Unclassified **ENV/EPOC(98)5**

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

OLIS : 06-Mar-1998
Dist. : 10-Mar-1998

English text only

ENVIRONMENT DIRECTORATE
ENVIRONMENT POLICY COMMITTEE

ENV/EPOC(98)5
Unclassified

ENSURING COMPLIANCE WITH A GLOBAL CLIMATE CHANGE AGREEMENT

OECD Information Paper

English text only

62870

ACKNOWLEDGEMENTS

This paper was prepared by Jan Corfee Morlot of the Organisation for Economic Co-operation and Development (OECD) Secretariat. Contributions from a number of sources are gratefully acknowledged: Linda Silverman, United States Department of Energy, provided an in-kind contribution which helped to shape the section on enforcement and non-compliance responses. A number of government experts from the Annex I Group provided comments, including: Patrick Szell and Helen Edwards from the United Kingdom delegation; Dina Kruger and Clare Breidenrich from the US Environment Protection Agency; Stuart Calman from the New Zealand Ministry of Environment; Klaus Radunsky from the Austrian Ministry of Environment; and the governments of Canada and Australia. The document also benefited from comments provided by a number of outside experts: David Victor, Tim Simmons, Lubomir Nondek, John Lanchberry, Ruth Greenspan Bell, Andre Jol (EEA); as well as representatives of the UNFCCC Secretariat. OECD and IEA colleagues also commented at various stages in development of the paper: Fiona Mullins, Yamil Bonduki, Pierre Boileau, Bo Lim, Karen Treanton, Lee Solsbery, Jan Adams, Jean Cinq-Mars, Bill Long. Carolyn Sturgeon and Janet Pape also provided editing and word processing assistance.

FOREWORD

This document was prepared by the OECD Secretariat at the request of The Annex I Expert Group on the United Nations Framework Convention on Climate Change. It does not necessarily represent the views of OECD Member countries or of Annex I countries. Rather, it is a Secretarial information paper 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: Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Czechoslovakia (now Czech Republic and Slovakia), Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom and United States. Where this document refers to "countries," “Parties”, or "governments" it is also intended to include "regional economic organisations," if appropriate.

This document is published on the responsibility of the Secretary-General of the OECD.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The first protocol under the United Nations Framework Convention on Climate Change (UNFCCC) emerged in December 1997 in Kyoto, Japan. The Kyoto Protocol strengthens the commitments of industrialised countries to reduce greenhouse gas (GHG) emissions within agreed time frames (2008-2012). The objective of this paper is to review and assess possible procedures to facilitate and ensure compliance with the UNFCCC and the Kyoto Protocol. The paper focuses 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. The Protocol allows Parties to use emission trading and other emission transfer mechanisms to build on domestic policy action to achieve emission reduction targets. Emission trading and other transfer mechanisms are relevant because they may introduce different compliance approaches than would otherwise be available under the UNFCCC. The paper is intended to be a starting point for further work to develop a compliance system for the UNFCCC and the Kyoto Protocol.

Possible compliance instruments range from management approaches to enforcement approaches (Chayes and Chayes, 1995). A three-part framework identifies the main elements of a compliance system for international agreements:

I. Monitoring and Reporting;

II. Review and Verification;

III. Non-compliance Responses and Enforcement.

These are separate yet inter-related elements. Monitoring and reporting aims to gather information to enable compliance assessment (Ausbel and Victor, 1992). Review and verification uses the information reported to ascertain compliance[1]. 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 states participating in the agreement. Review and verification is best conducted by an independent body, often the secretariat to the agreement. 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 (Victor *et. al*., 1997). The various elements of compliance approaches, formal and informal, must be seen as part of an integral system, all moving in the same direction to encourage full implementation of the agreement.

[1] Verification as defined in UN Document A/45/372 and as cited in Lanchberry *et al*. 1992.

Experience with other international agreements shows that the effectiveness of international agreements 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.

Inclusion of compliance procedures at an early stage in the development of an international agreement has several benefits (Greene, 1991; Fischer, 1991; Ausubel and Victor, 1992; GAO, 1992). Firstly, a compliance system builds Parties' confidence that the agreement will be effective and fair. Secondly, a compliance system can encourage shared learning to improve implementation of the agreement. Thirdly, compliance procedures add weight to an international agreement by demonstrating the intent of Parties to meet its terms. Finally, such 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 one of the priority tasks for policy-makers shaping the provisions and obligations of an international agreement.

Monitoring and Reporting

Reporting by countries is an essential part of a compliance system and is required under both the UNFCCC and the Kyoto Protocol. National reporting enables efficient monitoring and transparency. The UNFCCC reporting system already contains some essential procedures to monitor national compliance with targets and with obligations to adopt national programmes, policies and measures to achieve greenhouse gas reduction. Data on inventories and projections are central to the UNFCCC monitoring process with all Parties required to report the following: base year inventories, other historical inventory data (submitted annually) and regular reporting on projections, policies and measures and their effects. Historical, annual greenhouse gas inventories are vitally important because they provide the basis for the assessment of compliance with national targets (single-year or budget periods). Projection data and information on the effects of policies and measures look into the future and assess expected trends, providing the basis for review of expected performance and facilitating early identification of possible compliance problems. This will be essential to a system designed to initiate early, corrective action to encourage compliance. It will now be necessary to take a fresh look at the information needs for monitoring under the Kyoto Protocol.

The timing of reporting should to be tailored to the provisions of the Protocol. Additional information may be necessary. For example, data on national inventories may need to include more detail on emissions from individual sources. In addition, the Protocol's establishment of multi-year emission commitment periods, emission trading, and transfer mechanisms underscores the need for more frequent reporting of emission projections and other data for assessments of expected performance. Inventory data remain critical to the compliance assessment process, so annual reporting is likely to be a minimum requirement. Full reporting on national obligations and performance, in the form of national communications, can be less frequent.

If the compliance systems for the UNFCCC and Kyoto Protocol are to be effective, Parties must take reporting obligations seriously and continually improve the quality of information they report. A number

of approaches might encourage better reporting. National reporting and data could be strengthened through the use of agreed standards of performance for inventory preparation. Building on such standards, independent auditing of national inventory systems, data and reports, could also enhance implementation of such standards and could provide an objective assessment of national data quality. Non-compliance response measures and enforcement options should apply to reporting obligations as well as to more substantive obligations of the agreements. Within Annex I Parties, there is scope to improve capabilities for reporting and data quality. The Subsidiary Body for Implementation could be more active to identify Parties with reporting problems and to work together with these Parties to improve reporting and data quality. Whatever incentives or procedures are established, they should be dynamic and flexible to encourage better information over time, and to allow solutions that are tailored to the different needs of individual Parties.

Issues in Data Quality: Six Greenhouse Gases, Sources and Sinks

The Kyoto Protocol aims to result in 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 is comprehensive in its coverage of direct greenhouse gases, bringing all of the potential sources and sinks of greenhouse gases into the environmental management framework. However, sink activities, particularly land-use change and forestry, are handled differently compared to other activities. As the specific procedures for implementation and monitoring of the agreement are being developed, it is also timely to address data quality. Uncertainty in emission estimates varies with different greenhouse gases and with differing 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 the results that Parties are expected to achieve and report on, as part of the agreement.

In order to assess compliance with emission targets, complete accuracy of inventory data would be ideal, but attaining this is unlikely. Inventory data are estimates, at best, based on field work and statistical sampling of diverse socio-economic activities in every country. If the task of monitoring is to gather data relevant to an emission target compared to a fixed base year, the accurate assessment of emission trends is more important than the accuracy of emission estimates in any given year. The consistent assessment of trends is more difficult with a target comprised of a basket of gases, as compared to a single gas target. This is because within any national inventory, the mix of gases will change over time, affecting the uncertainty bounds of the overall CO_2 equivalent estimate. Similarly, if Parties trade emission reduction units, the differences in data quality among countries will influence the uncertainty of the combined estimate of emission performance.

A number of approaches are possible to account for uncertainty in emission inventory data when accounting for national performance with respect to targets. An important question post-Kyoto is whether the approaches to address uncertainty should vary in the design of emission trading and other transfer mechanisms compared to the approaches to be used to monitor performance emission reduction targets. The approaches could be used individually or in combination with one another:

- establish a rule to account for uncertainty (e.g., scaling inventory estimates on the basis of data quality);

- progressively include all greenhouse gases, sources and sinks, excluding at the outset the most uncertain activities;

- agree to follow established good practice standards for inventory preparation, which would aim to limit uncertainty;

Three main criteria are relevant in selecting an approach to address uncertainty. Does the approach: 1) stimulate environmental management of all greenhouse gases; 2) provide incentives for improving the quality of information over time; and 3) apply universally to all Parties in a consistent way and relatively simple to implement?

Using these criteria, a number of conclusions can be drawn about the main options identified above. 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, at best, partial. Progressive inclusion of greenhouse gases, as data meet certain minimum standards of quality, has the drawback of possibly excluding important source and sink activities from the full management framework. Nevertheless, the Kyoto Protocol uses this approach in its selective inclusion of only certain land use change and forestry activities (afforestation, deforestation and reforestation) as part of the "sink" offset allowed to account for emission reduction targets.[2] Good practice standards for inventory preparation could achieve all three criteria. They might be a first step towards standardised methods and improved data quality. Standards could also be used in conjunction with independent auditing, verification and "certification" procedures to provide the basis for the objective assessment of data quality.

Review and Verification

Verification aims to establish whether Parties are complying with targets and other obligations under the agreement. The main source of information for the verification process is national reports. In an international agreement, verification includes two steps: 1) the technical review of information which includes verification of data; 2) final assessment of the status of the Party with respect to obligations -- for example, a statement by the Conference of the Parties or a subsidiary body on whether a Party is in compliance or not with the terms of the agreement.

The present review process under the Convention, which is based on an in-depth review process, provides a reasonable basis for the technical verification of compliance. However, to date the process has not included the verification of national data. In addition, no procedure addressed under the Convention handles the task of final verification and assessment of compliance.

The Kyoto Protocol would benefit from the use of stronger verification and review procedures. The UNFCCC review processes could be strengthened in a number of ways:

[2] The Conference of the Parties is expected to return to the question of whether the list of allowable activities should be expanded in the near future.

- extending the Secretariat's In-depth Review activities to include corroboration of national data with independent sources;

- in advance of the site visit, targeting part of the In-depth Reviews to address specific problem areas, thus initiating a "problem-solving" dialogue with individual Parties;

- strengthening the role of the Subsidiary Body on Implementation (SBI) in the assessment of compliance with obligations; this could begin by assessing compliance by focusing on a sub-set of obligations under the Convention and the Protocol, such as those relating to national reporting.

There may also be a role for the Intergovernmental Panel on Climate Change, the European Environment Agency or other intergovernmental organisations to assist with verification tasks under the Convention and the Protocol. The review of performance, which is already conducted by intergovernmental organisations such as the OECD and the IEA, as well as by non-governmental organisations or outside experts, can also provide useful information, stimulate learning and encourage compliance. 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. It may be that as more stringent environmental standards are set internationally, the demand will increase for global legal enforcement based on international law (Fischer, 1991). At present, however, there are few examples of successful international enforcement procedures in multilateral environmental agreements (Cameron *et. al*., 1996; Victor *et. al*., 1997) .

Because enforcement procedures are difficult to apply at the international level, procedures should first aim to encourage compliance 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. At a minimum, international procedures should aim to encourage strong initial domestic enforcement. This might be done by better sharing of information and ideas or, more concretely, through international agreement on standards for domestic data gathering that would enable strong domestic enforcement.[3] Parties might also agree under the treaty to adopt effective enforcement regulations at the domestic level.

The paper explores a number of international management approaches, beginning with national reporting, review and verification mechanisms (discussed above). It also explores: consultation and negotiation; mediation; conciliation; issuing cautions or warnings; funding or technical support to assist Parties to comply (Chayes and Chayes, 1995; OECD, 1995).

[3] An example of such action is explained in OECD 1997e; it concerns guidance for domestic customs data collection on trade in controlled substances under the Montreal Protocol.

It may be desirable to aim to develop management responses under the UNFCCC over time in order to build capacity to improve basic data and information on compliance performance. This could include:

- establishing an expert group to facilitate exchange of information and capacity building; this group could be charged with providing recommendations on methods and best practice and data quality issues;

- requiring Parties, not in compliance with reporting obligations, to work with the expert group to design a plan to bring themselves into compliance with these obligations; and

- prioritising financial assistance from the Global Environmental Fund to support research, field work, institutional development and other capacity building to improve the availability and quality of information.

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 (Werksman, 1996; Victor 1996). 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 (Chayes and Chayes, 1995; Cameron *et. al*., 1996; Victor *et. al*., 1997).

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 (Chayes and Chayes, 1995). 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 funding (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.

Trade measures are used increasingly in environmental and other international agreements to address problems of compliance (Charnovitz, 1996). While at this stage it is difficult to envisage their use in a global climate agreement, trade measures should be further explored. They are effectively used in other environmental agreements (e.g. the Montreal Protocol and in the Convention on International Trade in Endangered Species) and experience with their design and implementation is growing (OECD, 1997e; Lanchberry, 1997; OECD, forthcoming). The use of trade measures could be considered once Parties have a better understanding of the chief compliance issues which need to be addressed under the UNFCCC and the Kyoto Protocol. They may also arise naturally in the development and implementation of emission trading and other related emission transfer mechanisms under the Kyoto Protocol.

Financial penalties remain an interesting idea, 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 (Brazil, 1997 and IEA, 1997). More research is needed to consider whether other

enforcement measures are relevant and useful in a climate change agreement. 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 multilateral consultative process foreseen in Article 13 of the Convention has the potential to be a vital element in a comprehensive compliance system under the Convention and any new agreement. The Montreal Protocol's Non-compliance Procedure (NCP) contain some useful lessons for the multi-national consultative process of the UNFCCC.

Effective enforcement and compliance approaches for 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 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.

Emission Trading and Compliance Issues

Implementation of the Kyoto Protocol's emission trading and other transfer mechanisms will open additional options to encourage better quality national data and, possibly, to encourage compliance. "Rules of entry" into the system might be based on data quality. This could be used in combination with good practice standards to guide the preparation of inventories, independent auditing, certification and, possibly, a rating system. These approaches would encourage participating Parties and entities to progressively improve inventory and other data quality in order to "qualify" for participation in the trading system. The approach could provide incentives for better information and encourage progressive expansion in the coverage of the trading system, which should lead to more comprehensive and cost-effective environmental management over time. In contrast, the suspension of a non-compliant Party from the trading system is a form of penalty.[4]

If countries trade, in any given target year, compliance will be based on the target emission level[5] minus the actual level of emissions in a country. The monitoring emphasis will be on the actual emission levels in any given year rather than on the trend in emissions. Selling any part of a country's national emission limit would effectively lower the emission limit with which the country would have to comply. Buying any part of another country's emission limit would effectively raise the national emission limit of the buyer. The emphasis on emission performance in a single year and the mixing of national data underscores the need for comparable, interchangeable national inventory data.

Assessment of compliance is critical to the validity of trading as a tool for environmental management and to the financial viability of the commodity to be bought and sold. Comparability of information becomes

[4] 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.

[5] Note that the target level in actual emissions may be calculated based on a percentage reduction over the budget period from a fixed base year level.

even more critical as trading entails the creation of a new commodity; this commodity would need 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.

National reporting will have to include additional information concerning trading activity. The requirements for transparency of information would be the same as without trading, but emission trading might require greater frequency of reporting in order to provide information to the market.

A trading system will need to be well lodged in the formal political assessment of compliance with all obligations of the UNFCCC and the Protocol, and other action to address failure to comply. If the trading system includes provisions to disallow credit for traded units that are not audited or otherwise verified, market forces would make emission trading self-regulating. By attaching a financial value to inventory information, resource problems associated with improving information might be more easily overcome. Because entry and exit rules can be established, the variety of enforcement options is greater with emission trading than without such a system.[6]

Joint Attainment of Target by Two or More Parties

The UNFCCC, and now the Kyoto Protocol, contain a provision for Parties to achieve targets "individually or jointly." To date, the European Community and its Member states have been the only Parties to use this provision.[7] While the paper discusses the unique compliance issues arising from the EC as a Party, many of the same arguments hold true for any other group of Parties that choose to use this provision of the UNFCCC or the Protocol.

As a Party to the Convention, in addition to its Member states, the EC has an individual responsibility to report on the performance of the European Union (EU) as a whole. It also has the responsibility to act to the extent of its competence to ensure that the obligations of the EU as a whole are met. Because a portion of the mitigation commitments are within the competence of the EC, and a portion are within the competence of Member states, the responsibility for compliance with UNFCCC obligations is therefore split among the EC and its Member states.

Timely reporting by the EC may be hindered by the need to have complete and early information from individual Member states. Individual Member states are also Parties to the Convention and are not compelled to provide early information to the Commission, but rather use the time available to improve individual national reports. This hinders compliance by the EC with reporting provisions of the Convention. Like other Parties to the Convention, the EC may need to design new systems which allow it to comply with the reporting provisions of the agreement.

The European Environment Agency (EEA) could assist to strengthen the monitoring and verification of the EC's performance on climate change. For example, it could provide more direct assistance to the EC in the preparation of their report under the UNFCCC. The EC already usefully contributes to the UNFCCC monitoring process by providing an independent projection of CO_2 from energy. The EEA

---

6 The paper explores some of these very briefly. Thorough treatment of the emission trading issue is beyond the scope of the paper. Another secretariat paper explores these issues in more detail. See Mullins and Baron, 1997.

7 The European Community (EC) is a regional economic integration organisation representing 15 Member states. The 15 individual Member states of the EC are also Parties to the Convention.

could help to strengthen this type of contribution in the important area of inventories and could possibly help to extend the work already done on projections to other greenhouse gases. The EEA might also serve as the EC's own internal watchdog organisation, providing independent assessments of the quality of national information and suggestions for improvements.

As a Party to the UNFCCC, the EC presents advantages and disadvantages. While it offers double coverage or assurance for mitigation obligations and double coverage of reporting obligations, it can also introduce an element of confusion into the compliance process and could complicate the review process. Under the "bubble" approach, both the Member states and the EC will have the responsibility for ensuring that targets are met. It is essential that the division of responsibility for meeting targets be clearly identifiable from the terms of the agreement and that this be foreseen in the Protocol.

INTRODUCTION

The main features of the Kyoto Protocol are:

- an overall industrialised country target of "at least" 5 per cent emission compared to 1990 levels to be achieved over the initial 5 year budget period (2008-2012);
- differentiated national emission reduction targets include: Russia and the Ukraine - stabilisation; Japan - 6 per cent; the US - 7 per cent; the EU countries - 8 per cent. Other countries are allowed emission increases, for example: Norway (1 per cent), Australia (8 per cent); Iceland (10 per cent);
- full coverage of 6 known greenhouse gases in the "basket of gases" covered by the targets spanning (CO_2, CH_4, N_2O, PFC, HFC, SF_6);
- offsets for forestry CO_2 sinks are allowed in accounting for emission reductions to achieve the national targets[8]
- a number of mechanisms provide flexibility and allow emission reduction transfers among industrialised countries; emission trading and project-level crediting mechanisms are to be additional to domestic action in Annex I countries to reduce emissions:
  - collective or joint attainment of national targets i.e. the EU bubble;
  - emission reduction unit and emission trading among Annex I countries (i.e. allowance, permit trading, or project based credit trading among Annex I countries);
  - the "clean development mechanism" to allow transfer of project-level "credits" for emission reduction to developed countries from developing countries.
- the agreement will enter into force once it is ratified by at least 55 countries, and representing at least 55 per cent of global emissions. This prevents any single country from effectively vetoing the agreement.

