12	Kyoto Protocol provisions on transfers of certified emission reductions from projects in developing countries to industrialised countries.
Article 17	Kyoto Protocol provisions on international emissions trading among industrialised.
Article 18	Kyoto Protocol provisions on compliance.

Assigned amount	Emission objectives of Parties, as defined by the Kyoto Protocol for the commitment period 2008-2012. This term refers to the amount of emission allowed for individual Parties in the commitment period given the targets for individual countries that are listed in Annex B of the Protocol. The assigned amount for the period 2008-2012 is therefore the target multiplied by the agreed base year emission in year 1990 (taking into account any adjustments to the base year as allowed for in Article 3 of the Protocol), multiplied by 5.
Assigned amount unit	A standard quantity of assigned amount that could be used by Annex I Parties to transfer and/or acquire emissions reduction units under Art. 6, certified emissions reductions under Art. 12, or parts of assigned amounts under Art. 17.
Baseline	A hypothetical reference case representing the estimated level of greenhouse gas emissions (and/or removals) that would occur in the absence of the JI or CDM project.
Baseline (methodology) update	Change in baselines and/or baseline methodologies that occur independently of one particular project.
Baseline revision	Change in the baseline that is required *for a particular project* after a fixed period of time.
Bilateral trade	Simple AAU transaction arranged and finalised by a buyer and a seller.
Broker	Private entity operating on as a market intermediary to match a buyer with a seller for a fee.
Certified emission reductions	Tradable emission reductions generated by CDM projects undertaken in developing countries, to be certified in order to be transferable.
Clean development mechanism	The Kyoto Protocol establishes the CDM to allow emission-reduction projects located in non-Annex I Parties to generate certified emission reductions to be used by Annex I Parties for the purpose of meeting their emission objectives under Article 3.
CO_2 equivalent	The unit for an amount of greenhouse gases taking into account their relative radiative forcing potential (i.e. their contribution to global warming over a specified year time frame).
Commitment period	The period for which industrialised countries' national quantified emission commitments have been set under the Kyoto Protocol: 2008 to 2012.
Compliance	Meeting legal obligations e.g. obligations of Parties under the Kyoto Protocol and obligations of entities under domestic law.
Conference of the Parties (COP)	The COP is the supreme body of the Convention. It currently meets once a year to review the Convention's progress and to advance negotiations on various aspects of implementation of the Convention.
Double-auction	Auction system whereby all "bids"—offers to buy—and "asks"—offers to sell—are posted simultaneously to allow transparent and competitive transactions.

Dynamic baseline	A baseline whose level varies with time.
Emission reduction units	Tradeable emission reductions generated by joint implementation projects.
Emissions timeline	Time (number of years) over which emission credits resulting from a JI or CDM project accrue.
Entities	Companies or other organisations that emit greenhouse gases in the course of their activities and/or undertake emissions reductions projects.
Environmental additionality	Difference between baseline emissions and actual emissions for a JI/CDM project. Environmental additionality of JI and CDM projects is required by the Kyoto Protocol.
Exchange	Organised and regulated market on which buyers and sellers—members of the exchange, or agents relying on these members—can trade commodities, stocks, etc. Membership is based on an annual fee and on certain financial guarantees.
Fixed baseline	A baseline whose level (or rate) is fixed at the start of the project for the duration of the crediting lifetime of a project.
Free riding	A situation whereby a project generates emission credits from JI or CDM projects even if the project would have gone ahead in the absence of JI or CDM, i.e. is not "additional". Free riding therefore affects the numbers of projects obtaining credits.
Gaming	Actions or assumptions taken by the project developer and/or project host that would artificially inflate the baseline (and therefore the credits from the project). Gaming generally leads to lax baselines.
Greenfield projects	New projects, e.g. those taking place at a new site and increasing the host country's capacity for heat output, electricity generation etc. (as opposed to refurbishment projects that build on *existing* projects)
Greenhouse gases	The main GHGs responsible for causing climate change are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_20). The Kyoto Protocol also addresses hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6).
Hybrid baseline	A baseline made up of different components that could be applied to a number of projects. A hybrid baseline could combine some aspects of project-specific baselines (e.g. incorporating some site-specific analysis) and some aspects of multi-project baselines (e.g. to include some standardised emission values for different technologies).
Intergovernmental Panel on Climate Change (IPCC)	The IPCC was established in 1988 by the World Meteorological Organisation and the UN Environment Programme. It conducts in-depth surveys of the worldwide technical and scientific literature and publishes scientific and technical assessment reports that are widely recognised as the most credible existing sources of information on climate change.

