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# Case Study

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## Comparative Case Study 4

# The UN Framework Convention on Climate Change

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### Summary

Verification of gas emissions faces particular problems of uncertainty, because of their intangibility, the variety of factors that influence them, and continuing disagreements on the monitoring methodologies. Verification under the UNFCCC aims to test compliance with the binding GHG emissions reduction targets identified in the Kyoto Protocol. The paper describes the verification system, which is managed by an international secretariat but based on national reporting. The Protocol has only recently come into force, making the effectiveness of some of the verification tools difficult to assess, although experience has been gained from gradual improvements made since the Treaty was first developed. The system has some innovative features (for example, Expert Review Teams, Designated Operational Entities, and a complex compliance methodology), and these may be of wider relevance in verification systems design.


### POLICY CONCLUSIONS

i. Verification of highly technical matters such as greenhouse gas reductions is a challenging area which must accommodate competing pressures; decentralisation of reporting responds to a political expedient (national sovereignty) but rapidly comes up against major capacity constraints (the lack of qualified technical personnel, particularly for Parties in the South). Financial incentives and technical support may be required to address these constraints, and the UNFCCC offers an interesting approach in these areas, though the investments are considerable.

ii. As with other treaties, the essence of effective verification under the UNFCCC lies in self-reporting according to a prescribed set of formats, backed up by a variety of institutional mechanisms to cross-check findings. The credibility of such an arrangement depends heavily on the effectiveness of the measures put in place to protect the system from political interference.

iii. Transparency and efficiency are desirable standards for any monitoring system. Where the system departs from a straightforward recording of observable phenomena, then the implications for verification are demanding. This is the case with the 'additionality' and 'sustainability' criteria for the Clean Development Mechanism.

iv. The Kyoto Protocol offers an innovative two-part compliance procedure (involving facilitation and enforcement); this acknowledges the fact that this is new territory for all of the Parties.

v. Sanctions need to be applied in a way which encourages compliance, and liability should reinforce governance. Conversely, where liability is at odds with governance, then compliance is likely to be undermined. The debates within the UNFCCC on buyer and seller liability underline this point.

vi. Non-governmental actors may have important roles to play in areas that formal verification fails to cover adequately (such as mechanisms with high social impact); they may also encourage compliance where internal controls are weak.

vii. Where a treaty imposes significant costs on its Parties, inclusiveness is a prerequisite for effectiveness; in the present instance, the presence of powerful non-Parties is a matter of some concern.

odi RECOFTC CIFOR CATIE Tropical Agricultural Research and Higher Education Center

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## Introduction

The 1992 UN Framework Convention on Climate Change (UNFCCC) is an inter-governmental agreement to tackle the problem of climate change. It recognises that climate is a globally shared resource which can be affected by industrial emissions of greenhouse gases (GHGs) such as carbon dioxide ($CO_2$) and chlorofluorocarbons (CFCs). It differs from the 1987 Montreal Protocol of the Vienna Agreement in that, while Montreal aims to rid the world of the ozone-depleting chemicals implicated in depleting the ozone layer, the Convention on Climate Change addresses the broader issue of global climate change, and seeks ways to mitigate – though not necessarily eliminate – its negative effects (see Box 2). The Kyoto Protocol to the Convention was agreed in 1997, and specifies emission reduction targets, as well as the main elements of the implementation mechanism. The Protocol commits the wealthier industrial states and states in transition to individual and legally-binding targets for reduction of greenhouse gas emissions. These are listed in Annex B of the Protocol, and require cuts in emissions of at least 5% from 1990 levels in the 'first commitment period', which runs from 2008–2012. The Protocol came into force in 2005, when the accession of Russia lifted the total level of $CO_2$ emissions of signatories above the required '55% threshold' (ratified by 55 countries and by nations accounting for 55% emissions from Annex 1 – industrialised – Parties). Notably, however, some of the world's major energy consumers, including the USA and Australia, have not yet ratified. The effects on the political will of the complying parties of having such prosperous nations operating as free riders (sharing the benefits without contributing to the costs) still remain to be seen.

In 2001, further accords were agreed at Marrakesh. Inter alia, the Marrakesh accords set out the detailed operation of a number of mechanisms to meet the reductions targets agreed at Kyoto. These are the three so-called 'flexible mechanisms' to help lower the costs for Parties and companies of achieving emissions targets. They are:

- Provisions for a greenhouse-gas emissions trading system;
- Implementtion and monitoring of the Clean Development Mechanism (CDM);
- Implementation and monitoring of Joint Implementation projects (JI).

The GHG trading system applies only to industrial (Annex 1) countries with 'capped emissions'. Annex 1 countries whose emissions ceilings are above their existing levels or which are able to reduce emissions easily will be able to trade emissions rights with other industrial countries which exceed their targets. Additionally, the CDM allows Annex 1 countries to generate emissions reductions through projects in developing countries (which have no ceilings on their emissions). This could be done by either helping the latter reduce their emissions levels, or helping them create carbon sinks. In many developing countries, forests are likely to be targets for either or both of these – emissions reductions through improved forest management and sinks through reforestation or afforestation (see Landell Mills & Porras, 2002).

Implementation of the UNFCCC is proving a sensitive matter, and the capacity for verification may be affected by this sensitivity. Conflicts arise over a number of issues including:

- The political dimension of emissions setting; for example, Australia negotiated a special agreement based on its net positive land use emissions, which gave it a 19% increase on its ceiling over 1990 emissions levels; this was equivalent to US$500 per citizen; the country has still not ratified, however (Victor, 2004);
- The ability of certain resource-rich countries to influence the market (for example, Russia could substantially influence the price of emissions credits, due to the extent of its over-supply, which, if released excessively onto the market, would cause prices to plummet).

Responsibilities for the problem are also very unevenly shared. For example, 15 large companies account for 5% of Annex I emissions (CDP, 2005).

Compliance with Kyoto is likely to be particularly problematic for industrial nations, as it will involve:

- Potentially high costs;
- Actions which affect their industrial competitiveness;
- The use of permits, for which future prices cannot easily be predicted.

The combination of high compliance costs, with market uncertainty could lead to abuse of the system, at both country and company levels (Victor, 2004).

Underlying all these concerns are some bigger issues relating to impacts. Climate change has been predicted to involve an increase in earth temperatures of 1.4–5.8°C between 1990 and 2100 (IPCC, 2001). Some argue that the Kyoto Protocol does not offer sufficient emissions cuts to address this rise. They argue that, as it stands, major resources are being invested in attempting to ensure some fairly marginal gains. Supporters of the Protocol, on the other hand, argue that it is the only viable system, which now in place, provides a structure for much more stringent cuts in the future.