Compliance will be an important question in the follow-up to the Kyoto negotiations. Article 17 in the Kyoto Protocol reads:

> *The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, approve appropriate and effective procedures and mechanisms to determine and to address cases of non-compliance with the provisions of this Protocol, including through the development of an indicative list of consequences, taking into account the cause, type, degree and frequency*

[8] Countries with net CO2 emissions from land use change and forestry in the base year are allowed to include them (Australia and the UK); countries with net removals will only be allowed to offset future emissions with verifiable changes in the net removal from this sector for actions taken after 1990; offsets are allowed for only a limited set of anthropogenic forestry activities: afforestation, reforestation and deforestation.

> *of non-compliance. Any procedures and mechanisms under this Article entailing binding consequences shall be adopted by means of an amendment to this Protocol.*

Significant or persistent non-compliance could undermine confidence in the Protocol, and may have negative political, economic and environmental consequences. For example, failure by industrialised country Parties to comply with commitments to reduce greenhouse gases could make it difficult to work effectively with all countries over the longer term to establish global commitments for emission reduction. Also, as international agreements become more stringent, Parties consider possible strategic or other competitive advantages that might be gained by non-complying Parties. In the event of emission trading, compliance problems will effect the market for emission reduction units. Concern about compliance could explain why "legally binding" targets became an objective of the negotiations leading up to Kyoto. Once a Party ratifies an international treaty, it is legally bound to the obligations of the treaty (Chayes and Chayes, 1995; GAO, 1992). However under international environmental law, legal enforcement is rarely an option. Hence clear and verifiable obligations are a necessary starting point, and a range of compliance approaches must be used. Monitoring, verification, and international responses to compliance problems, including enforcement mechanisms, can help to ensure compliance with international obligations.

Early inclusion of compliance features into an international agreement can have a number of benefits:

- to build confidence that the agreement will be effective and fair;
- to encourage shared learning about implementation approaches;
- to allow early identification of possible compliance problems and to enable corrective action;
- to add weight to the agreement by demonstrating the intent of Parties to meet its terms;
- to improve overall implementation and effectiveness. [9]

Aim and Organisation of the Study

The purpose of this study is to assess possible approaches to monitor and verify performance, and to respond to compliance problems in the context of a global climate change agreement.[10] It reviews experience with the implementation of the UNFCCC and, to a more limited extent, with other international agreements. The study draws conclusions about how to establish a compliance system as part of a climate agreement. The focus is on approaches to ensure compliance with emission reduction targets, However, many of the approaches are also relevant to other obligations and instruments present in the Kyoto Protocol, as well as to instruments that might emerge under the UNFCCC.

The report attempts to balance what might be optimal against what is politically acceptable. While it might be optimal to have tough enforcement procedures and intrusive verification to ensure compliance, it

---

[9] It is possible for an agreement to remain ineffective even with all participating states in full compliance. In this case full implementation of the agreement's obligations does not result in a significantly different outcome than that which would have occurred without the agreement. The paper does not try to assess the ultimate effectiveness of the UNFCCC or of the Kyoto Protocol. Effectiveness is used here to refer to the performance of Parties with respect to the specific obligations of the agreement. It is assumed that effective implementation of the Protocol will, at least, make achievement of the ultimate objective of the Convention more attainable in the long run.

[10] The study is timed to be relevant to discussions that will elaborate a compliance system for the Kyoto protocol. However much of the study is relevant to compliance with the obligations existing under the UN FCCC and other obligations that might emerge under the UN FCCC.

is not likely to be feasible or politically acceptable in a global climate change agreement, at least in the near term. Thus, the study focuses on practical solutions that are likely to balance different interests and political concerns.

The study is organised into five sections:

- the remainder of Section 1 outlines key considerations and a framework for a compliance system and thus provides a framework for the study;
- Section 2 addresses monitoring and reporting approaches;
- Section 3 discusses greenhouse gas data quality in the context of the monitoring function of an agreement; it also provides suggestions on handling data quality problems;
- Section 4 considers possible review and verification procedures;
- Section 5 reviews options to respond to compliance problems, including enforcement approaches.

The study outlines main approaches, their strengths and weaknesses, based on experience to date. The UNFCCC already operates a number of relevant mechanisms for monitoring and review of national performance and these should serve as the basis for new mechanisms designed to assist with the implementation of the Kyoto Protocol. Additionally, the literature on enforcement and compliance with international agreements indicates a number of lessons for a global climate agreement.

A Compliance System: Key Considerations

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

- *unambiguous and specific treaty language.* The broader and more general the language, the wider the scope for permissible interpretations (Chayes and Chayes, 1995; Green, 1996). Ambiguous treaty language on commitments will result in commitments that are, *de facto*, not legally binding. Every country will be allowed to interpret the language in its own way and this will hinder the development and effective operation of compliance mechanisms. On the other hand, the agreement should allow for amendments to specific obligations should new scientific or technical information become available.
- *transparent and open procedures and access to information.* Successful agreements provide for clear presentation of data collected and broad public access to the negotiating process and information. Willingness to collaborate increases if Parties are assured that others are adhering to the agreement and that the public may be watching. A common source of non-compliance is concern about loss of comparative advantage to other Parties who delay their own compliance, or about free-riding by other Parties. Transparency helps provide the basis for identifying Parties that depart from treaty obligations, helping to deter defectors and bring Parties in violation back into compliance. (Young, 1991; Ausubel and Victor, 1992; Chayes and Chayes, 1991).
- *informal linkages with non-governmental organisations and other stakeholders.* These stakeholders can provide valuable assistance to ensure that the terms of an agreement are met (Raustiala and Victor, 1997; Cameron *et al*., 1996). Non-governmental organisations can play an important role, especially in working with governments to monitor regulated activities, in pressuring governments to control pollution, and in pointing out non-compliance. Internationally,

they can collect and publish information related to compliance or serve as third-party verifiers/auditors.

- *graduated management and enforcement responses to address different types of problems.* Compliance is often a matter of degree, requiring a system to offer different responses to different types of problems. Even for those states committed to complying, the breadth and complexity of activities means that compliance may take time. Some states may fail to comply because they lack the financial, administrative or technical capacity to comply. Others may inadvertently fail to meet treaty obligations because policies they adopt do not achieve the intended results (e.g., carbon taxes to reduce greenhouse gases). Wilful non-compliance is also possible (Victor *et al*., 1997). Even with clear requirements and good intentions, countries may comply with one treaty provision while ignoring another (Young, 1992). Experience indicates that compliance with international agreements may be gradual for some states, requiring time to build institutions and capacity to abide by the agreement. Compliance approaches, therefore, should encourage shared learning (e.g., on ways to mitigate greenhouse gases) and provide incentives to improve performance over time. Responses could be graduated, depending on the degree and type of treaty violation.

Framework for a Compliance System

The compliance system in any international agreement will include a variety of inter-related procedures (see box). While the procedures may be separate, they draw on the same information. The products from one procedure are used to accomplish the tasks of another and will influence the other parts of the system.

Figure 1 provides a model of the main elements of a compliance system for the UNFCCC. It provides a framework for this study, identifying the individual elements of what might be seen as a broad system aiming to ensure compliance with the Kyoto Protocol. The framework has three main parts:

I. Monitoring and Reporting;

II. Review and Verification; and

III. Non-compliance Responses and Enforcement.

Reporting and monitoring aims to gather information to enable compliance assessment. Review and verification uses the information reported to ascertain compliance. Within this function, there are two steps: first, technical assessment and verification of information; and then political assessment of the status of compliance of a Party. Non-compliance responses and enforcement are triggered by the verification process and aim to address unambiguous failures to comply with treaty obligations.

Monitoring, Verification and Non-Compliance Responses: the UNFCCC

Monitoring is the process of acquiring information used to facilitate decision-making and implementation of an agreement (Ausubel and Victor, 1992). National reports are typically the main source of information for monitoring purposes under international environmental agreements and are a central part of the UNFCCC. The reports are prepared following internationally agreed guidelines to help to ensure comparable and complete information.

Verification[11] establishes whether states are complying with their obligations under an agreement.[12] It includes tasks under the UNFCCC which aim to review implementation by countries of their emission limitation obligations and to establish compliance or non-compliance with agreed targets. The main source of information is national reports. The verification process also includes technical review of information, checking or adjusting the quality of data for the purpose of accurately monitoring changes in national GHG emissions over time. The UNFCCC Secretariat review reports provide an important source of information, however, they stop short of technical verification and data corroboration. Beyond technical verification is the political assessment step whereby the COP would identify Parties that have not complied with obligations. This step has not evolved under the UNFCCC.

Non-compliance responses might take a variety of forms ranging from "soft" management approaches to "hard" enforcement measures (Chayes and Chayes, 1995). Response procedures should aim first to encourage compliance, find solutions, provide incentives and to establish a plan for compliance. Enforcement approaches might be called for in instances of persistent or significant non-compliance. Aside from dispute resolution, the UNFCCC establishes a multi-lateral consultative process intended to address compliance problems. The process is not yet operational. No other non-compliance responses curently exist. However the Kyoto Protocol calls on Parties to establish procedures.

[11] This definition should be distinguished from definition of verification with respect to inventories. The IPCC work on inventory verification proposes a different meaning: to test the accuracy of emission estimates (IPCC 1997).

[12] UN Document A/45/372, as cited in Lanchberry *et al*., 1992

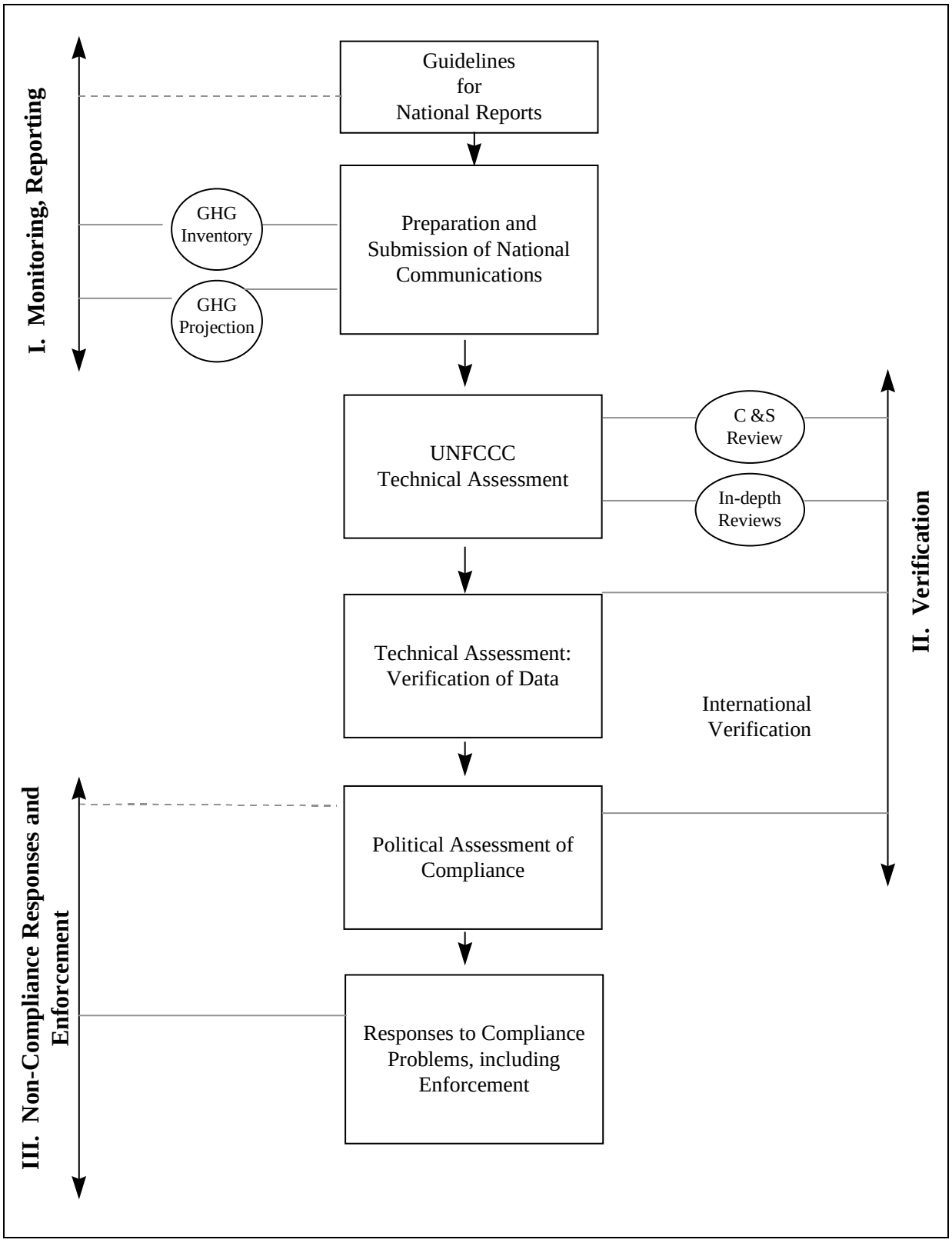


Figure 1: UN FCCC Compliance System

Source: Adapted from GAO, 1992 and Greene and Comes, 1996

The responsibility for different stages of the compliance system will fall on different participants in the system. Reporting and monitoring is largely the responsibility of states participating in the agreement. Verification and review is best conducted by an independent body, often the secretariat to the agreement. 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. The various elements of compliance approaches, formal and informal, must be seen as part of an integral system, all moving in the same direction to encourage full implementation of the agreement.

Trading, Baskets, Budgets and Bubbles

Emission trading and project level emission reduction crediting are new implementation mechanisms that have implications for the compliance system to be developed for the Kyoto Protocol. As such they are addressed throughout this study. The study begins to explore the key questions surrounding what additional compliance approaches might be necessary or available as emission trading and crediting are implemented.

In addition, the Protocol has a number of other features that may be important to the design of an effective compliance system. These include:

- the comprehensive coverage of greenhouse gases, sources and sinks (basket of gases approach);
- multi-year target periods (or emission budgets);
- the ability for countries to declare the intention to jointly achieve national emission targets (referred to as an “emission bubble”).

The extent that these features present special challenges or opportunities for compliance is considered in each of the sections below.

MONITORING AND REPORTING

Aim

In the context of an international agreement, monitoring is the process of acquiring information used to facilitate decision making and implementation of an agreement (Ausubel and Victor, 1993). It is principally achieved through self-reporting by Parties to the agreement. Reporting is central to transparency and openness in international agreements and essential to the task of assessing compliance over time (Young, 1992; Schally, 1996; and Chayes and Chayes, 1995). The ease with which non-compliance can be detected is an important consideration. Simply stated, the risk of being discovered may be enough to discourage treaty violations. This may be especially the case if compliance problems are to be widely publicised, leading to peer pressure on the Party in question (Young, 1992; and GAO, 1992).

This section considers actual and possible monitoring procedures to assess compliance by Parties with UNFCCC obligations and in particular with emission targets. It reviews experience with UNFCCC reporting and experience from other international agreements and draws conclusions about possible next steps under the Convention and the Kyoto Protocol. Data reliability of inventories is a critically important issue, underlying the ability of Parties to monitor and verify progress under a climate change agreement. This is the subject of the next section (3), which contains a separate set of recommendations relevant to data quality in the context of the monitoring function of the UNFCCC.

Main Approaches

National reporting is the main mechanism used in international agreements to gather information to assess compliance (Ausubel and Victor, 1992; and Young, 1996). The effective assessment of national performance will depend critically on the data contained in national reports. These must provide accurate, timely, complete, transparent and comparable data. Accurate and timely information will enable the assessment of compliance. Transparent and complete information are essential to facilitate open access and review and an informed judgement about compliance. Comparable information is necessary to ensure that all states are being treated equally. It will also allow aggregation of information, which will be necessary to assess overall progress under the agreement. While information that is accurate, timely, transparent, complete and comparable is the ideal objectives to strive for in national reporting, experience shows that full attainment of these objectives is not often possible.

Preparation of national reports involves extensive data gathering, internal review and analytical work at the national level. If the activity being reported is associated with significant uncertainty or is not regularly being monitored for other reasons, reporting should include national field research. Field research and other preparatory work is often limited by a lack of available resources. Thus, while aiming to provide high quality and timely information, reporting requirements must be balanced against the burden and ability of all states to comply with them. This also implies that if the quality of the

information is in question, the process of data collection used by a state may be as informative as the information itself.

A variety of other approaches for gathering information on national performance is possible, including more intrusive approaches. One approach is to rely on independent observers to gather information. This approach is used in the International Whaling Commission -- International Observer System, and also the International Atomic Energy Agency's inspections under international treaties governing the non-proliferation of nuclear weapons (Ausubel and Victor, 1992; and GAO, 1992). Non-governmental organisations (NGOs) can also be informal sources of monitoring information, supplementing officially submitted information. NGOs are already active in the UNFCCC process, where they regularly publish, along side of the formal UNFCCC Secretariat reports, reviews of Annex I Parties' efforts to limit greenhouse gas emissions (US-CAN, 1995; CAN, 1997; and WEC, 1997). Victor *et al*. (1997) argue that it is important to treat all the information sources (formal and informal) as integral parts of the whole "System for Implementation and Review" (SIR).

While all these approaches are relevant, standard reporting procedures under the UNFCCC are now well established and rely heavily, if not exclusively, on official national reports.[13] In addition to the national reports, the UNFCCC Secretariat reviews, compiles and synthesises the national reports and presents this information on a regular basis to the Conference of the Parties (see next section).

Experience in Other International Agreements

Experience with the Montreal Protocol (Parson, 1993) suggests that, in monitoring performance under an international agreement, a clearly defined and precisely understood target may require less information than broad and rather vague obligations. Studies have shown that, all-too-frequently, the data reported under international agreements are not carefully scrutinised. Where there has been attention at all, it has been on the quantity and completeness of the reported data rather than on quality (Fischer, 1991; and GAO, 1992). Incomplete reporting under international agreements is frequently linked to a shortage of technical or financial resources in the country of concern (Young, 1992; and GAO, 1992). This is not always the case, however, as there are important examples of wilful failure to report as a means to obscure failure to comply (Victor *et al*., 1997).

Even complying with reporting requirements of international agreements may be difficult for some Parties. This should be anticipated by designing the agreement to allow identification of reporting problems in the earliest stages of implementation, as well as by including mechanisms to provide technical or financial assistance. The Montreal Protocol made extensive use of expert groups to advise and assist with its implementation. As part of a capacity building effort, an expert group was established on data reporting difficulties, and this might prove to be a useful model for the UNFCCC (Parson, 1993).

A prompt start on reporting in advance of the establishment of normative requirements, can assist states to build capacity to satisfy reporting requirements for compliance purposes (Victor, 1996). In the Long-Range Transboundary Air Pollution Convention (LRTAP), it has taken time for the reporting system to evolve into something useful (Levy, 1993). Experience with the Montreal Protocol and the Vienna Convention also show the value of early reporting to build institutional capacity, in advance of the need to

[13] These national reports are formally called "national communications" under the UNFCCC. However, for simplicity, the author refers to them as national reports throughout the document. A distinction is made where necessary between national inventories, which are reported on a more frequent basis, and full national reports, which contain complete information on all FCCC obligations.

assess compliance (Schally, 1996). Early experience can build confidence in the reporting procedures and increase the ability of parties to constructively use the information under the agreement. It can also provide the time necessary to learn and to develop appropriate institutions to respond to the requirements of an international agreement.

Monitoring UNFCCC Obligations: Information Needs

The information needs for monitoring depend on the scope of the agreement, its choice of instrument and the timing of obligations. Targets for emission reduction are the principal instrument contained in the Kyoto Protocol. The Protocol re-affirms 1990 as a base year[14] and target emission levels relative to the base year for the budget period 2008-2012. A comprehensive reporting system for such a target needs to include at least two data elements to assess progress and, ultimately, compliance:

- base year (or baseline) data[15]
- historical data showing changes from the base year.