International emissions trading	The Kyoto Protocol establishes a mechanism whereby Annex I Parties (listed in Annex B of the Kyoto Protocol) with emission commitments may transfer part of their assigned amount to other Annex I Parties (listed in Annex B of the Kyoto Protocol). The aim of international emission trading is to improve the overall flexibility and economic efficiency in achieving the agreed Annex B emission target.
Issuer, issuing Party	Party that allows a transfer of parts of its assigned amount (AAUs) to another Party.
Joint implementation	Mechanism established by the Kyoto Protocol allowing transfers of project-based emission reductions units among Parties with emission objectives under the Protocol.
Kyoto Protocol	The Kyoto Protocol to the United Nations Framework Convention on Climate Change was adopted in December 1997. The Parties listed in Annex B of the Protocol commit themselves to reducing their collective emissions of the six main greenhouse gases by at least 5 per cent. Each country's emissions target must be achieved by the end of the period 2008-2012.
Leakage	An increase in GHG emissions, or a decrease in GHG sequestration, caused by the project activity but not accounted for in the emissions baseline for that project as these increases or decreases occur outside the GHG boundary used for that particular project.
Liability rules	Rules established to allocate responsibility in case a Party which has transferred parts of its assigned amount is found in non-compliance (e.g. buyer liability or issuer liability).
Monitoring	Monitoring is a generic term for the collection and handling of data on greenhouse gas emissions (and removals) and/or changes in assigned amounts.
Multi-project baseline	A baseline that can be applied to a number of similar projects.
National communications	A central requirement of the Convention (and the Kyoto Protocol) is that each Party must inform the others about its national climate change activities. Many Annex I Parties have submitted their second National Communications and non-Annex I Parties countries have started to submit their first National Communication.
Non-Annex I Parties	Countries that are not included in Annex I of the Convention -- developing countries. Non-Annex I Parties do not have any quantified emission limitation or reduction commitments under the Kyoto Protocol and have fewer specific mitigation and reporting obligations under the Convention compared to Annex I Parties.
Overselling	Situation where a Party does not hold enough AAUs to cover its emissions at the end of the commitment period and has issued and transferred AAUs. The Party has therefore "sold" more AAUs than it was entitled to.
Parts of assigned amount	Portions of a Party's assigned amount that can be traded under Art. 17 (emissions trading).

Prior notification	Announcement by a Party of its intent to buy or sell AAUs.
Project	An activity, undertaken in the context of the Kyoto Protocol's project-based mechanisms (i.e. CDM and JI), that can generate emissions credits based on emission reductions (or sink enhancement) compared to what would have occurred otherwise.
Project-specific baseline	A baseline that is drawn up for an individual project by examining it on a case-by-case basis. Each project-specific baseline is used only for the project for which it is developed.
Refurbishment projects	Projects in which existing equipment/processes is upgraded or replaced.
Revisable baseline	A baseline whose level or rate will or could be revised during the course of the project.
Static baseline	A baseline that has a constant level through time.
Stringency (of a baseline)	The stringency of a baseline is a measure of how difficult it is for projects to generate emissions below the baseline level.
Tracking	Tracking is considered as a synonym of monitoring and is used more specifically for the monitoring of assigned amounts.
Transaction costs	The costs associated with the process of obtaining JI or CDM recognition for a project and obtaining the resulting emissions credits. Transaction costs would include, for example, costs of developing a baseline and assessing the "additionality" of a project, costs of obtaining host country approval, monitoring and reporting, etc. Transaction costs would not include the direct investment, maintenance and operational costs of the project.
Transactions (or trades)	General term for sales or purchases of PAA.