## Verification under the UNFCCC

Verification under the UNFCCC is based on self-reporting by Parties to the Convention. It is designed to monitor emissions inventories submitted by Parties and to test compliance with the binding GHG emissions reduction targets set by the Kyoto Protocol. Inventories are comprehensive databases of different source categories and related emissions data, which enable the calculation of overall emissions for a particular country. Annex 1 countries are required to submit more detailed emissions inventories on a more regular (annual) basis, than non-Annex 1 countries. They are also subject to more stringent review procedures. These differences reflect the fact that the Convention and Protocol take into account the differences in emissions, and historical emissions between North and South, and hence their different contributions to the current climate change problem. These monitoring and review systems are discussed in more detail later in the paper.

To be in compliance, Annex 1 Parties must establish a national inventory system and meet reporting requirements, keep net emissions below their assigned amounts (which relies on setting and calculating an

appropriate historical emissions baseline with which to compare emissions) and comply with the requirements for the use of the flexible mechanisms. This highlights the fact that monitoring compliance is not related to real emissions but to reporting guidelines – there might be significant inaccuracies due to errors in compilation and uncertainties in the data – but a Party can still be in 'legal compliance' even if the emissions have not been reduced (Rypdal 2003).

This brief is concerned mainly with verification systems in place to check that Parties are carrying out their commitments under the treaty and protocol, such as following reporting procedures in the good practice guidelines of the IPCC (IPCC 2000) – sometimes called treaty verification (MacFaul, *pers. comm.* 2006). These guidelines define verification as:

> 'Verification refers to the collection of activities and procedures that can be followed during the planning and development, or after completion of an inventory that can help to establish its reliability for the intended application of that inventory.' (IPCC 2000)

This is built on by Tenner (2000):

> 'Verification is the process of gathering, processing and using information for making a judgement about compliance or non-compliance by Parties to an agreement. The aim of verification is to establish or increase confidence that a treaty is being implemented fairly and effectively by all Parties. In the case of the Kyoto Protocol, the verification system should provide assurance to governments that all Parties are taking action to reduce greenhouse gas emissions.' (Tenner 2000)

**Box One: Terminology**

*Annex I*

ANNEX I Parties include the industrialised countries that were members of the OECD in 1992, plus countries with economies in transition (the EIT Parties), such as the Russian Federation (UNFCCC 2005).

*Annex II*

ANNEX II Parties consist of the OECD members of Annex I, but not the EIT Parties. They are required to provide financial resources to assist developing countries with reducing emissions and adapting to climate change and 'to take all practicable steps' to promote the transfer of environmentally friendly technologies to EIT Parties and developing countries (UNFCCC 2005).

*Commitment Period*

The Kyoto Protocol sets binding emissions limits for Parties of an average of 5% below 1990 levels. The first commitment period, from 2008 to 2012 sets the deadline for achieving these reductions.

*Compliance*

Fulfilment by countries/businesses/individuals of emission and reporting commitments under the UNFCCC and the Kyoto Protocol

*Independent Transaction log*

A database, operated by the secretariat that records all transactions of emissions reduction units between Parties.

*Inventory*

A database holding information on total emissions estimates. In the UK, for example, the Environment Agency is the designated authority holding an inventory of all emissions estimates by participants in the EU emissions trading system.

*Least Developed Countries*

48 Parties given special consideration under the Convention on account of their limited capacity to respond to climate change and adapt to its adverse effects.

*LULUCF Sector and Sinks*

A *sink* is 'any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere'. They include GHG removals from land use, land-use change and forestry (LULUCF) sector. Sinks can be used to combat climate change by increasing removals by sinks of greenhouse gases from the atmosphere (e.g. by planting trees or managing forests), or by reducing emissions (e.g. by curbing deforestation). However, their use is complicated by technical difficulties in calculating net GHG flows, and in guaranteeing removals are permanent.

*Materiality*

The International Emissions Trading Association defines materiality as 'the professional judgment of the verifier as to whether an individual or aggregation of omissions, misrepresentations or errors that affects the information reported for an installation will reasonably influence the intended user's decision'.

*Monitoring*

Under the CDM, monitoring refers to the collection and storage of all relevant data for setting the baseline emissions and measuring the anthropogenic emissions of GHGs (i.e those with human causation).

*National Registry*

Electronic databases that track units held by a Party and moved between Parties.

*Sector*

Used in the compilation of inventories, which are divided into six sectors: energy; industrial processes; solvent and other product use; agriculture; land-use change and forestry; and waste.

*Validation vs. verification (for CDM projects)*

*Validation* is the process of independent evaluation of a project activity by a designated operational entity against the requirements of the CDM as set out in decision 17/CP.7, the present annex and relevant decisions of the COP/MOP, on the basis of the project design document. Source: http://cdm.unfccc.int/Projects/Validation

*Verification* is the periodic independent review and ex post determination by the designated operational entity of the monitored reductions in anthropogenic emissions by sources of greenhouse gases that have occurred as a result of a registered CDM project activity during the verification period. Source: http://cdm.unfccc.int/Projects/pac/ar_howto/VerifyCertify .

Verification can also be used in a narrower sense to refer to checking the reliability and accuracy of inventory data – a process that more resembles a technical audit function and sometimes called report verification (MacFaul, *pers. comm.* 2006). This might apply, for example, in the checking of GHG inventory data for a particular entity.

## Areas of verification concern

What does verification under this convention imply? There are three areas of concern.

- Verifying baseline emissions and emissions trends;
- Verifying changes in emissions resulting from reduction measures;
- Verifying mitigation mechanisms defined by the Kyoto Protocol.

The first two are interconnected, and fairly well established, at least in outline, as they affect all signatory countries. They relate mainly to technical methodologies for estimating emissions, about which the debate is still evolving as new technologies emerge and an increasing number of sources are included. With individual states taking responsibility for monitoring and reporting their emissions reductions, there are also some issues with the quality of reporting. At present, report quality varies widely, depending on the institutional structures and resources of the country in question, although they are all meant to conform to UNFCCC standards and conditions. Standard guidelines for compiling emissions inventories have been developed by the Intergovernmental Panel on Climate Change, which vary in complexity to suit the different institutional structures and capacity of the Parties. States are encouraged to use the most sophisticated procedures where possible. This increases accuracy, though this could be at the cost of transparency, because of the number of different systems in use (Tenner 2000).

Verifying the Kyoto Protocol's mitigation mechanisms is more challenging. It includes the verification of some fairly abstract phenomena in the Kyoto mechanisms, such as contributions to 'sustainable development' and 'additionality' (see below, discussion of CDM). There is little case material to draw on for these systems. As yet, there are very few CDM projects and even fewer that have been verified. Most learning has come from various prototype projects, such as the World Bank's Prototype Carbon Fund. And emissions trading has, until relatively recently, been restricted to national and regional systems (e.g. the UK and EU emissions trading schemes), and some private schemes run by individual companies (e.g. BP).