National greenhouse gas inventories cover both of these data elements. Thus, inventory data will be at the centre of any international monitoring and compliance assessment to be carried out as part of the Kyoto Protocol. International agreement on methodologies for national data gathering and/or on guidelines for reporting can improve the comparability, transparency and completeness of national reporting under an agreement. Guidelines might also improve the quality[16] of national data by serving as a resource guide for preparation and gathering of information.

Reporting on expected changes in greenhouse gas trends over time (projections) may also be important. Projections could enable those responsible for reviewing compliance to suggest and encourage adjustments to national compliance strategies. Thus, two elements may be added to the national data that should be reported:

- projected data, at a minimum throughout the target period;
- information on policies and measures expected to influence emission trends.

The UNFCCC already anticipates the need for such data and requires national reports to contain: national inventories (Article 4.1.a); projections of GHG; and policies and measures(Articles 4.2.b and 4.2.c). [17]

---

[14] The Protocol allows for countries with economies in transition to establish a different base year or base period (Article 3.5). For example, Hungary has established 1987-1990 as its base period. It also allows Annex B Parties to use 1995 as a base year for hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride, for the purpose of the calculation of emission reduction performance.

[15] Note that other forms of targets or commitments, for example, per capita or absolute emission targets, would not require baseline information.

[16] Data quality is defined here to include three concepts: accuracy, precision and uncertainty. These terms are defined as follows: accuracy is the exactness of an estimate; precision is the repeatability of an estimate; uncertainty is the range of error of an estimate. (IPCC, 1997.)

[17] It is interesting to note that these data are required even though the Convention fails to establish clear, quantifiable emission targets or reductions.

These data permit two different forms of compliance assessment: *historical* and *forward looking*. *Historical assessment* will be the basis for determination of compliance in international agreements. It will be based on the assessment of historical inventory data. *Forward looking assessment* will allow adaptive strategies and should enhance the possibilities for compliance. It will draw on projections of performance, historical inventory data in advance of the target year, or estimated inventories for the target year(s). Both types of assessments serve valuable and distinct functions. *Ex ante* assessment could be particularly important if emission budgets, emission trading or policies and measures are included in the agreement.

Existing UNFCCC Reporting Procedures

Extensive reporting of national information already occurs under the Convention, making it possible to evaluate the emission performance of individual Annex I Parties relative to the stabilisation "aim" contained in the Convention. At the first Conference of the Parties (COP-1), Parties adopted Guidelines on the content and the structure of Annex I Party national reports with the aim of providing accurate, transparent, comparable and complete information on which to assess progress under the Convention (UNFCCC, 1995). These Guidelines include the mandatory use of the IPCC Guidelines for National GHG Inventories. They provide a range of methods and guidance on good practice for inventory preparation. They also require a standard inventory format for reporting. Thus, from the start of the UNFCCC's implementation in 1995, Parties envisaged strong institutional mechanisms for open, consistent and transparent reporting (UNFCCC, 1995).

Annex I Parties were required to submit full national reports within six months of entry into force of the Convention, or within six months after a country's ratification of the Convention (whichever came first.) Second national reports were required again in April 1997. National inventory data are to be reported annually for 1990 and each year thereafter.

Initial Results

Early experience under the Convention shows that Parties are generally respecting their reporting obligations but that a number of problems still need to be resolved. By the time of the Secretariat's second compilation and synthesis of first Annex I Party reports (July 1996), 31 Annex I Parties had submitted national reports. At that time, only two Annex I Parties who were required to do so (European Community and Lithuania) had not submitted reports. Overall, twelve Annex I Parties were officially late in submission of their first reports, demonstrating the difficulty of achieving compliance even with reporting obligations[18] (UNFCCC, 1996b).

Main Elements of Information
Contained in National Communications

(1) Inventories

* • Emission estimates (by gas, by main source/sink activities; separate CO_2 from land-use change and forestry) for 1990 and annual inventories
• Worksheets used to develop inventories

[18] Belgium had also not reported by July 1996, but their report was not due until 15 October 1996. Three other Annex I countries (Belarus, Turkey and Ukraine) had not ratified the Convention by this time and therefore were not yet reporting under the Convention. Another two Parties, Liechtenstein and Monaco, had submitted reports ,even though they were not listed in Annex I.

- Activity data
- Emission factors (by gas, by main source/sink activities)
- Method description
- Discussion of data quality/uncertainty

(2) Policies and Measures Description

- Identification of individual measures, type, objective and their status.
- Benchmarks and how effects are to be monitored over time.
- How the measure is functioning.

(3) Projections and Effects of Measures for Year 2000 and beyond

- Gas by gas for CO_2, CH_4, N_20 emissions and CO_2 land- use change and forestry (separately)
  - projection
  - total effects
  - individual effects
- Model descriptions and quality discussion
* • Key assumptions

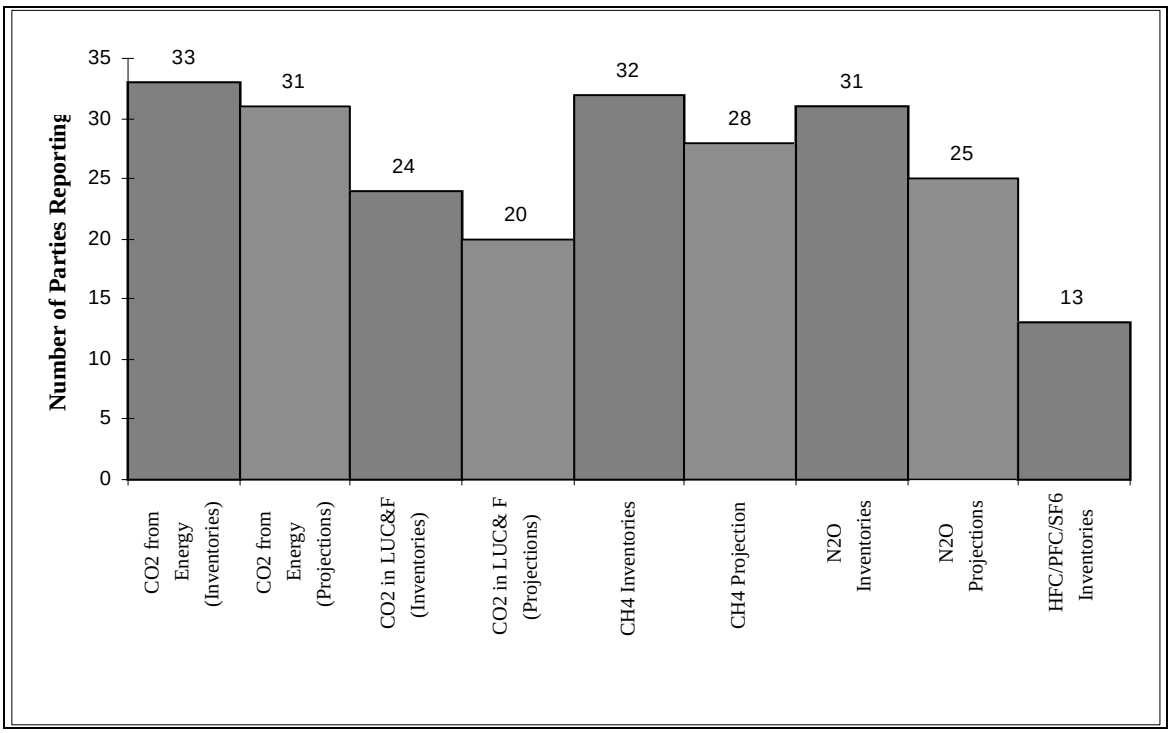
* Data points that can be checked against independently published estimates.

Source: Corfee-Morlot and Schwengels 1994

For first national reports, Annex I Parties have shown a remarkably high rate of reporting, especially if one compares this experience with that of other multilateral environmental agreements.[19] Initial experience under the Convention shows a delinquency rate of less than 10 per cent of the Parties by the time of COP-2 in 1996. All but one first national report had been received by the Secretariat by September 1997. Second reports, most of which were due as of April 1997, appear to be less timely. By September 1997, only 17 of 34 national reports had been received and only 6 of these had been submitted on, or before, the deadline (UNFCCC, 1997b). The heavy work load of Kyoto negotiations may have affected the submission of second reports. Also, the problem of late reporting should diminish over time as Parties establish and improve domestic reporting systems to respond to their UNFCCC reporting obligations.

[19] See, for example, Levy ,1993 and OECD, 1997d for examples on LRTAP and CITES ,respectively.

Figure 1: Frequency of Reporting on Key Data Elements in First Round of UNFCCC Reports



Source: Climate Change Secretariat, 2nd Compilation and Synthesis Report (UNFCCC/CP/1996/12/Add.2*) Inventories are for 1990 base year only; EITs reporting a base year other than 1990 are included in this count. Data are drawn from Annex I Parties only.

While the frequency of reporting is high, a careful look at the content of the reports reveals that some Parties are having trouble providing key data. For inventories and projections, Figure 2 shows that land-use change and forestry data are most frequently missing. Data from first national reports showed that 9 Annex I Parties did not provide inventories for CO_2 from Land-Use Change and Forestry, and 13 Parties did not report projections for this category. Generally, with the exception of those for CO_2 from energy, projections are frequently missing from national reports.[20] (UNFCCC, 1996b) Preliminary data from second national reports show better performance by Annex I countries in the reporting of inventories data from non-CO_2 gases: 15 out of the 17 Parties reporting by September 1997 provided CH_4, N_2O and SF_6/ PFC/ HFC inventories for 1995. Two countries did not provide projections for CO_2 from energy or for N_2O, and only one did not provide data for CH_4. Projections of SF_6/PFC/HFC are much spottier, with only 9 Parties out of the 17 reporting these data in 1997 (UNFCCC, 1997b and 1997c).

Another troubling factor in the reporting of data is that base year estimates may vary in different parts of the national reports. Data submitted for projections often reveal the use of a base year estimate that differs from the formal inventory base year figure (UNFCCC, 1996b and 1997b). A clear set of rules for the establishment and use of a base year to assess compliance will be necessary under the Kyoto Protocol. An additional issue is the correction of historical data if estimation methodologies change over time. The UNFCCC Secretariat's review of national reports identified this as a methodological problem that requires consistent treatment (UNFCCC, 1997b).

[20] CO_2 from energy is used to refer here to all CO_2 emissions other than those related to land use change and forestry.

In 1996, Annex I Parties were also required to report historical, annual emission inventory data for the years 1991-1994. Full national reports, which were due in 1997, were also to contain historical inventories data through the year 1995. In their 1996 inventory reports, three OECD Member countries -- Italy, Portugal and Spain - and three countries with economies in transition - Russia, Slovakia and Bulgaria - failed to submit these data. The EC in its 1996 full report also failed to include 1991-1994 inventories (UNFCCC, 1996b). Reporting of these data appears to be more frequent in the second round of full national reports where all of the 17 Annex I Parties reporting as of September 1997 included historical inventory data for 1990-1995. Though two countries (Germany and Belgium) are still missing current year (1995) data points, this represents a significant improvement in the reporting of historical inventory data when compared to first national reports. It also demonstrates that Parties are improving their ability to satisfy the basic reporting requirements of the UNFCCC.

In addition to the information formally submitted to the Secretariat by Parties, information on national performance is gathered through Secretariat-led "In-depth Reviews" of national reports. These reviews include site visits[21], in which a team of experts (a member of the Secretariat, nominated national experts and an expert from an inter-governmental organisation) travel to the reporting country. The review team meets with government officials to discuss the information contained in national reports and, more generally, the Party's overall progress in implementing the Convention. Not surprisingly, these visits result in a significant exchange of information between participants, and the UNFCCC Secretariat often receives updated national inventory or greenhouse gas projection information at this time.[22] Unless specifically requested not to do so, the Secretariat uses this information to supplement information contained in formal national reports. This helps to make sure that the information presented to the COP by the Secretariat is up to date.

The UNFCCC Secretariat also publishes reports on its In-depth Reviews of individual countries. To date, the Secretariat has visited all but one of the reporting Parties and issued 26 review reports. While these reports have often been released many months after the visit, they contain a valuable supplement to the national reports -- updating information, explaining apparent inconsistencies in the data, or the reason for failure to report specific data. The In-depth Reviews also provide insights into the Party's specific circumstances and strategy to achieve compliance with the obligations of the UNFCCC.

Monitoring of Performance Under the Kyoto Protocol

Early experience with the UNFCCC reporting mechanism reveals a useful foundation that can be built on to enable compliance assessment with the Kyoto Protocol. The UNFCCC reporting system already contains some of the elements necessary to monitor compliance with targets (base year information, annual inventory data and regular reporting on projections, policies and measures). All Annex I Parties are required to report under the Convention, and early experience suggests that Parties are taking their reporting obligations seriously. While much of the necessary data to monitor performance and verify compliance with targets is already required, these functions will take on added significance under the Protocol. The quality of information, which underlies the ability to accurately monitor performance, will

[21] Although the COP Decision stipulates site visits as optional, to be requested by the country, all reporting Annex I Parties have requested such visits. Hence, in practice, nearly all Parties reporting in the first round were also visited by the Secretariat for the purpose of conducting an In-depth Review.

[22] While the IDRs regularly serve to update information, it is not as clear that the review visits serve to fill information gaps. If a Party is unable or reluctant to report certain information, the reason for this omission is often due to a basic flaw in the data collection system of the country, or due to a difference between the reporting requirements of the Convention and the national system.

figure importantly as Parties assess compliance with the legal obligations of the Protocol. Since the Kyoto Protocol has set target dates that are more than a decade away, Parties have some time to build the necessary institutions and expertise for improved reporting and data quality prior to the beginning of the first commitment period in 2008. Information-sharing at an early stage in the interim period, before compliance assessment is at the forefront, will facilitate decision-making for refinement of specific monitoring procedures and better implementation of the agreement over time.

Reporting under the Protocol will need to be expanded in a number of ways. Reporting on how inventories are prepared could become more important, if a review process intends to scrutinise and assess inventory uncertainty as one of its functions. A corollary to this would be to modify the UNFCCC guidelines to clarify standards for good practice in inventory preparation, against which Parties' performance would be assessed. Emission trading and project credit transfers will require additional information on transactions, credits and transfers of portions of emission budgets. Information on each individual transfer will not be essential for determining national compliance. National aggregates of the carbon equivalent units sold to, and purchased from, other Parties could be presented. Double entry book-keeping by governments would show whether the aggregate information were correct. Where problems or inconsistencies are identified, more thorough review of individual trades might be required.

If entities other than governments are provided the authority for trading, then the monitoring and reporting task could become more complicated. In this situation, double entry book-keeping by governments would only be appropriate if individual governments kept a tight watch over international trading by private or other legal entities within their borders. National governments would need to accept the ultimate responsibility for these transactions. Any other arrangement would imply a much more complex monitoring and reporting system at the international level, allowing the tracking of individual transactions.

Another element of reporting under a new agreement might be for Parties to describe national enforcement efforts. This would provide a means to assess whether Parties are taking their obligations seriously and actively implementing the agreement. Implementation of specific enforcement procedures at the domestic level could be a particularly important feature of international emission transfers or trading.

Base year and other historical data

Historical, annual inventory data will be the basis for the assessment of compliance with the Kyoto Protocol targets. Procedures for reporting inventory data should continue to recognise the possible need to adjust data to ensure a fully consistent historical inventory data set. Adjustments might be required, should methods or input information improve over time. Documentation detailing changes made to historical data, and why, will be needed for transparency and verification purposes. A clear rule for the use of base year estimates, and their revision, should be adopted. In all cases, the base year inventory figures for the purpose of monitoring compliance should be consistent with the data underlying projections.

Historical and forward looking assessment

Regular monitoring and timely verification will assist in determining the likelihood of compliance and act as a deterrent to non-compliance. In monitoring compliance with national targets, annual inventory reporting will facilitate early identification of problems and their ultimate resolution. Budget periods and

emission trading make forward-looking assessment even more important. Assessment of a Party's likelihood to achieve compliance requires annual data for the period preceding the target year(s), interim data for years within the budget period, estimated inventories for current years, as well as projections[23] for the target years. The timing of full national reports and of inventory reporting should be based on the intention to use the data for one of these two assessment purposes (historical or forward looking). This timing relates to the target dates and the length of the target period.

Timing and content of reporting

The timing of data submissions will need to be specified in the compliance articles of a new agreement. Information should be required prior to the budget period in order to enable forward-looking assessments; and as soon as possible after the target year/period to enable a final determination on compliance. The lag for reporting of historical data is typically two years, i.e., reports submitted in 1997 contain inventory data for 1995. Annex I Parties might aim to improve their capacity for prompt reporting of inventory data, in order to limit the time lag for reporting to one year. For some Parties, this is an ambitious goal and would require significantly more resources at the domestic level. The introduction of emission trading or project level crediting place a value on such information and might help to overcome the resource problems connected to data collection.

The frequency and content of reporting needs to be carefully tailored so that the information provided by Parties conforms with the various dimensions (e.g., timing, instruments) of the Kyoto Protocol. The shape of the new implementation mechanisms, emission trading and project level crediting, as well as agreement on verification, enforcement and other compliance procedures, will also influence desirable reporting features. Therefore, any changes to the specific reporting requirements -- such as adjustments to existing guidelines -- need to be made sometime after international consensus on the Protocol decisions on implementation. Inventory data remains critical to the process, so annual reporting is likely to be a minimum requirement. Historical, base year data will need to be re-calculated, given the specific feature so the Protocol (e.g. accounting for CO_2 sink activities and PFC, HFC, SF_6). Full reporting on other items, presently in the form of national communications, should be less frequent than reporting on inventories.

Enforcement of reporting obligations

National reporting is central to effective monitoring of performance under the Kyoto Protocol. To encourage compliance with reporting obligations, compliance response measures should apply to reporting obligations as well as to other more substantive obligations. There may be a need to improve capabilities for inventory preparation among Annex I Parties. Some Parties may need assistance or additional flexibility, especially with respect to the timing of reporting. Identification of Parties with special reporting needs should be part of the compliance process. This could be done in the near term under the mandate of the Subsidiary Body for Implementation (SBI). Non-compliance responses (see Section 5) are also relevant as a mechanism for dialogue and negotiation of specific, tailored approaches to resolve reporting problems.

[23] Note that caution should be exercised in the use of national projection information for compliance assessment. Experience to date indicates that national projections are often an indication of a Party's aspirations or political commitment, rather than a true assessment of expected emission trends.

Joint attainment of targets by two or more parties

Experience with the EC reporting under the UNFCCC indicates the complexity of treating a regional economic integration organisation, representing several individual Member states, as a Party to an international agreement. Timely reporting by the EC is hindered by the need to have complete and early information from individual Member states. Individual Member states are also Parties to the Convention and are not compelled to provide early information to the Commission, but rather use the time available to improve individual national reports. This technical problem could seriously hinder compliance by the EC with reporting obligations under the Kyoto Protocol.

The transparency of reporting for this group of Parties is hindered by the fact that the Commission is often not the principal agent gathering the information or the driver of all key actions. For example, all of the inventory information originates in Member countries; therefore, the relevant documentation for the EC inventory is found in the national reports. Such information is voluminous and difficult to review, and relevant expertise is spread amongst Member states. In practice, the European Environment Agency (EEA) has been tasked to prepare the inventory for its report to the UNFCCC (see box).