Verification of gas emissions faces a particular problem of uncertainty in relation to monitoring. In tracking systems with a tangible commodity, efforts focus on assessing how monitoring systems have been implemented and whether commitments have been met, which is the also ultimate aim of the Kyoto Protocol. In the case of GHG emissions, this is complicated by the debate about how exactly to estimate and then monitor emissions. 'Carbon is an illusive commodity, it is difficult to measure and therefore highly dependent on a paper trail' (Moura Costa, 2005).

This difficulty is amplified by the ambitious targets set under the Protocol. These require Parties to monitor six GHGs against a baseline of 1990 emissions. In numerous cases, retrospective estimates have had to be made. Victor (2001) makes out a strong case that it would have been much wiser in the early stages to limit monitoring to fossil fuel emissions of $CO_2$ alone. He argues that 'the (environmental) logic of a multigas and multisource approach is impeccable (but it) ignores reality: expanding the trading system beyond carbon dioxide emitted from fossil fuels hugely complicates the problem of monitoring'. (2001) There are a number of reasons for this, such as:

- *Transparency*
  Amounts of $CO_2$ bear a known relationship to the amounts of fossil fuels used. As the latter are nearly always traded in commercial markets, they give a clear proxy of $CO_2$ use, and can be easily cross-checked from a variety of data sources.
- *Cost effectiveness*
  As fossil fuel emissions have historically caused the majority of global warming (c. 70%), and continue to do so, such monitoring would be a cost-effective way of addressing this problem.

Other greenhouse gases, such as methane and nitrous oxide, are not easily measured, offer no ready proxies, and also suffer from the fact that emission factors (which allows the calculation of absolute GHG emissions from a source when activity data (such as tonnes of fuel burnt) is known) vary widely. The extra flexibility of extending the trading system beyond fossil fuels (in the sense of giving market actors a wide range of options to address global warming) would thus be unlikely to make up for the additional costs entailed in monitoring compliance.

A particular area of uncertainty surrounds the issue of GHG 'sink' projects carried out in the land use, land-use change and forestry sector (LULUCF). These terms are explained in Box One. The official guidelines suggest a 10% uncertainty value on $CO_2$ emissions and up to 60% uncertainty on the other GHGs covered (IPCC 1996). What this means is that any emissions figure could actually be up to 10 or 60 percent (respectively) above or below the quoted value (thus, a project claiming to have reduced emissions by 1000 tonnes of non-$CO_2$ GHGs could in reality have reduced them by as much as 1600, or as little as 400 tonnes). The controversial inclusion of LULUCF sources and sinks could lead to high uncertainties because of the wide range of relevant activities that occur on a given area of land, the uncertainty in the science (particularly in extrapolating methodologies between different sites) and the high proportion of non-$CO_2$ GHGs which can occur in the forest and agricultural sector.

To overcome some of the issues outlined above, the IPCC have issued guidelines on uncertainty management (IPCC 2000) to ensure that estimates, even if they are uncertain, are 'bona fide' estimates and not subject to bias. They give an agreed set of definitions used in uncertainty analysis, which helps to increase consistency, comparability and transparency, and they have developed a tiered approach for determining uncertainties to different levels of detail depending on the capacities of different Parties.

## Monitoring and reporting before and during the first commitment period

Reporting under the UNFCCC is based on national communications submitted by Parties. The COP provides guidelines on preparing national communications, which helps to ensure transparency and comparability. It differentiates between Parties based on their capacity to report:

- Annex 1 Parties have to submit their initial national communications within 6 months of entry into force of the Convention, and then approximately every 4–5 years subsequently. They also have to submit an annual inventory of GHG emissions and removals, along with data on baseline emissions, which is submitted in two parts: the Common Reporting format (a standardised electronic database of emissions data) and the National Inventory Report (outlining how the inventory was compiled).
- Non-Annex 1 are divided into two groups with different reporting requirements; the LDCs, which in recognition of their lack of their limited resources, are not required to submit initial communications within a specified time period; and other developing country Parties which are required to submit their first national communications within three years of entry into to force of the Convention, for that Party. Non-annex 1 Parties are not required to submit separate annual GHG inventories, but file them with their national communications. The Consultative Group of Experts (CGE) assists non-Annex 1 Parties in compiling their national communications (for example, through training, technical support and advice on financial support).

The entry into force of the Kyoto Protocol has brought about modified reporting requirements. Before the first commitment period, each Party must put in place a national system for estimating greenhouse gas emissions and a national registry for recording transactions of emissions reductions units generated by different types of activity – certified emission reduction units from CDM projects, emission reduction units from Joint implementation projects and Removal Units from sink projects. The national system includes a comprehensive emissions inventory. They are also required to have made demonstrable progress in meeting their commitments under the Protocol. In summary, there are three main reporting formats:

*Demonstrable progress reports:*

- Describe emissions reductions policies;
- Describe trends and projections of GHGs at national level;
- Estimate the extent to which policies will contribute to the emissions target;
- Include a description of activities and projects to implement technology transfer.

*Pre-commitment period reports: these are in two parts and include:*

- Complete national inventories since 1990 and calculation of the assigned amount;
- A description of the national system and registry.

*Commitment period reports:*

- Provide an annual report in a standard format which describes the steps taken to implement commitments under the Kyoto Protocol, along with supplementary information on other commitments.

### Expert Review Teams

An unusual feature of the UNFCCC, when compared to other international environmental agreements, is the use of a review process involving expert review teams (ERTs) for Annex 1 Parties. In this respect, 'the climate regime is an innovator and forerunner in international environmental politics' (Wettestad 2005)). The ERT's role is to verify inventory systems and data submitted by a Party to the Protocol, before and during the first commitment period. They also have a facilitative role,

### Box Two: Overlaps between the Montreal and Kyoto Protocols

There are significant overlaps between the provisions of the Montreal Protocol and the Kyoto Protocol. These can be summarised in three different areas (Oberthur 1999):

i. The science – e.g. many of the CFCs covered by the Montreal Protocol are powerful greenhouse gases. Predicting how reductions or increases in CFCs will affect climate change is extremely complicated.
ii. Similarities in structure of the two protocols – e.g. both protocols follow a similar 'convention + protocol structure', with similar financial mechanisms, procedures for amending treaty rules, having a basket of different gases and linkages between policy-making and scientific advice.
iii. Conflicts between the solutions proposed by each regime – e.g. HFCs are included in the basket of GHGs under the Kyoto Protocol, but have also been promoted as substitutes for CFCs under the Montreal Protocol.

Of most relevance to this briefing is the similarity in the non-compliance procedures for the two regimes. The Kyoto Protocol has drawn heavily on the Montreal Protocol's compliance system and systems for dealing with non-compliance (e.g. Article 18 of the Kyoto Protocol, which calls for Parties to develop 'effective procedures and mechanisms' for dealing with cases of non-compliance). There are also interesting opportunities for shared learning over monitoring systems (e.g. the funding provided for training staff to collect ODS [ozone depleting substances] data through customs authorities using a custom codes system complex) and systems for reducing emissions (for example, through incentives or voluntary agreements with industry), particularly for fluorinated GHGs which are covered by both Protocols.

However, these similarities are limited by fundamental differences in the nature of the two problems. The Montreal Protocol has been one of the most successful environmental treaties (global consumption and production of ozone depleting substances had decreased by 80% by 1996 from the time controls were established, partly because there have been readily available and financially viable alternatives and ODS sources are relatively easy to track. The Montreal Protocol has exploited these features, making it attractive for Parties to implement the terms of the convention (Barrett 2000). GHGs, on the other hand result from a much larger range of sources, are less 'trackable', and political will and financial disincentives are preventing rapid adoption of alternative fuel sources.

providing feedback to Parties, which helps them to improve their emissions inventories. The output of the expert review process is a report submitted to the Compliance Committee.

The review process for Annex 1 national inventories is carried out in three stages:

i. An initial 'quality assurance' check of the information provided by the Party, mainly to check that the inventory is complete and has the correct format.
ii. Synthesis and assessment of the inventory information, to determine emissions trends, check the emissions factors used, and to identify any obvious problems in the submitted inventory or processes used to compile it.
iii. Expert review of the data, methodologies and procedures used. This is carried out by international teams competent in the different sectors. 3 types of review can be carried out:
    - A centralised review of 5–8 inventories, at Secretariat level;
    - Desk review where 3–5 inventories are reviewed by experts based in their home countries;
    - In-country review of a single inventory.

*Selection of Expert Review Teams*

A number of provisions help to ensure that the selection and composition of Expert Review teams is impartial. Teams are selected by the Secretariat from experts nominated by the Parties and by intergovernmental organisations, a procedure which maximises contributions from different interest groups in the process. The Secretariat itself has a degree of impartiality by being accountable to the COP and subsidiary bodies. It is also funded by the Parties, with their contributions being based on the UN scale of assessment.

Each team covers the range of sectoral issues, and has a balance of members from Annex 1 and non-Annex 1 Parties, as well as a degree of a geographical balance. New review team members have to undergo skills and technical training and have to pass an exam before they can conduct inventory reviews. Two lead experts, one from an Annex 1 and one from a non-Annex 1 country, manage the work of the ERTs and liaise with the Secretariat. Members have to serve in a personal capacity, 'free from any political judgement'. To help ensure these provisions are met, members selected to review a country 'shall neither be a national of the Party under review, nor be nominated or funded by that Party'. Additional provisions include that 'no national of a Party shall be included in the ERT for review of that Party' and that 'the inventory of a Party shall not be reviewed in two successive review years by ERTs with an identical composition of experts' (FCCC/CP/2001/INF.5: 43). Funding of the Standing Group of review experts (the pool from which ERTs are drawn) is provided by Annex 1 Parties (for the 6 Annex 1 members) and from the core Secretariat budget (for the 6 non-Annex 1 members).

A number of issues arise in relation to this review system.

- *Impartiality vs. Trust*
  Although a significant effort has been made to make the selection and funding procedure impartial, the direct involvement of the Parties could reduce impartiality. However, it is questionable whether any alternatives would be preferable (would selection by the Secretariat be more impartial, for example?). In addition, any risks in this area have to be offset against the benefits from high levels of participation by the Parties, which may increase trust and willingness to cooperate.
- *Issues of breadth and scope*
  The breadth and scope of tasks carried out by review teams requires that a number of teams with diverse technical functions are in operation at any one time. This raises the issue of how to standardise review procedures. The Secretariat is attempting to promote a common approach.
- *Access to information*
  Parties are requested to provide ERTs with the information they need to complete reviews of their monitoring and inventory activities. If a team requires further information it can request it from the Party and use information from other relevant sources (e.g. NGOs), as long as it declares all of the sources used. However, the Convention allows Annex 1 Parties to submit a confidentiality claim. Likewise, if there are conflicts between the disclosure of confidential information to a review team member and the agreement for expert review services, that member is excluded from taking part in the review of the Party concerned.

An ERT report is accessible to the Party whilst it is being written – a measure which is intended to help improve the standard of reporting and allow for the resolution of problems during the process. This also allows the Secretariat to gauge how well Parties are conforming to the Protocol and the difficulties they are facing.

Non-Annex 1 Parties are not subject to in-depth review processes. Their national inventories are subject to review only via compilation and synthesis reports on national communications, prepared by the Secretariat.

## Earth Observation and modelling for monitoring and reporting

Remote techniques (remote sensing, aerial photography, etc.) and modelling are other methods that can be used to monitor and report emissions. Remote sensing is particularly useful for LULUCF inventories, which are difficult sources to monitor, given their geographical extent. For forests, it can provide information on forest type, density, species and health and for agriculture it can provide information on the type of crops, their productivity and management practices. Emissions and removals estimates can be calculated by using standard conversion factors for these different types of land cover, which can then be compared with estimates for the base year and corrected for natural variations. Other methods include using known atmospheric GHG concentrations to model the size and locations of emissions sources. This requires knowledge of atmospheric transport and the size of natural sinks. It works quite well at a global scale, but is so far limited at a regional level due to lack of certainty and low resolution of the data (see Rypdal 2003).

There are a number of advantages in using such techniques:

- They can be used to give emissions estimates that are independent of the reporting by Parties;

- Results are highly comparable between Parties and are repeatable;
- They are convenient, particularly for large countries with large forested areas for example;
- They can be used effectively at a global scale to estimate overall emissions trends;
- They are useful for countries which lack regular inventories and/or lack information on the baseline year;
- They can add to the rigour of GHG accounting in countries which already have well-established monitoring systems;
- They could reduce the reporting burden if adopted by a number of cooperating Parties.

However, they are limited by a number of factors:

- Parties might feel that their national interests are compromised by an external and remote verification mechanism managed by an independent body, particularly if was a compulsory part of the overall verification system;
- There are high uncertainties in estimating natural emissions and limits to modelling techniques for estimating these emission sources and sinks;
- There are high uncertainties in meteorological data and modelling the transport of emissions in the atmosphere. This makes it hard to relate emissions observations to emissions sources which is a major problem, especially near to national borders;
- There is a lack of ground-based stations to improve/compare measurements;
- There are difficulties in distinguishing between man-made and natural sources (particularly for $CO_2$ and $N_2O$);
- There are difficulties in deriving carbon stock figures from data about land-use and a lack of default methodologies for doing this;
- Models can be complex and expensive to run.

Earth observation and modelling add to the range of tools that can be used to monitor the implementation of Kyoto. Earth observation is particularly useful for LULUCF activities and some man-made GHGs, but beyond this its use is limited until methodologies have been standardised, have become cheaper and deliver more accurate results.