European Environment Agency

The European Environment Agency (EEA), based in Copenhagen, is responsible for collecting European information on GHG (and other air) emissions for the EC. The EEA is independent of the Commission and the EC, governed by its own Management Board, members of which are selected from its Member states (MS). Set up in 1993, the function of the Agency is to:

"provide the European Community and the MS with objective, reliable and comparable information at the European level enabling them to take the requisite measures to protect the environment and to assess the results of such measures…"

The work programme for period 1994-99 requires the Agency to furnish information that can be used in the implementation of European Community environmental policy. Air emissions is one of five priority areas of work for the Agency. For each priority area a European topic centre has been established. The European Topic Centre for Air Emissions (ETC/AEM) is led by the Umweltbundesamt (UBA) in Bonn, Germany which leads a consortium including: the UBA Austria; CITEPA, France; the European Network of Environmental Research Organisations (ENERO) (includes NETCEN, UK; RISO, Denmark; and ENEA, Italy).

Source: Lanchberry, 1996

Information on inventories and projections could benefit both from the fact that the EC is a Party, and by closer involvement of the EEA in the EC's reporting. For the purpose of developing its own response strategy, the Commission develops an EC projection for CO_2 from energy. This is a useful contribution by the EC to the UNFCCC monitoring process. The EEA is already overseeing internal efforts aimed at improving the overall quality of inventories or other information contained in Member state national communications. The EEA might be asked to provide a comprehensive inventory for the EC, taking into account submissions from Member countries, but not relying exclusively on that information. Further, the EEA might develop projections to complement the EC's CO_2 from energy projections. The EEA is well placed to assist the EC improve its fulfilment of reporting obligations under the UNFCCC, and more importantly in the future, under the Kyoto Protocol.

ISSUES IN DATA QUALITY: NATIONAL GREENHOUSE GAS EMISSION INVENTORIES[24]

Why Is Data Quality Important in Design of the Agreement?

The question of which greenhouse gases and which sources and sinks to include was a key issue in the negotiation of the Kyoto Protocol. The Protocol includes comprehensive coverage of greenhouse gases, thus bringing all of the potential sources and sinks of greenhouse gases into the environmental management framework. However, as the specific procedures for implementation and monitoring of the agreement are developed, data uncertainty should be addressed. Uncertainty in emission estimates varies with different greenhouse gases and with differing source and sink activities. Data quality also varies among countries. Poor data quality needs to be addressed to ensure confidence in the ability to monitor progress. At a minimum, procedures should provide incentives to improve the quality of information available from Parties over time.

While complete accuracy of inventory data is an ideal, it is clearly unattainable. Inventory data are necessarily estimates, at best, based on field work and statistical sampling of a diverse population of socio-economic activities in every country. If the task of monitoring is to gather data relevant to an emission target compared to a fixed base year, an accurate assessment of the emission trend is more important than the accuracy of the emission estimate in any given year. Accurate emission trends for a single gas can be obtained if certain conditions hold:

- the methodology for emission estimation must remain the same over the period of assessment, thus establishing a standard ruler for the measurement of change;

- all relevant emitting activities are accounted for by the methodology.

Problems of data quality are particularly relevant to monitoring targets based on a basket of gases. Monitoring performance with a basket of gases will require a national inventory to include all relevant gases and types of source and sink activities. Each source and sink activity will be associated with significantly different levels of uncertainty. The mix of gases and the share of specific source or sink activities will change over time and thus will influence the range of error associated with the comprehensive inventory.

Under a system of international emission trading or project level crediting, countries collaborate to achieve targets and, as a result, national inventories are effectively combined. Differences in inventory uncertainty among greenhouse gases and among nations complicate the assessment of compliance for Parties that trade. Traded carbon equivalent units would likely change the mix of source/sink activities and change the overall range of error associated with the combined inventory. Depending on the direction

[24] Another Annex I Expert Group paper addresses methods for projections of greenhouse gas and estimation of effects of policies and measures; it also addresses data quality issues (OECD, 1998a).

of the change in overall uncertainty, combining national inventories in this way may result in lowering or raising the confidence with which combined performance of the participants can be assessed.

In order to address inventory data quality, it is first important to understand the sources of uncertainty in these data. The ability to reliably monitor emissions will vary by greenhouse gas and further by source and/or sink activity within each gas. The nature of the emitting or sink activity, such as whether it is biogenic or not, influences the ability to accurately measure emissions and activity levels. The variation in inventory uncertainty among countries stems from variation in the methods that countries use for preparation of inventories, from differences in the mix of gases for each country, and from differences in the availability of resources to support the inventory work, including field work to collect original data.

Sources of Uncertainty

Inventories of emissions for conventional pollutants and for greenhouse gases are largely developed through estimation rather than through direct measurement techniques. This is due to the cost and the technical difficulty of direct measurement (Lanchberry, 1992).

Uncertainty in emission estimates from any particular source or sink has two main origins:

1. failure to completely understand the causes of emissions/removals e.g., there may be error in the formula being used to estimate the emission or removal;
2. poor quality input data (e.g., activity data and emission factors).

For the aggregate estimate of emissions/removals for any particular gas, uncertainty may also stem from:

3. failure to identify all of the relevant emission or removal activities.

Emission removal activities that are poorly understood are those associated with highest uncertainty in national greenhouse gas emission inventories (see Table 1). Narrowing the uncertainty from errors of the first type would require improving the scientific understanding of emissions and removals processes. This might be accomplished through accelerated scientific research and further method development. These types of error are most relevant for all sources of N_2O and CH_4 and for CO_2 fluxes from land-use change and forestry.

A variety of factors influence the cost and technical feasibility of obtaining good input data for the preparation of inventories. Two main types of data are relevant: activity data and emission factors. Activity data define the level of the relevant activity causing emissions or removals to occur (e.g. energy use, animal populations, change in forest areas and densities). Emission factors refer to the rate of emission/removal associated with a single unit of activity. Field measurements in the country

ENV/EPOC(98)5

Table 1: Uncertainty Estimates[1] (± % or qualitative)

Source	AUSL	AU	CAN	CR	DK	GER	IR	NL	NZ	SW	UK	USA
CO_2			4	15			Low	2	5	5		
CO_2 Energy	10					Low					2-5	<10
CO_2 Deforestation											20	25
CO_2 LUC&F - Other	20				High	High			25-35	10	20	25
CH_4		40	30	15		Medium to High	High	30				
• CH_4 Energy									50		20	10-25
• CH_4 Landfills									35		20	10
• CH_4 Animal Husbandry									20		20	10
• CH_4 Other Agriculture and Forestry									50		20	10-25
N_2O			40	< 35	High	Medium	High	50-100		Low		
` N_2O Energy									50		25	25
` N_2O Agriculture and Forestry									60 50		25	25

Source: UNFCCC/IDR.1/Aust (Austria, Canada, the Czech Republic, Denmark, Germany, Ireland, Netherlands, Sweden, UK and USA)

1 The EU reported the uncertainty of individual gases relative to each other: $CO_2 < NO_x < CH_4 < NMVOC < N_2O$

of origin often form the basis for emission factor estimates, although in situations where resources are limited, countries may simply choose a value from the literature.[25] A number of characteristics of emission and removal activities influence the ability of countries to gather good input data and these, in turn, will affect inventory uncertainty (see Table 2). These include:

- the number of key variables to consider in estimation of the source/sink;
- whether the activity is a stationary point source (such as a power plant), a stationary but diffuse source (such as a forest, rice or livestock), or a mobile source (vehicles); and

if the activity has a limited number of sources or numerous sources (e.g., emissions from household energy use versus power plant fuel combustion). The number of key variables to be considered in the estimation of greenhouse gas emissions or sinks can vary widely depending on the category of activity. Estimation formulas range from the simple (e.g., fuel combustion) to the more complex (land-use change and forestry; rice; waste and wastewater). The calculation method aims to include variables that have the most important influence on the level of emission or removal of greenhouse gases. For example, emission factors from fuel combustion do not vary widely once the type of fuel combusted is well-defined. Therefore, quantity and type of fuel burned is a key variable, as is the emission factor for the particular fuel burned.

In contrast, estimating CO_2 from above ground-decay in the Managed Forests category of Land-Use Change and Forestry requires assumptions or data on five key variables: average area converted by type of forest; biomass before conversion; biomass after conversion; fraction left to decay; and carbon fraction in above-ground biomass. This method is clearly limited by the need to estimate many variables for which there is considerable uncertainty (Taylor, 1997). It is likely that the uncertainty associated with each of these variables is generally greater than that associated with any of the main fuel combustion emission variables. If this is true, it leads to a situation where uncertainty from one source/sink category of CO_2 is necessarily orders of magnitude greater than that for another category.

Table 2 shows the main features, of different activities resulting in greenhouse gas emission or removal, which influence the ability to accurately measure emission fluxes. Diffuse and mobile emissions/removals and related activities also tend to be more difficult to measure accurately than stationary point sources. Data collection requires extensive sampling and well designed surveys: depending on the type of activity, these samples may need to cover variation in a large number of different kinds of variables (e.g., for forestry, forest type, density, age of stand, type of management system). For mobile emissions, in-situ measurement studies are also difficult and expensive. In contrast, emissions from stationary point sources can be more easily measured without excessive cost. This already occurs in many OECD Member countries. The number of sources, especially point sources, can also complicate data collection. For example, although it is technically possible to measure residential energy-related emissions, the expense of doing so makes it impractical. Overall energy use for this sector is relatively well-known due to commodity sales data. However, behavioural patterns affecting energy and emission patterns in the residential, transport and buildings sector tend to be much less well understood, and data less reliable than for other categories which have fewer sources (e.g., power plants or large industry).

[25] In practice, the IPCC Guidelines provide a summary of the emission factors available in the literature. While the Guidelines encourage countries to develop their own emission factors, these data are provided as possible "default" emission factors should other country specific information not be available.

	Stationary Point Source	Stationary Diffuse Source	Mobile	Few	Many
Power plants	X			X	
Industry					X
Transport			X		X
Residential	X				X
Oil prod	X			X	
Coal mining		X		X	
LUC/F		X		varies by country but could be many	
Solid Waste Disposal		X		varies by country but could be many	
Wastewater		X		varies by country but could be many	
Livestock Enteric Fermentation		X			X
Livestock Manure Management		X			X
Rice cultivation		X		varies by country but could be many	
Agricultural soils		X		varies by country but could be many	
Adipic acid and nylon production	X			X	

Table 2: Characteristics of Main Greenhouse Gas Sources/Sinks

Source: Based on Lanchberry, *et al.*, 1992

Baskets and Data Quality

Accurate assessment of trends is more evasive if a basket of gases approach is used because the mix of gases may change over time, changing the data quality and error bounds of the overall CO_2 equivalent estimate. Even if the uncertainty of greenhouse gas estimates can be narrowed through best practice techniques, uncertainty associated with some gases or activities will always be significantly greater than with others that are easier to measure. While uncertainty can be narrowed over time, it can never be eliminated. Uncertainty will hinder compliance assessment in a basket approach in countries with mitigation strategies that target activities with greatest uncertainty, or alternatively, in countries where the major greenhouse gas sources are those that are difficult to measure and estimate. An example is where Country A has 90 per cent of its greenhouse gas emissions in its base year from CO_2 from energy, and 10 per cent from other more uncertain sources. Unless the mix of source activities shifts significantly between the base year and the target year, the trend of emissions can be assessed with a high degree of confidence. Alternatively, if the CO_2 from energy is estimated to increase slightly over this period (+/- 10 per cent uncertainty), while being more than offset by removals from forestry (+/- 30 per cent uncertainty) and reductions in other non- CO_2 sources (+/-25 per cent uncertainty), it may be difficult to say with confidence whether the emissions to the atmosphere are reduced and whether targets are met.

Another issue is that of missing base year data for major Parties. For example, Canada and the EC have yet to submit data on CO_2 fluxes from land-use change and forestry.[26]

[26] A Canadian official explains that this omission is due to the difference between the Canadian method and that of the IPCC. However, differences between national and IPCC methods shouldn't prevent countries from reporting a given

Variation in Methods

Variation in methods may limit comparability and consistency of data and this can introduce a significant source of uncertainty into national estimates. The IPCC Guidelines for National Greenhouse Gas Inventories have assisted in making comparable inventory data available under the Convention (IPCC, 1996 and 1997). While the Guidelines include two main elements – "default" methods for estimation of greenhouse gases and reporting instructions – Parties are only obliged to use the Reporting Instructions. The logic of the Guidelines is that the option to choose among possible methods provides a country with the incentive to innovate and to improve methods and data over time. The Reporting Instructions set out a "common reporting framework" as well as provide guidance on documentation, verification (at the national level) and characterisation and reporting of uncertainty associated with inventory estimates (see box). The IPCC Guidelines also provide an extensive set of "default" estimation methods; however, countries may also choose to use other methods. All reporting countries are required to bring their results into the common reporting framework, which includes common definitions and categories for emission and sink activities. The objective is to have data presented on a comparable basis.

Reporting Instructions for National Inventories: Key Elements

Common Reporting Framework: Parties are to use a common set of reporting categories designed to accommodate all sources and sinks of each GHG; standard units; common definitions of pollutants; and common summary tables for reporting of results.

Documentation Standards: Parties are to provide enough information to "enable results to be reconstructed by a third party;" at a minimum providing all worksheets and supporting information; all data sources should be fully referenced.

Verification: Parties are to perform a minimum of self-verification tasks, including cross-checking estimates and main assumptions with other publicly available information.

Uncertainty: Parties should qualitatively describe uncertainty; a framework for data quality rating is provided; quantitative estimation of uncertainty is recommended but is not mandatory.

Source: IPCC, 1997, Volume 1: Reporting Instructions

True comparability of inventory data is only achieved if all countries inventory the same activities with the use of identical methods. The IPCC Guidelines encourage flexibility of approaches, thus total comparability cannot be achieved. A good example is contained within the IPCC's tiered set of default methods for estimation of PFCs, HFCs and SF_6. Here two basic methods are presented, one more complex than the other. Each method has a different distribution of emissions over time, such that the results from the two methods may be radically different for any one year. This is because the simpler method estimates potential emissions over several years, and the more complex method estimates actual emissions in the given year. The latter leads to more accurate emission estimates, but requires more detailed input data.

The IPCC Guidelines, and hence the UNFCCC, allows countries to choose the method which best suits its data availability. The permission to choose methods allows countries to choose a method that favours their own performance in any particular period. A potentially important source of uncertainty and conflict could be avoided through agreement on a standard method, or alternatively, a strong recommendation from the IPCC on "best practice" approaches. Such an endorsement could be followed by a decision by the COP about the conditions under which Parties should be using "best practice" approaches.

Within Annex I countries, two principal systems provide guidance for the development of greenhouse gas inventories: the IPCC, which is the official guidance recognised under the Convention; and a European

source/sink. In fact, the IPCC encourages countries to use best available methods as long as appropriate documentation is provided. In the EC, the omission is due to incomplete data from Member states.

UNECE air emission inventory system, which is commonly referred to as CORINAIR. The CORINAIR system and IPCC are increasingly harmonised. The current CORINAIR system enables countries to report their inventories in complete accordance with IPCC Guidelines (IPCC, 1995), and will be updated to include the 1996 Guidelines (IPCC, 1997) by the middle of 1998 (Jol, 1997). A number of countries also use their own national systems to develop at least part of their inventories. This group is large and includes: Australia, Belgium, Canada, Finland, Germany, the Netherlands, New Zealand, Sweden, the United Kingdom, and the United States. Documentation of these national methods remains limited. Although Australia has published its own (multi-volume) inventory handbook, and New Zealand has provided some information on their methods in their second national communication, other countries have not documented their approaches. Further, available documentation is often in native languages, which prevents international review and use. As a result, our understanding of the methods being used to estimate national inventories from some important Annex I countries is limited.

With the exception of recent work comparing CORINAIR and IPCC, little attention has been given to the influence on final emission estimates of the variation in methods among Annex I countries. The study on CORINAIR-IPCC found that variation in methods can, in fact, be beneficial because results can be used for cross-checking and because this can ultimately improve the robustness of inventory estimates (Lanchberry, 1996). In contrast, the UNFCCC Secretariat experience demonstrates that diverging methods significantly complicate inter-Party comparisons and the synthesis of information (UNFCCC/SBI/1997/19).

Further work is required to systematically assess the influence of variation in inventory methods on emission estimates and to make recommendations in this area. In the interim, the approach taken for CO_2 from energy might be a model for reporting on all gases. Here, countries are required to present the results using the IPCC Reference Approach as a check against their own estimates; and, where there are significant differences, to explain them. If this were to be required of all gases covered in a new agreement, more national resources for inventory preparation might be needed; however, transparency, comparability and consistency might improve. Currently, Parties are requested to detail the differences between their methodologies and the default IPCC method for that sector. In practice, few provide this information. An interim step would therefore be for Parties to comply with existing guidance and to report on the differences in national methods compared to IPCC methods. Further examination of variation in national methods could provide insight into the influence of the variation on inventory reliability and comparability of data over time. Work on this issue by the IPCC National Greenhouse Gas Inventory Programme and by the UNFCCC Secretariat is proposed for 1998.

Approaches to Address Data Quality

A number of approaches to address data quality and uncertainty are possible:

- establish a rule to account for uncertainty (e.g., scaling or discounting inventory estimates on the basis of data quality);
- progressively include all greenhouse gases, sources and sinks, excluding at the outset the most uncertain activities;
- agree to follow established standards of good practice for inventory preparation and data collection.

These could be used individually or in combination with one another to account for uncertainty in the reporting and monitoring of performance that will take place under the Kyoto Protocol. An important

question post-Kyoto is whether the approaches to address uncertainty should be similar for emission trading and other transfer mechanisms as compared to the approaches for monitoring performance emission reduction targets.

Three main criteria are relevant in selecting an approach to address uncertainty:

1) stimulate environmental management of all greenhouse gases;

2) provide incentives for improving the quality of information over time;

3) apply universally to all Parties in a consistent way and be relatively simple to implement.

Each of the main approaches to address data quality is briefly discussed below, taking into account these criteria.

A decision rule to account for uncertainty

This might be done by inflating estimates of actual emissions, or discounting removals, for each major category of sectoral activity by an amount equivalent to the uncertainty associated with the estimates. Discounting uncertain elements of an inventory would discourage excessive dependence on these activities for mitigation and would encourage development of better data. However, a discounting approach would only work if Parties were able to assess and reliably report on uncertainty in inventories. This is because uncertainty estimates would need to be the basis for the discount rates to be applied. Unfortunately, this is not the case. Uncertainty estimates are usually derived from expert judgement and would rarely be verifiable.

An alternative is to separate uncertain greenhouse gases into a second "basket", which is discounted to diminish its importance compared to more certain elements of the national greenhouse gas inventory. This is a simple decision rule that would rely on reasonably well understood information. A drawback to this approach is that it effectively penalises countries that have better than average inventory information for these activities. Finally, a discounting approach might be the basis for a data rating system which could be useful in the context of emissions trading (see below).

In the context of overall compliance assessment, 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, at best, partial.

Limit initial coverage in the target to exclude activities with high uncertainty

One option for the design of emission reduction targets to account for uncertainty is to exclude the less well understood sources and sinks at the initial stages of implementation. The Kyoto Protocol uses this approach in its selective inclusion of only certain land use change and forestry activities (afforestation, deforestation and reforestation) as part of the "sink" offset allowed to account for emission reduction targets.[27] The Protocol also states that the COP, acting as the Meeting of the Parties, will return to the question of "…how and which additional human-induced activities related to changes in greenhouse gas emissions and removals in the agricultural soil and land use change and forestry categories, shall be added to, or subtracted from…" the agreed emission reduction targets (Article 3.4). This effectively allows Parties more time to consider how best to account for performance for activities that are inherently more

[27] The Conference of the Parties is expected to return to the question of whether the list of allowable activities should be expanded in the near future.

difficult to monitor. It provides incentives and a time line to complete further work to better the understanding of these activities. However, the delay of the inclusion of uncertain activities or gases can also have negative consequences. Parties might have difficulty ratifying an agreement without knowing the full coverage of greenhouse gas activities, and hence the domestic consequences of its implementation. A possible disadvantage of this approach is that it might delay environmental management of omitted sink activities.