## Compliance

The compliance system is set out in the Marrakesh Accords. The compliance mechanism is designed to judge Parties' adherence to the Protocol, based on information submitted by the Expert Review Teams and information from a selection of other specified sources (see below). There is a Compliance Committee, which both supports Parties in assessing their GHG emissions and inventory systems and sanctions them for breaches in their commitments. A facilitative process, combined with a well-defined sanction system, gives the Protocol a 'more far reaching non-compliance procedure than in any existing environmental treaty' (ENDs Report 2001, cited in Stokke et al. 2005).

The Compliance Committee is composed of 20 members and operates through a Plenary, a Bureau and 2 branches – a Facilitative Branch and an Enforcement Branch. The facilitative branch provides advice and assistance to Parties on compliance, and the enforcement branch sanctions Parties which fail to meet their commitments.

Each branch is composed of 10 members:

- 1 member from each of the 5 UN regions
- 1 member from the Small Island Developing States (SIDS)
- 2 from Annex 1 countries
- 2 from non-Annex 1 countries

This composition is meant to ensure that committee membership is kept non-political by maintaining a geographical balance and a balance of Annex 1 and Non-Annex 1 States. It also gives representation to a special interest group (the SIDS) that is likely to be particularly affected by climate change.

### The Facilitative Branch

The main aim of the Facilitative Branch is to help the Parties achieve compliance, by 'promoting compliance and providing early warning of non-compliance' (UNFCCC). Branch members have to be competent in relevant areas, though they don't need to be lawyers as they don't have to make legal determinations of compliance. The branch offers advice on national systems for estimating emissions reductions, on emissions targets and on inventory compilation, and can give technical and financial assistance to help achieve these objectives.

### The Enforcement Branch

This has a mandate to determine:

- The methodological and reporting requirements under Article 5 of the Protocol after the beginning of the first commitment period;
- The 'quantified emissions limitation' (i.e. the legally binding commitments of Annex 1 countries) at the end of the first commitment period;
- Eligibility requirements for participation in the flexible mechanisms;
- Resolution of disagreements between ERTs and Parties;
- Adjustments to Parties' national inventories
- Corrections to a Party's compilation and accounting database.

Members of the Enforcement Branch function in their individual capacities and have to be legally qualified. Decisions are reached by consensus or by a three-quarter majority with a double majority of Annex 1 and Non-Annex 1 countries (implying a majority of the members of both categories that are present and voting). This is supposed to reduce concern of some Annex 1 Parties that the equitable geographic representation (there being more Non-Annex 1 members on the Committee) might lead to unfair or politically motivated decisions against them. Transparency is increased by allowing Parties to request that hearings of their cases are open to the public and by making the final decisions publicly available.

Stokke et al. (2005) point out that the process by which the Enforcement Branch is elected by the COP/MOP means that 'non-professional factors' could influence its composition. This is a similar process to the selection of other international bodies, such as the International Court of Justice (ICJ), the Montreal Protocol and the World Trade Organisation (WTO) Appellate Body. Unlike these bodies, however, there are no rules in the

Kyoto system on the nationality of the membership of the Enforcement Branch. Given the system of majority voting for judgements of compliance by the Enforcement Branch, suspicions of bias in judgements could easily arise. It is also possible that even with such a 'balanced' Compliance Committee, decisions might be 'strategic', due to the nature of the sanctions imposed on Parties if they are found to be non-compliant.

### Sanctions

3 types of sanctions can be imposed on a non-compliant Party (UNFCCC 2005):

i. Deducting from the Party's assigned amount for emissions in the second commitment period a number of tonnes equal to 1.3 times the amount in tonnes of excess emissions;
ii. Developing a compliance action plan that outlines how they intend to meet their emissions reductions targets in the next commitment period;
iii. Suspending the non-compliant Party's eligibility to sell quotas.

Whilst the strength of the 1.3 tonne penalty has been welcomed internationally, the way that the sanction system is administered could possibly interfere with the independence of the verification system. Hagem et al. (2003), for example, suggest that it is likely to be easier to sanction countries where sanctions result in minor impacts on the world economy than those that have major impacts. Decisions by members of the Compliance Committee might therefore be influenced by their interests in their own country and/or in their interests in movements of the world economy. To overcome this problem, Hovi and Areklett (2003) suggest a different sanction system, whereby a Party to the Protocol that has exceeded its allowances sees them transferred to other Parties. This would, they argue, reduce the incentive to act strategically since it would lower the demands on the other (complying) Parties.

Regarding the difficulties in the design of the sanction system, Victor (2001) suggests that there is a fundamental flaw regarding liability in international emissions transactions: 'Many studies and conventional wisdom have advocated 'seller liability' (where) the country that originally issued and distributed the permits would be accountable for compliance'. This should reduce the need for permit tracking because permits are 'mingled into one world market'. It could also increase buyer confidence and lead to a more efficient market, as the buyer, 'having bought from a homogeneous world pool of permits', does not need to be concerned that it could lose its value. However, Victor argues that this is 'a fiction in international law' because such a mechanism can't impose liability on those most likely to default – the countries with weak legal institutions. It also prevents use of expulsion from the Convention as an enforcement mechanism. If a Party is expelled from the Treaty after selling its permits, the effect might be to increase permit inflation and leakage (i.e. untracked emissions outside the monitoring domain), as the Party can re-enter the market further down the line and claim new permits. The only potential negative implications for them would be reputational.

He advocates 'buyer liability' as a potential solution to this problem. In such a system, the buyers would most likely come from industrialised countries with strong legal institutions, where they will be forced to comply. Buyer liability would increase transaction costs but this information is needed in an emissions trading system and ultimately, the market is a better way of sorting such matters out than international institutions. There could be problems for buyers, however, as they become subject to in-country risks that will alter the value of their permits. Victor argues that this is an issue that other markets have to deal with daily, such as markets for government bonds. In any case, the alternative – a seller liability system – is ultimately worse, as it could lead to participants trying to sell permits quickly before withdrawing. In a buyer liability system, the outcome could be better management as permits will be worth more the further the trading system is from default. Other mechanisms have been proposed that increase buyer liability, such as 'escrow accounts' (which become operational only when certain conditions are met) and systems for taxing non-compliance. (for a full discussion, see Victor, 2004)

The introduction of the 'commitment period reserve' at COP6 in 2001 has gone some way to solving the compliance problems raised by the seller liability system. To prevent Parties from overselling emissions credits, the reserve restricts them from transferring a quantity of their assigned amount units to another Party during the commitment period. The exact quantity is taken as the lower of either[1]:

- 90% of the Party's assigned amount, as defined in Articles 3.7 and 3.8 of the Protocol. This calculation is likely to be relevant to Annex I Parties which prove, at the end of the commitment period, to be "net buyers" of units under the mechanisms;
- The level of national emissions indicated in the Party's most recent emissions inventory (multiplied by five, for the five years of the commitment period). This calculation is likely to be relevant to Annex I Parties which prove, at the end of the commitment period, to be 'net sellers' of units under the mechanisms.

There has been some discussion over the exact proportion of ARUs to be held in the reserve. This has to effectively reduce the risk of a Party overselling, whilst ensuring that it doesn't have negative impacts on emissions trading or significantly raise compliance costs. For a full discussion of this issue see, for example, OECD (2001).

Assessment of compliance, decisions on non-compliance and enforcement actions are often presented as a sequence of discrete stages (see, for example, http://www.europa.eu.int/comm/environment/impel/pdf/compliance.pdf). On this approach, assessment of compliance is depicted as the stage following verification of emissions reductions, implying that the enforcement system is isolated from the verification system. However, as the discussion above illustrates, the facilitative nature of the UNFCCC system combined with the potential for the sanction mechanisms to influence the decisions of the Compliance Committee does lead to a blurring of the boundaries between verification and compliance. There is a high degree of 'feedback' in the process of verification, which contrasts with the one-way progression usually assumed in verification systems theory.

**Box Three: Designated Operational Entities (DOEs)**

The Marrakesh Accords set out specific guidelines for the accreditation of DOEs by the Executive Board. These include (UNEP 2004) that the DOE must:

i. Be a legal entity employing a sufficient number of persons, with the necessary competence to validate projects or verify emissions reductions, under a responsible senior executive;
ii. Have the financial stability, insurance coverage and other resources required to conduct the relevant activities;
iii. have sufficient arrangements to cover legal and financial liabilities arising from its activities;
iv. Have documented and public internal governance procedures and a management structure with overall responsibility for its functions;
v. Have the necessary expertise, particularly regarding the Kyoto Protocol rules, environmental issues and technical expertise in baselines and GHG accounting; and
vi. Demonstrate that no actual or potential conflicts exist and have adequate conflict management procedures in place, particularly if it is part of a larger organisation, which may have a financial interest in the underlying project.

The elements for the procedure of accrediting DOEs are also defined:

i. COP/MOP designates Operational Entities on recommendation from the Executive Board;
ii. The Executive Board takes a decision whether or not to accredit the applicant entity (the entity applying to become an Operational Entity);
iii. The CDM Accreditation Panel prepares a recommendation for the Executive Board;
iv. The CDM Assessment Team undertakes a detailed assessment of the Applicant Entity. This team is drawn from a roster of experts established by the Executive Board. It carries out a desk review, an on-site assessment to confirm operational capability and witnesses the applicant entity performing a relevant task.

The Secretariat supports the implementation of the CDM accreditation procedure.

## Verification within the Kyoto mechanisms

This section reviews the system for verifying CDM project activities and for emissions trading. Space considerations do not allow for review of verification procedures within any single trading system. However all these systems (for example, the EU emissions trading system, the national Australian Greenhouse Challenge, the UK Emissions Trading Scheme and the local California Climate Action Registry) have their own verification requirements (they are reviewed in Peskett, 2005, on this website). The burgeoning of different systems is not necessarily conducive to effectiveness or efficiency.

### The Clean Development Mechanism

The CDM provides a mechanism for Annex I Parties to implement project activities that reduce emissions in non-Annex I countries, in return for certified emission reductions (CERs). The CERs thus generated can be used by Annex I Parties to help meet their emissions targets under the Kyoto Protocol. The projects are intended to assist the host (developing country) Parties to achieve sustainable development, as well as the UNFCCC's wider mitigation and adaptation goals.

To date, participation in the CDM has mainly involved a few large international organisations such as the World Bank and donor governments which have invested in projects on a 'learn by doing' basis (UNEP 2004). Whilst there are strict and ambitious criteria for the implementation of CDM projects (see below, and UNEP 2004), a tightly defined system for monitoring and verifying project activities is still lacking. CDM requirements are:

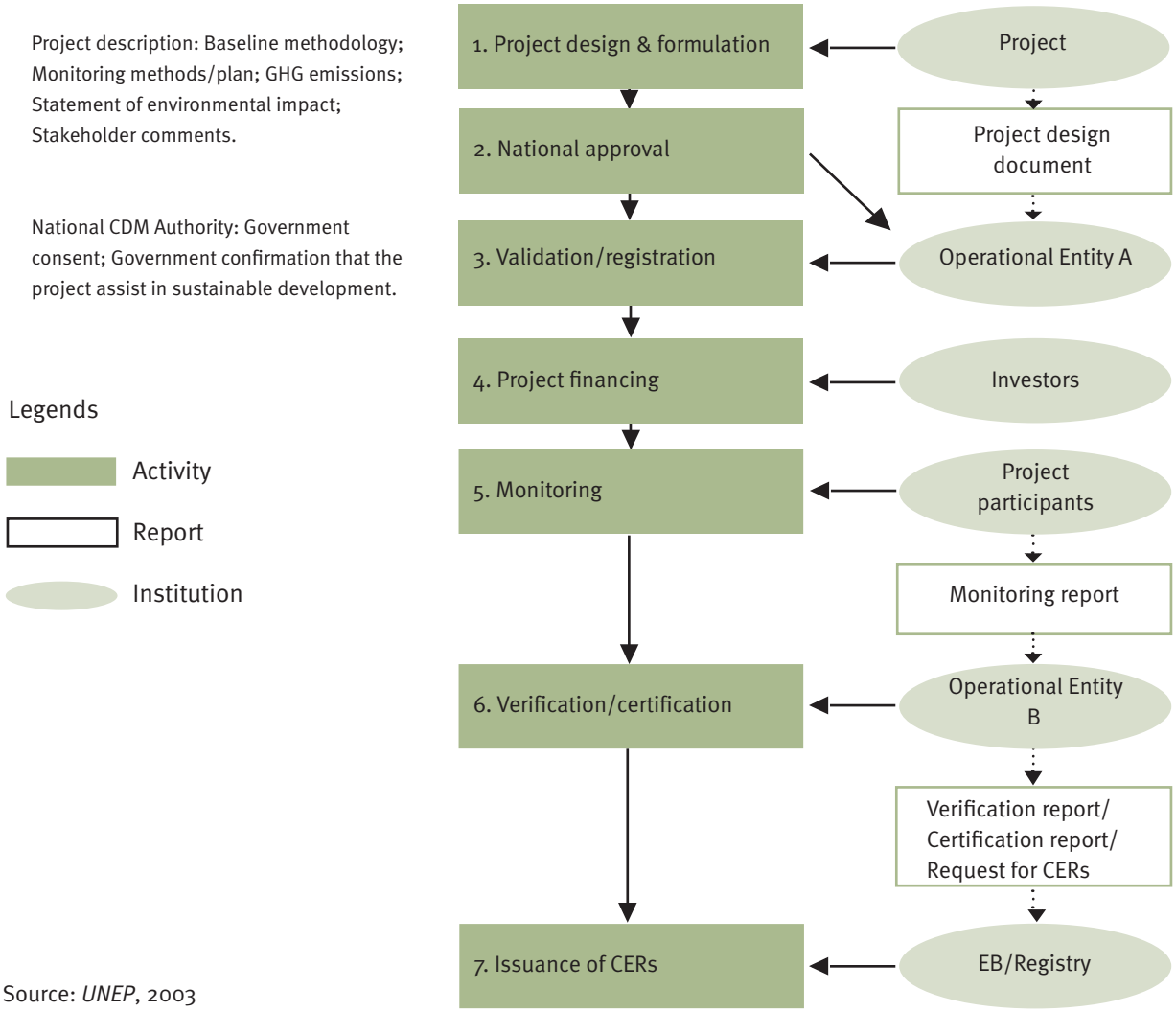
- The project activity must be undertaken in a non-Annex I country (i.e. a developing country) that is a Party to the Kyoto Protocol;
- All participation must be voluntary and approved by the authorising Party (the Host Country or any Annex I Party involved in the project);
- The project activity must be of a type that results in emission reductions by producing real, measurable and long-term benefits related to the mitigation of climate change;
- The emission reductions must be additional to any emission reductions that would occur in the absence of the certified project activity (known as 'additionality'); and
- The project activity must contribute to the goal of national sustainable development for the Host Country.