Establish and follow standards of good practice for inventory preparation

This approach would require Parties to agree and to follow established standards of good practice for inventory preparation. Agreed monitoring procedures or definitions of "good practice" might be set out to guide national practices. This might be similar to "good practice" in laboratories guidelines which are common in the chemicals industry. This might be based on the present IPCC Guidelines, but require the use of higher tier IPCC methods and criteria for field work required to develop local emission factors, including such issues as frequency of field measurements and coverage of sampling or actual measurement data. A useful example might be the standards for field work to measure emissions from rice which are proposed in the IPCC Guidelines (IPCC, 1997, Reference Manual). The ideal is a rigorous method that can be adapted to national circumstances with clearly-defined data disaggregation, collection and quality guidelines. Codes of good practice could be accompanied by the use of independent auditing or certification procedures to ensure that Parties are following the practices established under the agreement.

Some observers have argued for the full standardisation of inventory methods as a means to address and to ensure truly comparable data. Methods standardisation would also facilitate review and verification of estimates. However, standardisation might be a disincentive for countries to conduct their own field research. It might also limit the ability of individual countries to narrow the uncertainty in their own inventory estimates by committing significant resources to inventory preparation.

In summary, moving toward good practice standards or codes for inventory preparation could help to achieve all three criteria. They might be a first step towards standardised methods and improved data quality. Standards could also be used in conjunction with independent auditing, verification and "certification" procedures to provide the basis for the objective assessment of data quality. The latter might be particularly important to the implementation of emission trading and project level crediting provisions of the Protocol.

Additional options with emission trading

The design of a trading system would ideally provide incentives to reduce uncertainty, establish procedures to reward strong domestic action to carefully monitor performance and penalise participants that fail to implement strong monitoring procedures. By including such safeguards at the international level, the market created for international emission trading could become self-regulating, with participants aiming to maintain the financial integrity of the system within the boundaries set out in the international agreement. If established with the proper balance of policy and institutional support at both the international and the national level, emissions trading could encourage better information and enhance the effectiveness, efficiency and equity of the agreement.

Establish rules for trading that build on minimum standards for data quality

This approach would limit the trading of greenhouse gases to those activities that achieve a minimum standard of data quality. By limiting trading to only those activities that have well-documented emission fluxes, the risk for abuse would be limited. If the agreement included terms for acceptance of the activities that are initially excluded, it would provide countries with the proper incentives to improve the quality of information for these activities. Such a decision rule might allow a country with high quality data to trade in all of the gases and activities covered under the Kyoto Protocol, while limiting another country with poorer quality data to trade in only a sub-set of the activities.

Unlike targets alone, the use of emission trading would shift the emphasis and the objectives of reporting inventory data with respect to accuracy. Because emission trading must be based on the actual level of emissions in a country in any given year relative to target levels, the accuracy of annual emissions data is critical. The tradable commodity is likely to be based on the simple formula: target level minus actual emissions equals amount to be purchased or sold (Mullins, 1997b). The objective of compliance assessment under such a system must be to assess the actual emission levels relative to target levels for a particular country or other participant in the trading system. In this way, creation of an emission trading system will provide the incentive for governments and other market participants to improve and understand the accuracy with which national emissions are estimated.

"Rules of entry" into the system might be based on data quality. Limiting trading to only those activities (sources and sinks) for which data quality is acceptable would allow for full coverage of all gases and activities in the domestic environmental management framework, but limit its coverage in the trading system. This could be used in combination with good practice standards to guide the preparation of inventories, independent auditing, certification and, possibly, a rating system (Mullins and Baron 1997). These approaches would encourage participating Parties and entities to progressively improve inventory and other data quality in order to "qualify" for full participation in the trading system. The approach could provide incentives for better information and encourage progressive expansion in the coverage of the trading system, which should lead to more comprehensive and cost-effective environmental management over time. Auditing or certification of inventory data and related reports on emission trading could also enhance Parties' understanding of inventory data quality and build confidence in the trading instrument.

Special Issues in Monitoring the Land Use Change and Forestry Sector

The Land Use Change and Forestry sector warrants special treatment in the Kyoto Protocol for a number of reasons, most of which concern the quality and availability of data (see box below). The Protocol limits coverage of this sector to verifiable changes in stocks from three activities in a specified time frame (i.e. afforestation, deforestation and reforestation since 1990). Verifiable changes in carbon stocks from these activities can be used to offset future emissions in the commitment period to account for performance with emission reduction targets. Guidance on a number of issues will be needed to implement this part of the Protocol:

- what constitutes a verifiable change in stocks from afforestation, deforestation and reforestation activities since 1990 and how to verify such change?
- what source and sink activities are relevant in accounting for afforestation, deforestation and reforestation (e.g. are soil carbon fluxes included)?
- what is the definition of stocks to be used in accounting for performance? how to develop base year estimates against which changes will be measured?

- how to reconcile the extremely long time frame for greenhouse gas emissions and removals from this sector, the time frames identified in the IPCC Guidelines (30 years) and the time frames for relevant action under the Protocol (post 1990 through 2012 equals 17-22 years);
- how to report such activities in a transparent and verifiable manner?
- how and which additional human-induced activities related to the land use change and forestry and agricultural soils category should be used to comply with national emission targets?
- how should countries with net national emissions from the land use change and forestry sectors account for this in the 2008-2012 commitment period?

Land Use Change and Forestry inventories share many characteristics with methane and nitrous oxide inventories, but there are also several important ways in which they differ. They have similar ranges of error, lack sound data, and are difficult to estimate because of the biogenic nature of much of the source activity. But there are three reasons why Land Use Change and Forestry warrants special attention:

- the magnitude of the influence on the entire national inventory estimates is often much larger;
- the likelihood of changes in inventory estimates is greater and the verifiability of change is poorer (see box); and
- land use change and forestry represents a low cost mitigation option.

Removals from Land Use Change and Forestry in some countries are very large relative to CO_2 emissions from energy. In 1990, they accounted for -81 per cent of the CO_2 from energy emission in New Zealand, -60 per cent in Sweden, -56 to -36 per cent in Finland, -17 per cent in Russia, -9 per cent in the United States. In Australia, land use change and forestry CO_2 accounted for 45 per cent of the emission from energy in 1990; in recent years Australian emissions from land use change and forestry converted to a removal of CO_2, and the sector is currently estimated to remove CO_2 equal to about 10 per cent of energy emissions. (FCCC 1997d). As a result of the magnitude of the fluxes, inventory errors for this sector, which generally range from 10-35 per cent or higher, could have significant consequences for mitigation action. In countries where the sector is showing an increase in removal trends, inventory errors could limit action on cost-effective mitigation in the energy sector. With emission trading or project level crediting, the significance of errors in national inventories will flow across borders.

Although methane and nitrous oxide are biogenic sources of greenhouse gases, any changes in inventories for these sources are likely to be more verifiable than they would change in forestry inventories. This is because methane and nitrous oxide inventories are based on activity data, such as animal population, area of rice cultivation or area of agricultural soil, that are not subject to great uncertainty. In contrast, the basic "activity" data for Land Use Change and Forestry are main sources of error in national estimates of CO_2 fluxes from this sector.

Finally, because of the relatively low cost mitigation options offered by the forestry sector, Parties will be particularly keen to extend coverage of this sector under the Protocol (UNFCCC 1997d). For the reasons mentioned above, however, it will be important to do this carefully so as to ensure better information over time and overall environmental management and performance as intended under the Protocol

Special Issues Surrounding Forestry and Land-Use Data

1. The UNFCCC review process has identified a variety of problems specific to land-use change and forestry data. They suggest that further progress is needed to ensure that land-use change and forestry greenhouse gas (GHG) inventories are consistent, comparable and transparent. The data are not being reported in a uniform way (IPCC, 1997b):

   - differences in methodology: Parties use both IPCC and their own national estimation methodologies;

   - variation in the reporting of carbon pools: Parties do not report emissions and removals from identical sets of carbon pools; some include emission and removal from harvested wood products and soil carbon and some do not (IPCC 1997)

   - inconsistent interpretation of the term anthropogenic: this is especially the case for managed forests and forest fires.

2. National estimates of greenhouse gas fluxes from land-use change and forestry are associated with a high level of uncertainty. The UNFCCC Secretariat attributes this to the lack of data, which was identified as a major constraint for the preparation of national greenhouse gas inventories (UNFCCC 1997b).

3. In accounting for greenhouse gas fluxes from land-use change and forestry under a climate change agreement, it will be vital to allow time to develop methods that are consistent with principals and goals of international forestry initiatives. These will need to ensure encouragement of sustainable forest management and protection of old growth forests (McKenzie-Hedger, 1997).

4. The IPCC has started to consider how best to revise current guidelines to address a number of key issues including those noted above. However, this will necessitate resolution of several contentious scientific issues. Critical issues include: definitions of anthropogenic or human-induced activities, methodologies, inventory data quality and availability, and how relevant data can be gathered in and used in a practical cost-effective manner to support the objectives of the Convention and the Kyoto Protocol.

.

REVIEW AND VERIFICATION

Aim

Review and verification is the process of establishing whether states are complying with their obligations under an international agreement. It includes the corroboration of data submitted by Parties. Verification can help to build confidence in the agreement by demonstrating that non-compliance is likely to be discovered and publicly disclosed. It may be beneficial to establish review and verification procedures at the outset of the agreement. This will shape the intent of the agreement and, perhaps, participation in it. (O. Greene, 1991; Fischer, 1991; Ausubel and Victor, 1992; GAO, 1992). Aside from establishing compliance, the review of national reports under the UNFCCC agreement may serve a variety of useful purposes (see box).

Review of national reports serves a number of important functions:

- improve data reliability and consistency
  - * tackle weaknesses in data or methodologies
  - * identify and correct errors
  - * deter distortions or mis-reporting by governments
- promote comparability
  - * among Parties
  - * over time
- encourage transparency and complete information
  - * identify gaps in the national report
  - * provision of additional documentation
- build confidence in and promote compliance
- promote learning about projections, effectiveness of emission reduction policies
- encourage adaptive management (nationally, to achieve agreed targets and internationally, to achieve the objectives of the protocol and the Convention)

Source: Based on O. Greene and S. Comes (1996)

Verification is not a typical feature of international environmental agreements (Greene, 1991; GAO, 1992; and Ausubel and Victor, 1992). While national reporting is common, thorough review and corroboration of that information is much more rare.

A variety of verification and review approaches is possible, ranging from the more to the less intrusive. However, before considering the use of intrusive approaches under the UNFCCC, such as independent auditing, one must consider the demand for verification to assess compliance (Fischer, 1991): Do Parties favour rigorous verification of their data? The demand for rigorous verification is likely to be linked to the severity of the target or other commitments, and to the penalties for non-compliance. If the economic costs associated with implementation are high, Parties will be more concerned about the economic risk of cheating or "free-riders." More ambitious targets will raise the importance of verification and Parties may therefore increase the demand for stronger verification mechanisms.

Main Approaches

Two different steps of verification are relevant to this discussion: 1) the technical assessment or verification of data; and 2) political assessment of compliance. In the first step, verification can be carried out through validation of the national data by comparison with independent estimates or sources of information. The second step of verification is the political assessment of the compliance status of individual Parties to the agreement. This step would need to be carried out through a Meeting of the Parties (O. Greene and Comes, 1996). Verification of national performance relative to the obligations outlined in the Kyoto Protocol could

build on existing review procedures under the UNFCCC, but may also need to include new elements. This section outlines a range of possible approaches, new and existing.

Experience from Other International Agreements

The main verification approach found in international agreements is a review of national reports, a function typically performed by the secretariat to the agreement. Independent auditing or review by a third party is another approach that might be used to verify compliance by Parties with their obligations under the Kyoto Protocol. Independent auditing and site inspections are frequently used in the verification of arms control agreements (Greene, 1991). The ILO and the UN Human Rights Committee also provide examples for the use of third party reviewers to provide independent comment on a national report and on performance (see Table 4 and GAO, 1992; Chayes and Chayes, 1995). Non-governmental organisations and industry associations may also emerge as important watchdogs in the verification process.

Concern about verification has influenced the structure of international agreements. In the arms field, areas of control and specific obligations are often selected based on the ability to measure and verify strategic and military importance (Greene, 1991). Concern about what is measurable may have led negotiators to limit the inclusion of sinks of greenhouse gases in the emission reduction objectives of the Kyoto Protocol. The Protocol implicitly calls for verification approaches to be established, both in accounting for changes in carbon stocks from afforestation, reforestation and deforestation activities and in accounting for emission reduction units that would be eligible for trading or crediting among Parties (Articles 3, 6, 12, and 16 bis).

OECD and IEA policy performance reviews offer another possible model. Although similar to UNFCCC review process, the strongest of the OECD reviews provides critical assessments and policy recommendations to national governments. Well-prepared site visits are part of the process, resulting in targeted policy advice within a year after date of the visit. Combined with a small amount of well-timed publicity, this kind of objective "expert" opinion may help to swing domestic political support behind new policy action in the country.[28] Indeed, the value of these reviews may be in their influence on the longer term policy performance of the country (OECD, 1997). The reviews try to consider national policy performance against a clear set of criteria or goals.[29] When the policy objectives for the review are unclear or controversial, it is impossible to use the reviews to bridge policy differences (Kemper, 1991). Where clear policy objectives are lacking, critical advice from performance reviews will be controversial and will not necessarily further consensus on appropriate policy paths.

[28] Individual reports have been released up to one year after the visit to the country and this delay may have seriously limited the internal value to the country of the information contained in the Secretariat report.

[29] See, for example, IEA's "Shared Goals" and the OECD Development Assistance Committee's "Goals for Development Assistance in the 21st Century".

Table 4: Selected Mechanisms Used by International Organisations to Monitor Compliance

	Monitoring mechanisms			
International organisation	**Independent review of reports countries submit**	**Visits to countries/on-site inspections**	**Hearings**	**Complaint procedures**
International Labour Organisation	Worker and employer representatives review and comment on reports countries submit. ILO staff analyse reports. ILO's Committee of Experts prepares written analysis of reports and other data.	Not applicable	ILO's Committee of Experts presents its analysis and other data to the Conference Committee. If a party appears to have compliance problems, it may be requested to testify and respond to complaints lodged against it. The results of these hearings are distributed at the annual conference of the parties.	ILO reviews complaints from workers, employers, and governments to determine if a party is in violation.
United Nations Center for Human Rights	The Human Rights Committee, composed of independent experts, reviews information countries report on compliance.	The Commission on Human Rights, a designated group under the United Nations Economic and Social Council, can conduct fact-finding missions within nations being investigated for violations.	The Human Rights Committee conducts hearings on information countries report and invites countries to testify.	The Commission on Human Rights investigates complaints of human rights violations.
International Atomic Energy Agency	Not applicable	The Agency's team of trained experts inspects nuclear facilities.	The team's results are reported to and reviewed by the Agency's Board of Governors.	Not applicable.
General Agreement on Tariffs and Trade (GATT)	To determine compliance, GATT's Trade Policies Review Division staff examine information countries report.	GATT's Trade Policies Review Division staff visit countries.	The GATT Council reviews and discusses the results of the Trade Policies Review Division's examinations.	Through the GATT secretariat, parties may request a consultation with countries they believe are violating the agreement. If the consultation fails, the Parties may resort to a panel that hears disputes.

Source: GAO, 1992

Existing Approaches Under the UNFCCC

At present, the UNFCCC secretariat performs two important review tasks for the benefit of all Parties:

1. in-depth reviews of Annex I Party national communications, based on site visits to the country;
2. compilation and synthesis of the contents of all national communications.

At COP-1, Parties agreed to a review mechanism for national reports which included In-depth Reviews of individual national reports. The COP-1 decision on the review of first reports from Annex I Parties (UNFCCC, 1995b) requests the UNFCCC Secretariat to perform in-depth "paper" reviews of individual national reports within one year of their submission, and "if deemed helpful, to undertake visits to clarify…" the reports. In-depth Reviews are to be conducted with the assistance of experts nominated by Parties and selected from inter-governmental organisations. The Secretariat is also instructed to compile and synthesise the national reports for the Conference of the Parties.[30] The purpose of the review process is:

> to review in a facilitative, non-confrontational, open and transparent manner, the information contained in the communications from Annex I Parties to ensure that the Conference of the Parties has accurate, consistent and relevant information at its disposal to assist it in carrying out its' responsibilities (UNFCCC/CP/1995/7/Add.1).

The Decision cites a number of the COPs' responsibilities for which the information from the reviews will be used. These include:

- to assess implementation of the Convention by Parties, the overall effects and cumulative impacts of the measures taken and the extent to which progress towards the objective of the Convention is being achieved;
- to guide the development of methodologies and guidelines and to facilitate the exchange of information on measures adopted by Parties.

A first step in the existing UNFCCC review process is to examine the data received in national reports for any errors, omissions or inconsistencies which would prevent summarisation of the information in a comparable way. When a problem is identified, data adjustments are carried out by the Secretariat in contact with the appropriate national representatives. This process tends to be straightforward and non-controversial.[31] This type of work has been systematically carried out through the compilation and synthesis reports which are provided by the UNFCCC secretariat to the COP.

---

[30] A first compilation and synthesis report of first national communications was presented at COP-1 in 1995, and a second at COP-2 in 1996. A first compilation and synthesis of second national communications was available in September 1997 for the eighth session of the Ad hoc Group on the Berlin Mandate.

[31] Exceptions to the non-controversial nature of this exercise do exist. For example, one country chose to adjust inventory data for temperature variations in base year; another chose to adjust for imports of electricity. Both types of adjustments change the base year level and hence the assessment of performance in any given year thereafter. The adjustments also limit the comparability among national estimates. For this reason the UNFCCC secretariat chose to revise the national estimates which had been submitted for the purposes of standard comparison among countries, as well as to present the country's own estimates. These revisions were not without controversy, as the reporting countries believed that they were justified in presenting their data in a manner that best reflected national conditions and circumstances.

In-depth Reviews are an important source of information that serve to supplement formal submissions by Parties. To date, the reviews have emphasised non-confrontational information exchange as their objective, providing an opportunity for shared learning among participants and a better understanding of particular national circumstances. The value of these reviews in their present form may be largely due to the country which is being reviewed.

At the national level, the IPCC Guidelines for inventories encourage countries to conduct verification through an internal set of review procedures (see box below). The Guidelines suggest that national analysts check inventory estimates and key assumptions against independent sources of data. Some countries are carrying out internal verification, ranging from simple internal review to comparison of estimates from competing estimation methods (Table 3). In addition, if the country has chosen an alternative method to estimate CO_2 from energy, the UNFCCC Guidelines for national communications require countries to also report estimates for using the "Reference Approach". In this way, the Guidelines set out approaches to verification, to be conducted at the national level, to improve the reliability of estimates before they reach the UNFCCC.

IPCC Reporting Instructions for National Inventories – Guidance on "Verification"

In completing the inventory you should also make a report in which you summarise the verification procedures you have used. This report should include an overall assessment of the quality and completeness of each of the main source and sink estimates for each greenhouse gas. You should ask yourself the following questions about your inventory when attempting to provide an overall assessment of the inventory's quality and completeness.