They form the basis on which CDM projects are designed and carried out in the CDM project cycle (see Figure 1).

These are stiff demands, and they fall very heavily on the principal assessment agency – the 'Designated Operational Entity' (DOE). DOEs have responsibility for both validation and verification, effectively functioning as independent auditors to assess the 'materiality' of the information reported (see box 4). There is a rigorous accreditation process for appointing DOEs, which assesses their potential through desk-based and on site reviews of their capacity to work as GHG verifiers (see Peskett, 2005 on this website for more detail on this procedure). A DOE can apply to be both the validator and verifier of a single project. This is the case for small-scale CDM projects and is justified on the grounds that, having validated a project, a DOE will be familiar with the project, reducing the time needed to verify emissions reductions. However, there is a possibility that reputational factors might interfere with the legitimacy of the verification where a DOE has already been involved as a validator.

The CDM Executive Board has the power to 'spot check' DOEs to ensure their compliance with the Kyoto Protocol and Marrakesh Accords, although they have to give prior warning. They can suspend accreditation if an entity is found to be in breach of the rules. The DOE is responsible for all costs incurred if this happens, including the costs of a review of the project and of replacing any incorrectly verified CERs. The stringent accreditation requirements of the Marrakesh Accords, along with an up to date database of accredited DOEs held by the Executive Board, help to minimise the risk of such a situation arising.

**Figure 1: The CDM Project cycle**




Source: *UNEP*, 2003

## Additionality and Sustainability

The additionality and sustainable development requirements pose particular difficulties for DOEs. *Additionality*, because it requires verification of baseline emissions and a prediction of how the country might have developed economically and technologically in the absence of the project. *Sustainability*, because there is no common set of sustainable development indicators. The Marrakesh Accords do not include details of what constitutes 'sustainable development' and leave it to the discretion of the host country, which submits a letter of approval for projects to the Executive Board. A DOE should be able to verify the project design document against national standards, but in practice, only a few countries (such as Costa Rica) have put in place the necessary institutions and criteria for assessing sustainable development.

With such a lack of agreed criteria at an international level, implementation of CDM projects is likely to be retarded, reducing the level of comparability in the CDM verification system and influencing investor decisions regarding where to carry out CDM projects. For example, in the case of inclusion of GM organisms or non-local tree species in CDM projects, open declaration of the facts in the project design document will help maintain transparency, but differences in national policies on such controversial subjects will decrease comparability.

Even with appropriate systems in place to help standardise assessments of sustainable development (indicators, checklists, etc.), it will be hard to verify whether these conditions have been complied with, and also whether they are having a positive impact. This might simply be due to a lack of understanding of project impacts at the local level and/or bias in the preliminary assessment of environmental and social impacts. In the case of the Norwegian 'Tree Farms AS' carbon sequestration project in Uganda, for example, a number of concerns have been raised relating to the eviction of local people, poor labour relations and negative impacts on water supplies, despite it being flagged as a good example of a CDM-based carbon offset project (Eraker, 2000; Stave, 2000; cited in Landell-Mills and Porras, 2002). This also highlights the challenges involved in verifying the social impacts of CDM projects, where spin-offs from new and innovative types of project could result in unexpected outcomes at the local level. In an interesting review of 75 payment schemes for forestry offsets in 27 countries, Landell-Mills and Porras found 'a clear bias in reporting on social impacts, with little critical analysis of how forest carbon offset projects may negatively affect local communities' (2002).

## Financing verification

### Treaty level

The funding mechanism for the UNFCCC is set out in Article 11 of the Marrakesh Accords, which asserts that it functions under the guidance of, and is accountable to, the UNFCCC Conference of the Parties. The Global Environment Facility (GEF) is the operational entity for the financial mechanism.

The UNFCCC is unusual in the extent to which it offers economic incentives to help achieve its aims. A number of funds are available to assist Parties in implementing the terms of the Convention. These include the GEF Trust Fund (US$1.8 billion in grants since 1991), the Special Climate Change Fund (SCCF: $34.7 million in total receipts as of December 2004), the Least Developed Countries Fund (LDCF: $32.9 million in total receipts as of April 2005) and the Adaptation Fund (resources still being mobilised)[2]. Funding is also available through bilateral, regional and multilateral channels from monies generated through CDM projects.

### Entity level

The cost of verification at an entity level is usually borne by the company being verified, but at present (with GHG emissions reductions units trading at low values) this could be prohibitive for small-scale projects. Some ways around the problem have been proposed. In the UK emissions trading scheme, for example, companies are allowed to enter as a collective. Under this approach, the administrative burden of entering the scheme will be handled by a single representative on behalf of a number of different companies. This will enable small business to pool costs and exploit economies of scale.

Another approach that was used by BP plc in verifying emissions for their trading system was based on the risk of there being a material misstatement in reported emissions. Auditors selected the areas to verify based on the level of risk, thus reducing transaction costs. Such a system is unlikely to be accepted in larger-scale emissions trading schemes, but it does offer a way of filtering out small uncertainties (which could divert time and resources away from efforts to minimise larger, more important uncertainties).