Method

- Is the approach well documented and reproducible?
- Have results been checked against other methods of estimation?
- Are measurement data part of the estimate? If so, has the source activity been summarised in part (for the remaining non-measured part of the activity) and has it been summarised in total? Have you verified that the emissions from a given activity are not included in several source categories?

Emission Estimates

- Have any estimates been compared with measured emission and concentration data?
- In some instances it is possible to cross-check emission estimates against roughly comparable statistics (e.g., for NMVOC, solvent production + imports - exports should equal total of applications). Have these checks been done and if so how do these data compare?
- Have results been compared for reasonableness with outside or independently published estimates? This could include comparison with estimates from a country of similar size or economic profile.

Activity Data Assumptions

- Does the level of activity reported cross-check reasonably well with other sources of information on this activity, e.g., with international statistics?
- Do units match emission factors reported?

Emission Factors

- Do emission factors represent operating cycles or conditions from the region reporting?
- Are the sources of emission factors well documented? Are the conventions the same as those found in the activity data e.g., using net calorific value?
- Have emission factors been compared with other sources (taking into account technologies, maintenance, operating cycles, or other conditions that may influence emission factors)?

Source: IPCC (1995); Step 3 of "Reporting the National Inventory" from the Reporting Instructions (Vol. 1)

Table 3: Examples of countries conducting some form of internal verification of inventory estimates

Belgium	national top-down estimates of CO_2 used for comparison with bottom-up estimates
Denmark	fertiliser sales and application rates compared; Danish transport model compared with COPERT
EU	national estimates for CO_2 compared with estimates developed from EUROSTAT data; CORINAIR and UNFCCC inventories also compared where there are questions about the reliability of information
Ireland	figures being checked by relevant national ministries; COPERT transport figures checked against fuel sales
Luxembourg	check measurements with data reported by industry
Netherlands	CO_2 and other industrial emissions compared using the Dutch bottom-up estimations and IPCC approaches; agreement +/- 1 per cent; regular review of factors determining emissions in each sector
Sweden	industrial EF calculated from emission measurements;
UK	informal internal checks are made by the Global Atmosphere Division for their own purposes

Source: Moran and Salt 1996 and information provided by countries

Developing Verification Under the Kyoto Protocol

The UNFCCC secretariat's thorough review of national reports provides a strong starting point for the technical review of Parties' compliance with targets and other obligations under the Kyoto Protocol. The UNFCCC review process aims to be non-confrontational and to share experience, as well as to gather information and improve the accuracy and timeliness of data. However, to be effective as part of a compliance system under the Protocol, the review process would need to include a objective assessment of compliance with all obligations of the Protocol. This would enable a clear declaration at the end of the process about a Party's status with respect to compliance.

Data corroboration

Building on the information available from the Convention's reporting process, verification procedures could be used to check the reliability and accuracy of inventory data. It is unlikely that technical verification of the final estimates would be feasible, but it is possible to include verification of main assumptions through corroboration with independent sources of information. It is also possible to verify the methods used by Parties to construct the inventories.

Corroboration of information has not been included to date in the existing review process. Instead, review of national data by the UNFCCC Secretariat -- which is carried out in the two-part procedure of In-depth Reviews and compilation and synthesis -- aims to clarify and check national data and improve its transparency. The national data are checked with those who provide the data (i.e., national experts) rather than against independent sources of information. When comparisons with independent data are made, any differences found are not publicly released by the Secretariat.

Although it would be a change in the style of the Secretariat's work, the Secretariat could be asked to extend its review activities to formally include the corroboration of national data with independent sources. For example, the UNFCCC Secretariat could validate specific historical data, used to construct the inventories, and key assumptions used in the development of projections against published statistics. A variety of different kinds of national statistics are published, documenting historical trends in many of the socio-economic activities which drive emissions (see Table 4).

Some possible difficulties with a data corroboration exercise include: differences in definitions or categories of activities; and a lack of truly independent information since often governments are the

source of much of the international data available in the literature; the additional resources that it would require. Nevertheless, corroborating data provided in national reports, with information found elsewhere in the open literature, can assist to identify inadvertent errors and inconsistencies in data reported, and thus strengthen the review process. Where significant differences are identified and cannot be explained by the Party being reviewed, the comparisons could be released in the public documents produced by the Secretariat.

Data corroboration could be a feature of both the compilation and synthesis exercise and the In-depth Reviews of the individual reports. To avoid controversy, adding the task of corroboration to the Secretariat's work would have to be initiated in response to a clear request by Parties. Expanding the Secretariat's mandate in this way would, of course, have resource implications.

Table 4: Sources of Published Data for Verification of Key Assumptions used in Preparation of National Inventories and Projections

	Type of Statistics Available	**Sources of Published Data**	**Reliability**
Energy sector	End use consumption and production data by fuel/product type, world oil prices and coal prices	IEA, UN, EUROSTAT	annual - high
Industry	commodity production and trade; value added	OECD	annual - high
Transport	road / vehicle number statistics	IRF, UN ECE, ICAO	annual - medium
Residential	household and commercial building statistics (e.g., floor area, size of hh, etc.)	IEA, UN, EUROSTAT national surveys	annual - high irregular – medium
LUC/F	Forest areas by type of forest; tropical timber production and management	FAO and ITTO	periodically (every 5-10 years) poor
Solid Waste Disposal	volumes of solid waste	local, usually not national	irregular - poor
Wastewater	volumes of wastewater treated	local or regional, usually not national	irregular - poor
Livestock	head of livestock by type	national surveys and FAO	variable quality
Rice cultivation	area of cultivated rice fields; rice production and trade	national surveys, FAO, IRRI, OECD	variable high
Ag. Soils	fertiliser sales	FAO	high
Economic growth	Gross Domestic Product over time	OECD	high
Demographic trends	Population and migration data	UN	medium

Quality management and treatment of uncertainty in emission projections

For greenhouse gas emission projections, it is possible to consider more rigorous review of key assumptions used to develop projections or to review trends in key indicators associated with the projections (e.g., GDP growth, fuel intensity and carbon intensity). On this point, corroboration of projected trends against historical trends from independent information can be insightful. While this type of verification cannot be used to ascertain compliance or non-compliance, it could help to improve data quality and to assess the robustness of national projections.

A recent OECD paper outlines approaches that can be used to manage the quality of and uncertainty inherent in greenhouse gas emission projections (OECD 1998a). The paper considers projections as a key element of national communications aiming to provide information to monitor progress under the UNFCCC. Accuracy and transparency are the main criteria addressed in national communications and as

such, the paper identifies a number of procedures that might be applied by Parties to enhance the usefulness of projections data.

It is useful to begin with a description of the sources of uncertainty in emission projections:

> *Uncertainty in emission projections stems from many sources including: gaps in scientific knowledge on emission factors; the limitations of data collection or survey techniques; inaccuracies in the representation in models of real-world technical, economic and social dynamics; and from uncertainty in the exogenous assumptions used for projections. Uncertainty in projections grows with time. Most of the uncertainty in projected CO_2 emissions from energy stems from uncertainty in future economic, technical and behavioural changes. Uncertainty in other types of emission stems mainly from the current variability of emission factors.* (OECD 1998a)

Some approaches for managing uncertainty and quality of emission projections include:

- testing projections for sensitivities to variation in key parameters such as GDP and energy prices;
- providing a range of scenarios, giving an indication of the effects of uncertainty in a large number of underlying variables;
- citing a range of projections from the national literature;
- conducting public and peer review processes in the development of the projections.

A number of other approaches could enhance the transparency and the accuracy of projections reported in national communications. These include:

- providing details on the origin and methods used to develop the projections;
- providing contact details for responsible analysts;
- ex-post monitoring of emissions against projections;
- based on ex-post monitoring, reporting on sources of differences between actual and projected emissions over time in the national communications.

The first two of the above suggestions are already required by the UNFCCC guidelines for national communications however, many Parties have failed to provide this information. The latter two suggestions would need to be added to the Guidelines but they could build on experience in a limited number of countries that are already using ex-post monitoring to strengthen their projections.

Verification of inventory and projection approaches

An alternative to verification of the inventory estimates or of projection results is to focus verification on the preparation process for these data sets. As mentioned earlier, standards of performance for inventory preparation or best practice approaches might be agreed as a means to address inventory uncertainty. If

such standards were agreed, verification of the inventory or projection preparation approach used Parties could be added to the review process to be established under the Kyoto Protocol.

For inventories, verification would thus include investigation into inventory method used by the Party, and whether the choice of method is consistent with the agreed standards for best practice. For example, if the standard is for Annex I Parties to use Tier 2 or higher level IPCC methods, this can be easily verified in the review process. Standards might also encourage Parties to carry out specific kinds of field work to ensure that input data are based on reliable data collection techniques. Again, checking records on the type of field collected and used to construct the inventory could become a routine part of the review exercise.

Agreement on best practice approaches for projections would take longer to achieve than such an agreement for inventories. However, if specific standards were agreed, a similar review exercise for projections could be envisaged.

Problem assessment

There is scope to extend the UNFCCC In-depth Review process to the Kyoto Protocol and to include discussion and review of specific problems related to compliance. Problem areas could be identified in advance of the review visit, thereby giving the Party time to consider its position and possible responses. Review visits could contain a more critical component, aiming to explore specific problems preventing or limiting the Party's ability to comply with its international obligations. Where the problems relate to an lack of capacity or targeted resources, it may be possible for the review exercise to refer the problem to an implementation body which could assist the Party. Thus, the In-depth Reviews could become an increasingly important mechanism for dialogue with individual Parties under the Kyoto Protocol, allowing early problem identification and resolution. This approach could require significantly more advance preparation than the present review process but it could enhance the value of the reviews to the country being examined and to all Parties by encouraging compliance.

Linkages to independent research and review activities

There may also be a role for the other inter-governmental organisations, such as the IPCC/OECD/IEA National Greenhouse Gas Inventory Programme, in the establishment and implementation of verification mechanisms under the Convention. For example, the IPCC might be asked to assist the UNFCCC Secretariat by lending expertise or in-kind products, timed to assist with their work. Alternatively, verification of inventories, and development of verification methods might be requested as an IPCC input to the UNFCCC process.[32] In a similar way, the review of compliance by the UNFCCC might be supplemented by a targeted use of the information provided in OECD or IEA policy performance reviews. These linkages do not need to be formal connections under the Convention to provide effective contributions to the wider verification and compliance process.

Other possible linkages would be to use independent auditors or experts to certify or to rate the quality of information reported by Parties under the agreement. This might be similar to an audited financial report, a bond rating, or an eco-label on a consumer product. Independent auditing could be envisaged to help to enforce standards of best practice for the preparation of greenhouse gas inventories or projections that might be adopted under the agreement.

[32] The 1998 IPCC work programme includes work some on inventory uncertainty assessment and verification procedures.

Another useful source of information and means to achieve openness in an agreement is for non-governmental environmental organisations to perform independent reviews of national performance (e.g. USCAN 1995 and CAN 1997). Reviews performed by non-governmental organisations have proven to be an extremely useful method to exert pressure on Parties to comply with international agreements, as well as to raise public awareness about the issue being addressed (Victor *et al*., 1997 and Cameron *et al*., 1996; Chayes and Chayes, 1995) . The value of such reviews is well recognised by some OECD governments, who have provided financial support for non-governmental organisations. Several such review activities have emerged to follow national performance with respect to the UNFCCC, and this could be encouraged in the verification that emerges for the Kyoto Protocol. At a minimum, the UNFCCC internet site could provide links to other relevant "review" information available on the internet. These internet links could extend to relevant sites for non-governmental or inter-governmental organisations that are recognised as "observers" under the Convention.

Political verification and timing of the exercise

The political assessment task is the second step of a possible verification process for an international agreement. This step would require a declaration by the COP or a designated subsidiary body about the compliance of individual Parties, which in turn would trigger responses to non-compliance or enforcement action. At present, no process under the Convention is handling the political assessment of compliance. Even when the reports of the Secretariat have identified where Parties are deficient in meeting their obligations under the Convention, the Subsidiary Body for Implementation (SBI) or the COP have not acted upon this information to formally acknowledge and act upon instances of non-compliance. The Convention and the Kyoto Protocol provide for establishment of a multi-lateral consultative process, (MCP) (Article 13 of the UNFCCC), however this mechanism has yet to be established.

In the early stages of implementing an agreement, there may be great value to focus the attention of institutions on information-gathering and shared learning. However, now with the Kyoto Protocol in place, it is timely to move toward political assessment for at least a minimum set of the new obligations. The procedure might address reporting obligations first, building toward more concrete emission mitigation obligations over time. The political assessment task could be subsumed as part of the multi-lateral consultative procedure. The need for this task might also be addressed in part if automatic non-compliance responses were part of the compliance system. (See Section 6 for a more detailed discussion of the MCP).

Formal recognition of problems with compliance is not clearly part of the UNFCCC Secretariat's current mandate for review of national reports. In support of a stronger review process, the Secretariat might be specifically requested to identify compliance problems in their reports to the COP and subsidiary bodies. Secretariat reports could cover the full range of possibilities, from clear declarations of non-compliance to indications of the likelihood of non-compliance.

The political assessment task might be most effective if conducted by a small group of Parties that would be established to consider compliance issues and to report to the COP. Such a group could be allowed to consider various sources of information on national performance, either working through the Secretariat or on its own. An assessment of compliance by the body could be based upon all available information from reliable sources, including but not limited to the Secretart's In-depth Reviews.

Political verification and final compliance assessment could be complemented with interim assessments of performance. Because of the time lag for inventory data, final compliance assessment could not occur until two to three years after the end of the commitment period. To advance the assessment process,

countries could be requested to provide estimated inventory data for current years. This, combined with forward looking compliance assessments, could be established as an interim or preliminary political assessment process.

Verification of sinks and baskets: to improve data quality

Emissions/removals from the land use change and forestry sector are monitored with difficulty, and national level estimates are not verifiable. Forest areas are known with greater certainty and can be verified with global satellite imagery data (IPCC 1996; and Lanchberry *et al*., 1992), but unfortunately, forest areas are an imperfect proxy for greenhouse gas emissions. In contrast, the smaller scale of project-level activities allows them to be monitored easily , making emission/removal estimates from this sector at the project level would be verifiable.

At a minimum, inventory data quality, and specifically, uncertainty should be explicitly addressed in the design of an agreement and in monitoring and verification procedures to be adopted. Verification approaches to encourage data quality could include the following:

- to allow for stronger verification, require more detailed reporting of national greenhouse gas emissions and removals by individual sources and sink activity;
- continue to require reporting of individual greenhouse gases along side of the aggregate CO_2 equivalent inventory estimates;
- strengthen verification efforts (national and centralised) with emphasis on gases with the greatest uncertainty and which account for a significant portion of total national emissions (base year) and emission reduction activity (future) for each individual Party;
- through the use of standards or codes of good practice, focus verification on inventory preparation approaches rather than on uncertainty of estimates *per se*;
- consider the use of independent auditors or certifying agents to provide technical verification of data;
- where countries have reported unusually low uncertainty for estimates of a particular gas – source or sink, verification might also focus on these estimates to better understand and share information on how improved data quality can be achieved.

These approaches would aim to improve information flows on emitting activities associated with the greatest uncertainty. Strengthening verification would not only provide information upon which to assess compliance, but it could also aim to share relevant experience among countries.

Five year commitment periods

Multi-year commitment periods for greenhouse gas reduction targets do not introduce significant added complexity for verification. Verification of compliance over multi-year periods will require annual national data on inventories for the period in question. Annual submissions will facilitate review and quick identification of problems. To enhance the possibilities for corrective action, forward looking compliance assessment will become important. Annual emission projections or projections for individual

budget periods will also be necessary. The UNFCCC guidelines for Annex I Party national communications already require annual inventory data from Annex I Parties but do not require annual projections of greenhouse gases.

Joint Attainment of Targets by Two Parties

As the main Party to the UNFCCC that has actively developed a strategy for the joint attainment of targets by a number of individual nation states, compliance issues concerning the European Communities is of special interest. The EC established the European Environment Agency and tasked it to provide independent information on the environment in Europe. The fact that this institution was created at all demonstrates the difficulty and the importance of obtaining good, internationally-consistent information on the environment (Greene and Comes, 1996). The EEA is tasked to provide "objective, reliable and comparable information at the European level" on environmental quality in Europe.

One might envisage a broader partnership role for the EEA on climate change, especially to support the EC as a Party to the Convention. The EEA could be asked to assist with the review and verification of climate-related data in Europe. In this role, it could become an important partner with the UNFCCC Secretariat and the EC, serving to strengthen the monitoring and verification of the EC's performance on climate change. An alternative would be for it to provide direct assistance to the EC in the preparation of its report under the Convention.

As discussed in Section 3, the EC as a Party to the UNFCCC presents advantages and disadvantages. Because a portion of the mitigation commitments are within the competence of the EC, and a portion are within the competence of Member states, the responsibility for compliance with UNFCCC obligations is split among the EC and its Member states. While this offers double coverage or assurance for mitigation obligations and double coverage of reporting obligations, it also introduces an element of confusion into the compliance process and could complicate the review process. For example, under the "bubble" approach, both the Member states and the EC will have the responsibility for ensuring that targets are met. In this case, it is essential that the division of responsibility for meeting targets is clearly identifiable from the terms of the Protocol. This issue was important in the negotiation of the Kyoto Protocol.

NON-COMPLIANCE RESPONSES AND ENFORCEMENT

Aim

International responses to compliance problems under multi-lateral treaties should aim first to encourage compliance, to help Parties to find solutions to overcome barriers to compliance, and to provide incentives and establish a plan for compliance. Enforcement approaches might be called for in instances of persistent or significant treaty violations.

This section of the paper addresses several key questions in the context of the Kyoto Protocol:

- Based on a review of lessons from other international agreements, what mechanisms are available to respond to non-compliance and enforce provisions of the Protocol?

- As the first multilateral environmental agreement to explicitly set out a non-compliance procedure, what lessons can be learned from the Montreal Protocol?

- What is the likely role of Article 13 (Resolution of Questions Regarding Implementation – Multilateral Consultative Process) and Article 14 (Settlement of Disputes) in a compliance system for the UNFCCC?

- How might the various non-compliance response and enforcement options be used in compliance provisions under a climate change agreement?

Main Approaches

The spectrum of international responses to compliance problems under international agreements is quite narrow. By comparison, national governments have a much wider range of instruments and approaches available to them. National governments have a legal basis for implementation of multilateral environmental agreements (MEAs); implementation of international agreements occurs at the domestic level through the use of domestic policy instruments which include instruments for enforcement. Regulations and fiscal instruments (e.g. grants or taxes) can be used at the national level either to encourage compliance or to penalise non-compliance. International agreements also cannot compel compliance if a Party fails to implement all of its obligations. Enforcement of MEAs has therefore occurred principally at the domestic level through the use of domestic policies (Victor *et al*., 1997).

International agreements can establish the imperative for national action and may even provide specific guidance for the domestic policy action needed to implement the agreement. While international agreements do not dictate to sovereign governments the types of policy action that must be taken, they do tend to set broad norms for participating states. By setting clear timetables for action and delineating the scope of actions required for consistent and systematic implementation of its provisions, an agreement

will encourage co-ordinated national policy action. Further, through provisions to share information, international agreements can facilitate shared learning and policy co-ordination among participants.

Mechanisms to encourage compliance in MEAs range from management approaches (soft) to enforcement approaches (hard) (Raustiala and Victor, 1997; Chayes and Chayes, 1995). Management approaches are based on the belief that states are willing, able and likely to comply. These approaches presume that compliance problems stem from a lack of capacity or from other unintentional or uncontrollable circumstances. Management approaches aim to provide incentives or to establish the conditions for compliance, and can range from reporting to providing advice or other forms of assistance (Victor *et al*., 1997).

Advocates of enforcement approaches view international law as a vehicle for imposing specific obligations on nations. These approaches presume that states are rational decision-makers and will not necessarily comply with an international agreement unless it is expensive not to comply (Raustiala and Victor, 1997). A treaty designed with enforcement approaches would include measurable obligations enforceable through compulsory, binding dispute resolution or by imposing trade or economic sanctions on those reneging on their commitments (O'Riordan *et al*., 1989). Enforcement approaches are frequently used with arms control treaties, where national security demands strict compliance due to the high stakes of non-compliance (Greene, 1996; and Ausubel and Victor, 1992). While enforcement approaches are much rarer in MEA, some recent examples are found in the Montreal Protocol and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Lang, 1996; Victor *et al*., 1997; and Lanchberry, 1997). Some analysts argue that the demand for and use of enforcement approaches may rise as agreements attempt to achieve deeper international co-operation on the environment (Fischer, 1991; Raustiala and Victor, 1997).

Expert views differ on the value of soft and hard approaches to respond to non-compliance. Some believe that only softer responses are effective in the international system (Chayes and Chayes, 1995; Young, 1992). Others believe that harder enforcement measures are needed to ensure compliance (Ausubel and Victor, 1992; Werksman, 1996; Raustiala and Victor, 1997). Oran Young (1992) stated that "enforcement is even harder to use effectively (not to mention, efficiently) in international society than it is in domestic society." However, it may be that, as more stringent environmental standards are set internationally, the demand for legal enforcement will increase.

Management approaches to identify and address compliance problems include the following:

- national reporting and other data collection;
- review and verification of information reported to assess compliance, identify problems and refer them to the appropriate mechanisms for resolution under the agreement;
- consultation and negotiation; and
- mediation, conciliation.

Beyond the more traditional approaches noted above are management approaches with "carrots" or "sticks":

- funding or technical support to assist parties to comply; and
- issuing warnings or cautions.

At the end of the spectrum are possible enforcement approaches:

- making funding conditional upon compliance;
- suspension of rights or privileges;
- trade measures; and
- financial penalties or economic sanctions.

Lessons from International Agreements

Until recently, multilateral environmental agreements (MEAs) have not included effective mechanisms for handling problems of non-compliance (Victor *et al*., 1997, Cameron *et al*., 1996). As noted in Section 4 on verification, many agreements include requirements to submit reports, but often little has been done with the information. A few agreements have included modest mechanisms for reviewing implementation, but they generally do not have systems to address compliance problems, if detected.

The Convention on Long-Range Transboundary Air Pollution, implemented under the auspices of the United Nations Economic Commission for Europe (UNECE), provides an example of an agreement that has taken more than a decade to establish an operable system of data collection and review. While early protocols under the agreement required data reporting, instances of non-compliance with reporting provisions were not acted upon, and there was no formal mechanism for review of this information (di Primio, 1997; Raustiala and Victor, 1997). The 1994 Second Sulphur Protocol establishes an "Implementation Committee," composed of representatives from eight Parties. It is tasked to review implementation and compliance by Parties and report to the Executive Body. Its objective is to recommend solutions in cases on non-compliance, such as assistance for the non-complying Party or other measures. Unfortunately, the Implementation Committee has not been tested, as the Protocol has not yet come into force (di Primio, 1997; and Mullins, 1997).

The Montreal Protocol was the first MEA in force to include an operational compliance system, including penalties for non-compliance (Szell, 1996). Its Non-compliance Procedure (NCP) contains elements of a variety of dispute settlement procedures and mechanisms to assist Parties in the case of non-compliance (see box). Perhaps the most important feature of the NCP is the possibility to progressively rely on "harder" approaches once a Party is deemed out of compliance. This is not accomplished through the NCP *per se*, but through its linkages to the financial mechanism of the Protocol (MLF), and also to the full Meeting of the Parties, which has the power to revoke privileges and invoke penalties for non-complying countries (Lang, 1996; Victor, 1996; and OECD, 1995).

The Montreal Protocol may provide useful experience for the design of a compliance system for the UNFCCC and the Kyoto Protocol. It draws on a wide range of measures across the spectrum of management and enforcement options. Much of the effectiveness of the Montreal Protocol is attributed to its use of trade measures as an enforcement mechanism. Management approaches have also been used with good results. Informal linkages to financial resources and institutions external to the agreement have proven to be particularly effective to help to influence performance.

However, there are also some important differences between the objectives of the Montreal Protocol and those contained in the UNFCCC. The Montreal Protocol aims to eliminate, rather than to manage, the environmental threat it was created to address. It also addresses a rather limited set of chemical

substances. Both of these features of the agreement facilitate its use of trade measures, which appears to be critical to its effectiveness. Even though the problem addressed is in many ways simpler, implementation problems still exist. Illicit production from a major Member state and an important black market for trade in controlled substances are two of the most pressing problems plaguing the agreement. (OECD, 1997e.) Future approaches for addressing these problems of "leakage" may be particularly relevant to enforcement of emission reduction targets.

The Montreal Protocol: Experience with Implementation and Compliance

In 1990, the 2nd Meeting of the Parties (MOP) of the Montreal Protocol established "interim procedures" and an "interim committee" for the Non-compliance Procedure (NCP) of the agreement. The terms of reference were clear; the NCP should help the MOP:

- to determine situations of non-compliance
- to decide on treatment of Parties found to be in non-compliance
- to identify solutions

The years 1990-93 were the formative years of the Implementation Committee. A number of principles guided its operation:

- simple
- not confrontational and non-judicial
- transparent
- under the supreme authority of the MOP

The Implementation Committee is a standing committee and has a role in general assessment of Parties' compliance under the MP; its responsibilities include evaluation of performance and general monitoring. Parties experiencing problems in the implementation of the MP can trigger the procedure. Initially, the IC was assigned the role to review compliance with Parties' obligations to report data. They began work slowly, in order to develop a common understanding among all Parties of its terms of reference. Its functioning preserved the authority of the MOP and provided full transparency of its activities to the MOP. Membership in the IC is representatives of specific Parties, rather than individuals named in their own capacity. Selection of Parties is based on geographic and regional balance. Institutional links with other parts of the MP committee structure are key to the success of the IC. The IC is able to establish an operational link when necessary to the Funding Mechanism and to the Technical and Economic Advisory Panel (TEAP), as well as to the implementing agencies of the MP (i.e. UNEP, UNDP, and the World Bank).

The Committee searches for innovative ways to address questions regarding the performance of Parties to the MP. Emphasis in the Committee is on solutions and establishing plans for achievement of compliance under the MP. In this way its focus is not on dispute settlement but on dispute avoidance. Early work of Committee reviewing compliance with reporting and data issues served to build confidence in the procedure and allowed its development to proceed while addressing relatively non-controversial issues.

The small size of the IC is a strength, allowing it to work more efficiently than would be the case with a much larger group of Parties. However, the naming of Parties rather than individuals to the IC may also hinder its effectiveness due to a lack of continuity. Leadership in its early years of operation and its ability to test ideas and approaches to solutions on non-controversial issues of reporting may also have proven critical to Parties' positive perception of the NCP. The ability the Committee has to link to other mechanisms under the MP significantly strengthens its ability to design appropriate solutions (e.g., working with the Technical and Economic Advisory Panel) and to ensure their implementation. Linkage with the financial mechanism is particularly powerful as an incentive for Parties to work with the IC because when a Party chooses to trigger the Non-compliance Procedure additional financial assistance may be made available to help the Party achieve compliance.

Source: Schally, 1996; Szell, 1996; Victor, 1996; and Victor, 1997

Establishing A Compliance System for the Kyoto Protocol

A compliance system for the Kyoto Protocol might include a continuum of mechanisms intended to address different levels and types of compliance problems. Responses to violations of reporting obligations might be addressed quite differently than a failure to achieve main substantive obligations, such as emission reduction targets. For example, responses to a first time violation or to a Party that is not likely to achieve compliance might aim to develop a plan for implementation. The plan would need to be agreed on by the Party in question and adapted to the needs of the Party. By comparison, persistent treaty violations might require recourse to enforcement approaches which are at the other end of the continuum.

The full range of management and enforcement approaches is discussed briefly below, drawing on lessons for other international agreements. Unilateral sanctions as a means to enforce multilateral agreements are also briefly considered as another enforcement option. Dispute resolution is presented as another available response which would operate in parallel with other possible responses.

Basic Management Approaches

As discussed in Sections 2-4, reporting, review and verification are the principal means to provide transparency and openness in an agreement and are critical elements of a compliance system. They encourage compliance by making treaty violations public. Once openness and transparency have been achieved, diplomatic ties among nations, pressure from non-governmental organisations and increased public awareness will help to keep states in compliance and responsive to their international obligations. National reporting is widely used as the main approach to collect data on performance. It is also typically the first point of contact of national bureaucracies with the provisions of an international agreements. As national bureaucracies are eventually responsible for implementation of the agreement, early reporting can facilitate long term implementation of the agreement (Chayes and Chayes, 1995).

Review and verification measures are also key to ensuring transparency and enhancing performance. While many international agreements contain provisions for review of national reports, national performance is rarely subject to careful review (Chayes and Chayes, 1995). The UNFCCCs' review procedures are already quite elaborate compared to review procedures in other MEAs, and are useful to a compliance system. However, there is room to expand the focus of the UNFCCC review procedures to include not just national reports and data quality issues, but also to explicitly address the overall performance of states with respect to substantive obligations. The OECD policy performance reviews may provide some useful lessons in this respect (see Section 4).

The World Trade Organisation's review panel approach is another possible model for policy reviews under the UNFCCC. The WTO process conducts regular and comprehensive review of national trade policies. It is designed to be a pro-active mechanism for performance assessment and to facilitate the early recognition of compliance problems. Moreover, problem identification through the review process could be the first step to the creation of a strong system to address compliance problems under a new agreement (Victor, 1995 and Mumme, 1994).

Another possible model for a strengthened review process is that used by the International Labour Organisation (ILO) (Chayes and Chayes, 1995). The ILO requires extensive reporting by countries to monitor and help to enforce implementation of its various conventions. Review of these reports is performed by a Committee of Experts which is comprised of individuals who are named in their personal capacity as experts in labour issues. The Committee performs an in-depth review of national reports and provides individual countries with a clear indication of compliance problems. The Committee of Experts

also suggests corrective action. A standard grace period of two years allows the country time to come into compliance. This period may be extended if the country is clearly moving toward compliance. If non-compliance persists, the violation is reported to the Conference Committee as part of its annual report. This report identifies individual countries and the nature of the compliance problem. The Conference Committee addresses the most serious violations in a session where the country in question must be present and defend its position. The strongest action available to the Conference Committee is to "blacklist" a country. Seven different types of violation can result in blacklisting; one of these is continued failure to implement a convention. A number of interim steps are possible, including a warning system and the possibility for the country to request a site visit by International Labour Organisation secretariat to work toward a solution to the problem. As of 1995, blacklisting had been used in only three instances, but warnings had been much more numerous (23 instances) (Chayes and Chayes, 1995). The low ratio of blacklisting to warnings indicates that the system has been effective in limiting the frequency of serious violations.

Strengthening the UNFCCC review process in the directions noted above would be a clear move toward an adjudication-type process. This may not be necessary or desirable in the early stages of the agreement. However, a stronger review process is likely to be warranted as the obligations for greenhouse gas mitigation become more stringent. In addition to encouraging compliance, review that engages all parties and that encourages information-sharing will help the agreement to evolve over time by raising the common level of understanding of the issues being addressed.

Consultation and Negotiation

Consultation and negotiation implies an exchange of views with the objective of working out a disagreement or better understanding the reasons for non-compliance. Negotiation of an approach to facilitate or assist the Party to come into compliance may be the final outcome. Consultative approaches are valuable as a means to manage compliance problems. The international community recognised this by including Article 13 in the UNFCCC on a multilaterial consultative process.

Guidance on the implementation of Article 13 has not yet been advanced by the Conference of the Parties (see box). However, an ad hoc committee under the UNFCCC has been considering various possible design features of the consultative mechanism for the Convention. The group has not reached consensus on the basic design features needed, but it has carefully identified the questions that need to be addressed. The ad hoc committee aims to complete its work by the fourth Conference of the Parties in order to be able to take into account the outcome in Kyoto. The consultative mechanism for a protocol could be the same as that for the Convention; at a minimum, it will be important to limit duplication between the procedures adopted for the Convention and for the Protocol.

Mediation and Conciliation

Mediation and conciliation are the next step toward formal dispute settlement from consultation and negotiation. Mediation involves a third-party charged with helping to maintain constructive discussions and to reach agreement on the way forward. A mediator does not have the power to impose an outcome on a Party. Conciliation gives more formal powers the mediator. It includes appointment of a group to evaluate factual issues whose main task is to establish the facts of the case. In addition, the group may be empowered to propose solutions; however, a Party is not obliged to accept the solutions. The objective of conciliation is to find a compromise solution to the problem. International environmental agreements using these mechanisms include: the Vienna Convention; Biodiversity Convention; and the 1993 North

UNFCCC Provisions – Article 13

The Framework Convention's Article 13 calls on the Conference of the Parties (COP) to "consider the establishment of a multilateral consultative process, available to Parties on their request, for the resolution of questions regarding the implementation of the Convention". The COP has set up an ad hoc committee, AG-13, to explore how such a multilateral consultative process (MCP) would work under the UNFCCC.

Parties are cognisant that the MCP could be applied to the new climate change agreement and the AG-13 discussions are being conducted in that vein. Article 13, rightly, did not contain more specificity because commitments and institutions for managing compliance are a package, and the design of the system should be focused on the specifics of each agreement. Although the AG-13 has spent hours deliberating the design of a MCP, many Parties are hesitant to take firm positions on how a MCP should work until there is more certainty about the requirements and obligations under the new agreement.

The nature of the outstanding issues under AG-13 reflect the uncertainty of many Parties regarding how much they wish to replicate of the Montreal Protocol's Implementation Committee. While there is general agreement that the MCP should focus on specific questions of implementation and should be conducted in a "facilitative, co-operative, non-confrontational, transparent manner and be non-judicial," there is still considerable disagreement about certain critical issues whose resolution would have significant implications for how compliance would be handled, particularly under a new agreement. These issues include:

- Who triggers the MCP? Would a Party self-report its own compliance problem or could a Party(ies) report on another Parties' compliance problems. This issue is sensitive among countries who oppose a body that would be supervisory rather than advisory, particularly in a legally-binding agreement.
- What is the nature of assistance? Should the MCP just clarify questions? Should assistance be purely technical or also financial? In an agreement addressing climate change, requests for technical and financial assistance to help with implementation and or compliance issues could be significant, particularly given the number of Parties and range of sectors involved.
- How would the Implementation Committee be organised and represented? Would it be ad hoc or standing? Would there be a small committee or large one? Would there be equal geographic distribution even if many Parties are not subject to QELROs? Would representatives represent themselves or their governments? These issues increase in importance if the Implementation Committee were to recommend financial assistance and/or had a "supervisory" mandate.
- What would be the outcome of the Implementation Committee's deliberations? Would the Implementation Committee have authority to take action? Would it make recommendations to the SBI or directly to the Parties? What would be the rights of the Party in question?
- What are the consequences of non-compliance? While this question would be answered in the agreement itself, and not in the AG-13, the answer will increase the significance of how the MCP is structured.

These questions get to the heart of what a body that is established to consider compliance and implementation problems should be.

American Agreement on Environmental Co-operation (NACE). NACE is unique in that it allows one party to challenge another for persistent failure to effectively enforce (domestic) environmental laws. The dispute is referred to a dispute panel which is empowered to impose sanctions if the country fails to respond. The use of such a comparatively advanced procedure may be possible because only three countries are involved. Such a process would be hard to envisage at the present time in a global context.

Source: Contributed by Other Management Approaches

Management approaches may also provide direct incentives or "carrots" to Parties to assist with implementation of the agreement. If "carrots" are part of the system of compliance mechanisms, then it is also possible to imagine taking "carrots" away as a penalty for failure to comply. Measures with "sticks" are those that clearly identify non-compliance and penalise Parties for failure to respect their obligations under the agreement.

Funding or technical support to assist Parties

Funding or technical support to assist Parties to comply is one of approaches that has emerged in recent MEAs. Both the Montreal Protocol (MP) and the UNFCCC provide financial assistance to developing countries to build capacity for analysis and assessment of the national situation and to assist with the gathering of baseline data. Under the MP, a direct link between the Implementing Committee (see box) to the Multilateral Fund has built confidence in the constructive, co-operative nature of the procedure. The Implementing Committee may request additional financial assistance from the Multilateral Fund for Parties in need. Also, early in its operation, the Implementing Committee initiated establishment of an expert group on reporting to assist Parties with these commitments (Schally, 1996; Victor, 1996). This group identified the problem of capacity to implement the agreement as being at the root of many national compliance problems. It also provided a push to redirect resources and support for additional capacity-building through the various institutions supporting the implementation of the Protocol (Victor, 1996).

The financial mechanism of the UNFCCC (operated through the GEF) also provides funding to needy EIT countries to assist them with implementation of their reporting obligations. Additional financial assistance is available for investment in technology projects with low greenhouse gas emissions.

In addition to formal assistance under the Convention, informal mechanisms are also relevant. The Annex I Group is an example of an informal mechanism that provides technical and analytical assistance to a group of Parties. The Group's activities include full participation of all countries listed in Annex I of the UNFCCC, but it is wholly funded by Annex II Parties. The financial support for this activity is provided by Annex II Parties through the OECD, and the secretariat support is provided by the OECD and the IEA. Both of these organisations are formally independent of the UNFCCC set of institutions. The Annex I Expert Group has provided a mechanism for all Annex I countries to discuss problems related to implementation of their obligations and to propose solutions to the Conference of Parties. It may be seen also as a informal mechanism to share experiences and to provide assistance to some of the Annex I countries.

Another informal mechanism that might emerge would be the linking of climate change to activities of the international financial institutions (IFIs), such as the World Bank, the regional development banks or the International Finance Corporation (IFC). Many development assistance projects financed through the IFIs will have lasting impacts on the greenhouse gas emissions of the country where the project is located. The World Bank and the IFC have recently adopted environmental guidelines for project investment. This type of linkage of issues among independent institutions can constitute a powerful, yet informal mechanism for the enforcement of MEAs. Experience under the Montreal Protocol demonstrates the value of such linkages (see box). Several observers argue that informal linkages are critical to successful implementation of an agreement and must be seen as an integral part of a compliance system (Victor et al., 1997 and Chayes and Chayes, 1995).

Issuing cautions

Issuing cautions is one way to draw attention to non-compliant behaviour, and to warn Parties of the intention to invoke more severe penalties, such as a suspension of rights or privileges. It is classified here as a management approach that carries a "stick." Cautions of different types could be developed, corresponding to increasingly significant types of problem behaviour or instances of non-compliance. For example, a "blue" warning might be issued for persistently late reporting or for reporting which contains major gaps in the inventory or other required data. A "yellow" warning might be issued for failure to co-operate with the review of information. A "red" warning might be issued for persistent or significant non-compliance with agreed targets. Warnings would add to the information publicly available on the overall performance of individual Parties to the agreement.