## Role of NGOs in verification

NGOs have often been opposed to the market-based approaches of the Kyoto Protocol, arguing that the commitments are weak, the offset mechanism misleading (confusing fossil with biological carbon) and the 'win-win' philosophy fallacious (see, for example, FERN, 2005). Nevertheless, a number of major NGOs have begun to offer their support, albeit cautiously, on the grounds that this is the only international mechanism that has been successfully implemented and it has the potential to develop further (Adresen and Gulbrandsen 2005).

NGOs have been involved in the development of the verification system under the Protocol. The dual Enforcement Branch and Facilitation Branch system, for example, was originally proposed (in modified form) by CIEL and WWF in 1999. Environmental Defense also had an input into the design of the flexible mechanisms and in the inclusion of carbon sinks within them.

Some Parties to the convention (e.g. Russia) have limited the involvement of NGOs in the verification and compliance process, but NGOs are able to sit in on meetings of the Enforcement Branch and to submit information that could assist the quality and transparency of verification.

NGOs might become involved in the GHG verification process in the following ways (Ibid, adapted):

- Participation in compliance proceedings as official delegates or through participation in government delegations. For example, FIELD, Greenpeace and WWF have helped the Alliance of Small Island States (AOSIS), offering policy advice and scientific backup;
- By monitoring sinks and CDM project activities and attending CDM Executive Board Meetings. These are broadcast on the Internet, and two watchdog websites 'CDM Watch' and 'Sink Watch' already exist;
- Some of the larger NGOs are developing their own monitoring systems, such as WWF's 'Carbon Savers'

### Box Four: A new economic system?

With the development of flexible mechanisms to curb carbon dioxide and control climate change, a new component of the international economic system is emerging. The system operates using a new currency, based on units of carbon dioxide (1 unit = 1 tonne of carbon dioxide) traded through new types of organisations, such as carbon brokers, CO2e, carbon analysts, Point Carbon and specialists in carbon offsetting, Climate Care. There is no doubt that this system is active and growing (by 2004 over 250 million tonnes of CO2 equivalent (tCO2eq) had been transacted), and managing to put a price on GHG emissions, given the enormous technical difficulties and uncertainties involved in measuring them, could be hailed as a huge achievement in itself. There is also no doubt that the Kyoto Protocol, based on flexible mechanisms, has played a significant role in helping to structure the way this market works. The Protocol's monitoring, review and verification procedures are a major part of this by helping to ensure that data is comparable– an essential feature of any economic system.

However, as Victor and House (2004) argue, developing new currencies requires strong and sophisticated institutions – manageable at a national scale, but extremely difficult at the international scale, where carbon trading operates. Getting such an international trading scheme off the ground that is effective at reducing GHGs and economically viable will be an achievement that is 'unprecedented in the history of international environmental law'. He argues that the system should develop from the bottom up, with the creation of 'strong national carbon currencies', which are not endangered by trading partners with weak enforcement systems. Regional systems are also tenable, such as the EU Emissions Trading Scheme, where prices are kept high by a wall that limits trading outside the European Union, and thus controls risk. International trading can then proceed between regimes with higher compliance standards. This is in fact how things seem to be proceeding, given the number of individual schemes that have been implemented at local to regional scales.

programme which works with companies to help implement GHG monitoring systems. Under the programme companies agree to have their emissions verified by an outside party;
- Preventing 'hot air trading' (i.e. countries selling their excess emissions allowances to commercial companies, derived not from effective emissions controls but from windfall surpluses deriving – as in the case of Russia and the Ukraine – from economic collapse); they have done this by shaming the Parties involved. Greenpeace has developed 'loophole analysis' software to help identify situations where hot air trading is taking place;
- NGOs can ensure the quality of technology transfer and appropriateness of local circumstances (e.g. local NGOs helping to verify the 'must contribute to sustainable development' criterion of the CDM assessment process). One way to do this is through the Global Environment Fund which involves NGOs in its implementation through regular meetings with the World Bank;
- Increasing public awareness of a potentially dry, technical issue.

The territory open to NGOs is also enlarged by the heavy dependence of the system on voluntary will, rather than punitive measures. 'It is tempting to conjecture that in the climate regime, external pressure will cause a return to compliance more often than the punitive consequences' (Hovi et al., 2005).

The ability of NGOs to contribute to the verification process has been strengthened by the Climate Action Network alliance of NGOs (CAN), which streamlines communications and position statements by NGOs during negotiations.

## Conclusion

The success of the UNFCCC and its Kyoto Protocol is heavily dependent on putting in place a workable verification system. Once mechanisms such as the CDM and emissions trading are up and running, Parties stand to make significant financial losses if there are free riders in the system or non-compliant Parties. Significant effort and resources have therefore been applied to developing a rigorous verification regime with detailed guidelines for monitoring, reporting and review. Attention has also been paid to maximising independence of review teams, accreditation of independent reviewers and funding systems, and involving civil society groups. It remains to be seen how these procedures will work in practice during the first commitment period.

The compliance system is also thorough, introducing the innovative Facilitative and Enforcement branches and clearly defined sanctions. However, the Protocol is unlikely to be enforceable unless GHG trading encourages self-enforcement, in a similar way to trading of ozone-depleting substances in the Montreal Protocol.

The capacity of Parties to put in place institutional and legislative systems is a major issue, particularly for economies in transition. There is a huge variation in the quality of monitoring and reporting, which is incompatible with the requirements of fair trading of a potentially high-value good. The UNFCCC is addressing this problem by offering financial assistance to Parties. Ultimately, however, it will be important to decide on the balance between the accuracy of the system and the transaction costs involved in implementing it. Given present uncertainties in the future of Kyoto, beyond the first commitment period, there are still many unknowns, in implementation terms.

In the forest sector reference, of equal interest to the technical accuracy of reporting will be the evaluation of the broader social and political dimensions of applying the flexible mechanisms: the consequences of investment decisions on the welfare of the poor (for example, the shift from mixed stands of natural forest to pure stands of plantation exotics) and the implications of allowing industrial and commercial interests to impinge on issues of national sovereignty. It remains to be seen how these evaluation questions will be addressed as 'verification' issues within the UNFCCC.

The signs from the most recent meeting of the Parties in Montreal (COP11/MOP1) indicate that the Kyoto Protocol will continue beyond 2012. Debates have shifted towards consideration of how systems should be developed in the next commitment period, not if they should; interest from the business community has grown markedly; involvement of the development sector and actors from the South has increased; and elements of the verification system are up and running. Now the basic features of the Kyoto system are in place, there are numerous options for how the climate regime should develop over the next few decades. Some of the most viable proposals suggest multi-stage systems with more multiple targets and mechanisms than the present system. It is likely that these will be immensely complicated, but if structured in a way that is sensitive to differences in capacity, they could reflect the complexity of the problem and the changing requirements of all parties involved.

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## Endnotes

[1] http://unfccc.int/kyoto_mechanisms/emissions_trading/items/2731.php
[2] Figures taken from: http://unfccc.int/cooperation_and_support/funding/items/2807.php

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