Informal Linkages to Ensure Compliance: Lessons from the Montreal Protocol

In the Montreal Protocol on Substances that Deplete the Ozone Layer,...most funding to address problems of poor implementation comes from the Protocol's Multilateral Fund, but the financing necessary for …[a number of] states to comply with the Protocol flows from the Global Environmental Facility (GEF), a separate entity. In practice the GEF has made its funding contingent upon the prior approval of the parties to the Protocol. When non-compliance by …[a number of Parties] became apparent, the GEF required those countries to have implementation plans approved via the Protocol's Non-compliance Procedure before funds were disbursed. The GEF's conditionality has, in turn, induced …[an important Party] to supply data after years of refusal. These data have made it easier to assess …compliance, to track emerging problems such as illegal trade in ozone-depleting substances, and to assess the overall effectiveness of the Montreal Protocol. In essence, the GEF acted as a critical part of the SIR [system for implementation and review], ensuring that the system operated well. The Montreal Protocol's SIR includes the GEF, although the Protocol's legal commitments do not formally empower the GEF.

Source: Excerpts from Victor *et al,*. (1997); brackets added by the author.

As mentioned above, relevant experience may be found in the elaborate compliance procedure of the International Labour Organisation (ILO) agreement (Chayes and Chayes, 1995). This procedure culminates in a decision to "blacklist" a member where "special or persistent" compliance problems exist. Seven categories of infraction are listed that could lead to blacklisting. Four of the seven infractions relate to reporting obligations demonstrating the importance attributed to the these obligations.

Warnings could be automatic, rather than discretionary response measures. To be automatic, they would need to be issued based on clear performance criteria that would need to be agreed on in advance by all Parties. In this way, warnings could be systematically and fairly implemented without requiring discretionary decision-making by the Conference of the Parties or its subsidiary bodies. Warnings could be linked to the suspension of rights and privileges or they could trigger the multilateral consultative process of the agreement to design a plan for compliance.

Enforcement Approaches

Making funding conditional upon compliance

Making funding conditional upon compliance might be an effective means of taking a "carrot" away to encourage compliance. Of course, it can only function for Parties that are eligible for funding under the UNFCCC, and these are principally developing countries. For these countries, compliance with targets is not an issue in the near term. Limited financial support for EIT countries is available under the Convention, and this support could be made conditional upon compliance with specific obligations of the new Protocol, beginning with reporting obligations. Ensuring compliance with reporting obligations is another relevant objective. Further, as noted in the example from the Montreal Protocol above, there may

be opportunities for informal linkages with other institutions providing financial support to projects that will influence greenhouse gas performance and reporting under the agreement.

Suspension of rights or privileges

Suspension of rights or privileges or "membership sanctions" are frequently used to enforce international agreements (Chayes and Chayes, 1995). Sanctions of this sort might extend to a member's eligibility for financial assistance or to voting privileges under the agreement. If emission trading is part of the agreement, the right to participate in this system might be suspended (Mullins and Baron, 1997). Membership to the agreement is the most severe form of sanction that might be imposed on a member not in compliance with the basic provisions of the agreement. Experience has shown that these sanctions are used only in extraordinary circumstances (Chayes and Chayes, 1995). Suspension of membership rights risks serious dilution of the agreement's effectiveness by excluding participation of the Parties which are out of compliance and possibly in need of assistance to achieve compliance. In practice, this type of sanction is only likely to be levied against Parties that are not a major power, which undermines its legitimacy as an international instrument.

Trade measures and economic sanctions

Trade measures are increasingly used in international agreements to encourage compliance (Charnowitz, 1996). Examples of MEAs that use trade measures include: the Montreal Protocol (MP) (Victor, 1997 and OECD 1997e); the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Lanchberry, 1997 and OECD, 1997d); and the Basel Convention on the Transboundary Movements of Hazardous Waste (OECD, 1998, *forthcoming*).

Under the Montreal Protocol, trade in ozone-depleting substances is banned with non-Parties (Charnowitz, 1996; OECD, 1997e). Trade measures are waived if non-Parties voluntarily submit data that demonstrates compliance. The trade measures are thought to have successfully encouraged wide participation and hence boosted the effectiveness of the agreement (Benedick, 1991). Use of trade measures in the Montreal Protocol is made relatively easy by the market conditions of the products being controlled, i.e., small markets in overall economic terms, a limited number of products and a small number of producing companies. In recent developments under the Montreal Protocol, UNEP and the World Customs Organisation will co-operate to implement standard custom codes to facilitate tracking movements of ozone-depleting substances. This is one of several steps to improve Parties' ability to reduce illegal trade (OECD, 1997e).

Under CITES, trade of specimens can be banned when Parties fail to implement domestic legislation and control trade as required by the Convention. Parties can also be expelled from the agreement if persistent violations occur, thus effectively excluding the Party from trade in CITES-controlled specimens (Lanchberry, 1997; Raustiala and Victor, 1997). The environmental effectiveness of trade measures used in CITES, even in this context, where the explicit objectives of the agreement are to control trade and international markets for products, is difficult to ascertain. This is because trade is only one factor putting pressure on wildlife, and rarely the most important one. Enforcing the controls at the border is difficult for customs authorities, as some 30 000 species are listed in CITES. CITES is seen as a 'living convention,' showing adaptability and resilience to respond to changing circumstances over time. Its provisions are thought to have limited the demand for products though the control of international trade for many of the species it is intended to protect (OECD, 1997d).

The WTO, the OECD and UNEP are currently examining in some detail the use of trade measures in environmental agreements. The WTO Committee on Trade and Environment has noted that trade measures based on specific provisions may be needed "to achieve the environmental objectives of an MEA, particularly where trade is related directly to the source of an environmental problem" (WTO, 1996). They observe that trade measures have played and are likely to continue to play an important role in the future. The final outcome of this work will not be available for some time, but the conclusions within the WTO could have important implications for the possible use of trade measures under a climate change agreement (Charnowitz, 1996).

Dispute settlement in the application of trade measures is another important question. The WTO Committee on Trade and Environment stated in its 1996 report to Ministers:

> *While WTO Members have a right to bring disputes to the WTO dispute settlement mechanism, if a dispute arises between WTO Members, Parties to an MEA, over the use of trade measures they are applying between themselves pursuant to the MEA, they should consider trying to resolve it through the dispute settlement mechanism available under the MEA.*[33]

The findings of the WTO Committee on Trade and Environment, as cited above, imply the acceptance of trade measures as a legitimate instrument in MEAs. The use of trade measures under a climate agreement is clearly possible. Nevertheless, designing or using trade measures under the UNFCCC or the Kyoto Protocol would not be straightforward.

The use of trade measures in the UNFCCC could be difficult because of the large number of types of products (e.g. fossil fuel products; wood products) that would have to be controlled, and possible implications for the GATT. A key challenge in the trade and environment area is how to treat process and production methods (PPMs) in the trade system. Process methods can be critically important in environmental terms, but the trade system is reluctant to allow policy measures to differentiate between products based on PPMs. For example, a country may choose to ban imports that are produced in a way that does not conform with the terms of an MEA. Such a choice could be used to help enforce the obligations of the Kyoto Protocol. The status of such a policy under WTO law is unclear. One design option for emission transfers or trading might be to only extend participation in the system to Parties that are conforming with agreed inventory codes of good practice or methods. If such action were to be interpreted as a PPM, then the question would be whether banning trade of emission permits or credits with Parties that have not conformed with specified standards would be a WTO issue.

Other forms of economic sanctions are available in international agreements; however, their effectiveness is questionable (Chayes and Chayes, 1995 and Mumme, 1994). Mumme describes economic sanctions available to address environmental management problems along the United States-Mexico border. Based on his analysis of the practical use of these instruments, he questions the extensive reliance on economic sanctions and trade measures that was built into the North American Agreement on Environmental Co-operation. He suggests that alternative approaches could be more effective, since economic sanctions are often not used. The value of persuasive accountability and co-operative approaches may be more effective than economic sanctions in the long run because they are more likely to be used in a consistent way (Chayes and Chayes, 1995 and Mumme, 1994).

---

[33] WT/CTE/1, 12 November 1996, para. 178 as cited in OECD 1997d.

Financial penalties

Financial penalties would seem to be even more difficult to implement than economic sanctions to enforce MEAs. Financial penalties for non-compliance were recently proposed as a mechanism to address instances of non-compliance in future obligations to arise from the Kyoto Protocol (see box - IEA, 1997; and also Brazil, 1997). Such interest may reflect the perceived high economic stakes of non-compliance with major new obligations for greenhouse gas reduction. However, for sovereignty reasons, formal agreement on financial penalties or other measures with "sticks" are problematic. Financial penalties have been used with some success in many domestic settings to encourage compliance, but they are virtually untested internationally, even in the area of international arms control (Greene, 1996). Nevertheless, they may be an interesting option for climate change, not so much for their value as a deterrent but as a source of funding for technology assistance to achieve long-term greenhouse gas objectives world-wide.[34]

The International Compliance Incentive - A Financial Tool

One option is to introduce a financial tool to act as an international compliance incentive (ICI) with targets to be agreed at COP-3, and contribute to the legally-binding nature of the protocol. There is so far no experience with financial tools as instruments for compliance with internationally-set environmental objectives.

At the national level, monetary incentives are often used to assure compliance with environmental objectives. Non-compliance with SO_2 emission levels under the Clean Air Act Amendments of 1990 leads to a penalty of US$ 2000 per ton (plus inflation). In Denmark, a company that fails to meet its CO_2 emission target specified in its voluntary agreement with the government would pay, retroactively, a tax on its past emissions. Switzerland, in its recent federal law on CO_2 emissions reduction, includes the possibility for economic activities to be exempted from an eventual tax,[35] provided that they formally agree to reduce their emissions. If a given sector/activity does not meet the previously-agreed target, the exemption is cancelled and the CO_2 tax has to be paid for emissions that have taken place over the period (with interest). Here again, this represents a significant incentive for compliance with a quantified objective,[36] emission sources, in the above examples, are legally-bound to pay a fixed amount to the regulator in case they do not meet the agreed target.

An International Compliance Incentive would require Parties that do not comply with agreed targets to pay a fixed amount for every tonne of CO_2 equivalent above the objective. It would establish a clear cost for non-compliance by governments with targets. Any revenues from the imposition of an ICI would go into a collection fund, which could help to fund greenhouse gas mitigation. Through this mechanism, Parties would be bound to pay for any shortfall in meeting their targets. ICI would not be included as a possible policy or measure under a protocol or any other legal instrument (POALI). Neither should the inclusion of ICIs in the POALI intrude with the governments' choice over domestic policies and measures.

Source: IEA, 1997

Unilateral sanctions

Beyond multilateral trade and economic measures, unilateral sanctions are also frequently used by countries to selectively target and try to help enforce or punish trade partners for violating international obligations (Chayes and Chayes, 1995). They usually take the form of retaliation to behaviour that is viewed as challenging accepted international norms.

---

[34] See IEA, 1997; Brazil, 1997 as well as earlier work on international carbon taxes OECD, 1993.

[35] The tax would be introduced only if other policies and measures have failed to set the country's emissions on track with its emission target.

[36] *Message relatif à la loi fédérale sur la réduction des émissions de CO2*, ch. 232 p.42; for payment in case of non-compliance, see Article 9, paragraph 6, p. 62.

Unilateral sanctions are likely to be used by the most powerful Parties in an agreement. It is also virtually impossible to impose these types of sanctions consistently across the members of an agreement which calls into question their legitimacy. The imposition of unilateral sanctions may be justified on the basis of the norms established by a particular international agreement. But, in practice, their use will be influenced by many political and foreign policy considerations. This creates a tension between their use as a foreign policy instrument and as a strategy to enforce legal obligations of an international agreement. Experience with their use also indicates that they are most effective when several Parties join the effort to collectively impose the sanction. Overall experience with unilateral sanctions argues for more co-operative approaches to problem resolution (Chayes and Chayes, 1995).

Dispute Resolution Mechanisms

Most international environmental agreements have dispute resolution mechanisms intended to resolve compliance problems. Dispute resolution tends to be a bilateral instrument that is confrontational in nature. Because dispute resolution tends to be more confrontational than other management and enforcement options, it is seen as an option that operates in parallel with the other non-compliance responses.

In practice, dispute settlement has never been invoked in multilateral environmental agreements, despite many instances of non-compliance (Szell, 1996; Victor, 1996). The International Court of Justice (ICJ) has only addressed one case on environmental issues and, even then, it might be argued that it was only marginally about the environment.[37] Although there have been repeated calls to use the ICJ, countries have been reluctant to engage a compulsory review by the ICJ to settle environmental issues (Szell, 1996). Resolving legal disputes among governments also tends to be slow and expensive (OECD, 1995).[38] The lack of international case law in the area of the environment is therefore underdeveloped, which in turn may limit the use of legal remedies internationally (OECD, 1995).

Even so, dispute resolution procedures have a role to play. As Patrick Szell (1996) noted with respect to the development of the Montreal Protocol: "something extra is needed since, rather more than in the case of a treaty composed of mild commitments, each party to a normative treaty needs assurance that any costly economic steps it must take to enable it to meet its obligations are being matched by equally conscientious observance by other parties of the obligations."

The UNFCCC's Article 14 outlines an approach for dispute settlement based on a legal process to include negotiation, settlement by the International Court of Justice, arbitration and, if the dispute has not been resolved after 12 months, conciliation. Article 14 is based on sound precedents in international law. It is intended to address disputes arising among two or more Parties "concerning interpretation or application of the Convention". It calls for the creation of a conciliation commission upon the request of any one of the Parties to the dispute.

The Kyoto Protocol has a dispute settlement mechanism identical to that of the UNFCCC's Article 14. Use of the mechanism should aim to be the ultimate fallback for Parties at any stage in the compliance system, i.e. during the multilateral consultative process, the application of non-compliance responses or

---

[37] OECD, 1995 as well as personal communications with Ruth Greenspan Bell of Resources for the Future, who informed me that the one environmental case handled by the ICJ is a recent Hungarian/Slokak litigation concerning a dam.

[38] Two cases of arbitration of trans-boundary environmental disputes took 15 years to resolve -- 1941 Trail Smelter Arbitration Between Canada and the United States and 1968 Gut Dam arbitration between Canada and the United States. (OECD, 1995)

other enforcement approaches. Alternatively, it is also possible for Parties to jump straight to this stage should they choose to do so.

Concluding Remarks

The role of non-governmental stakeholders

Non-governmental organisations, stakeholders and the public can play a critical role to encourage states to comply with international obligations. This is one reason to strive for openness and transparency as part of a compliance system (Chayes and Chayes, 1995; Cameron *et al*., 1996; Victor *et al*., 1997). Economic interests effected by an agreement can also form a natural watchdog to help to enforce the agreement. This is the case for the Montreal Protocol and for some arms agreements (Greenspan Bell, 1997). It is possible that energy-intensive industries or fossil fuel energy industries would be compelled under a climate change agreement to help to watchdog the relative performance of states and to encourage consistent, co-ordinated implementation.

To a certain extent, wide stakeholder involvement has already begun to occur under the UNFCCC. For example, the World Energy Conference follows closely the development and implementation of the UNFCCC. It also make energy and emission outlooks and compares the official statements about expected performance to these outlooks. In a similar fashion, environmental non-governmental organisations have also been extremely active in the UNFCCC implementation process to date. Climate Action Network, which is a network of interested environmental NGOs, has published two independent assessments of Annex I country mitigation performances (CAN, 1997; and USCAN, 1995). In the United States, citizens' suits can also supplement government enforcement approaches.

Systematic reliance on non-governmental stakeholders is not realistic, though, as in some regions of the world, there is much competition for their attention and limited resources to carry out such functions (Greenspan Bell, 1997). Nevertheless, non-governmental and other public stakeholders play a critical role and their participation should be encouraged and facilitated by the formal procedures of the compliance system.

Problem identification, consultation and management

Early implementation of a consultative mechanism under the Convention and the Kyoto Protocol will be an important complement to national reporting and review procedures. Initially, it may be desirable to aim non-compliance responses and consultations at capacity-building to improve basic data. This could be done in a number of ways:

- establish an expert group to facilitate exchange of information and capacity building; this group could be charged with providing recommendations on methods and best practice and data quality issues;
- require Parties not in compliance with reporting obligations to work with the expert group to design a plan to bring themselves into compliance with these obligations;
- when possible, prioritise financial assistance to support research, field work, institutional development and other capacity building to improve the availability and quality of information.

Non-compliance responses should encompass more substantive compliance problems, but early experience with reporting problems could provide useful lessons. The procedural issues are likely to be the same, including: who identifies the problem and how it is referred to the consultative process; how the consultative process is informed about the nature of the problem; how possible solutions are outlined and agreed with the Party(ies) in question; and whether or not serious compliance problems are addressed with stronger enforcement measures. There is value in testing these procedures in advance of trying to address compliance issues concerning tough substantive obligations.

Key issues in the design of an effective consultative approach involve how it is foreseen to gather information and to negotiate possible solutions (Victor, 1995). Data collection and information preparation might be done by the UNFCCC Secretariat only, or supplemented by outside experts or organisations. Different sources of authoritative input would be desirable to ensure the best possible information for decision-making although a Secretariat would need to be responsible for overseeing and guaranteeing the accuracy of information presented. Linkages to outside institutions and inter-governmental organisations might also help to exert necessary pressure or provide assistance to bring a Party into compliance (Chayes and Chayes, 1995). It possible that politically sensitive consultations might not benefit from full transparency, thus the process might need to be somewhat closed compared to other aspects of the compliance system (Victor, 1995).

Automatic versus discretionary responses

As mentioned above under *issuing cautions or warnings*, automatic responses might be a potentially useful part of a compliance system. This would avoid the pitfalls posed by discretionary responses, such as political pressure by Parties to ignore compliance problems. Automatic responses might only be relevant for a limited number of possible compliance problems, such as those associated with lighter or non-substantive obligations (e.g. reporting and review). Alternatively, they might only apply to certain types of the "softer" instruments, such as warnings. However, even in a limited capacity, automatic responses could significantly strengthen a compliance system by demonstrating to Parties the intention to use, without discretion, certain features of the system.

Trading: incentives for compliance

International emission trading could open up a variety of different options to provide incentives for compliance and to enforce obligations. Participation in an emission trading system might be treated as a "carrot" which would be offered only if certain conditions were met. For example, one design option might be to extend participation in the system only to Parties that follow agreed inventory and monitoring methods. Another option is that failure to comply with targets would eliminate the opportunity for the country to sell carbon equivalent units. Yet another option is to base the coverage of a trading system on data quality. A trading system could be limited to only those gases or source/sink activities with an acceptable level of uncertainty. By not allowing trading until data quality was assured, Parties would have the incentive to improve information and to maintain the quality of that information over time. These conditions might be established in combination with an auditing option (see earlier sections) to certify whether a party had met the required conditions. A difficult question is whether some Parties with high quality information would be allowed to trade in some activities, while other Parties with poorer quality information would be prevented from doing so. This raises an important equity issue which would need to be balanced against the need to provide proper incentives for better information and overall environmental management of the full range of greenhouse gas activities.

Because an international market in greenhouse gas emissions would give emissions an explicit market value, trading could create incentives for more effective national enforcement and international compliance. Non-compliance by one participant would raise the supply of carbon equivalent units and lower the value of carbon equivalent units for other participants. Because of this, countries or firms that own carbon equivalent units, would have a strong incentive to help ensure that other traders were delivering verifiable emission reductions (Mullins and Baron, 1997).

Balancing management and enforcement approaches

Recent research (Cameron *et al*., 1996, Victor *et al*., 1997) on the implementation of environmental agreements and the effectiveness of approaches to encourage implementation and compliance finds that:

- most implementation problems are not wilful;
- the most serious failures to meet international obligations are due to unanticipated factors; and
- whether wilful or accidental, all compliance problems result from insufficient priority and attention being given to compliance by the implementing state.

Raustiala and Victor (1997) conclude that both management and enforcement approaches are useful to improve implementation. They find that the enforcement approach increasingly explains international environmental co-operation. Noting that "sticks" are rarely used and perhaps rarely needed, they show through case studies that when "sticks" are used, they can be effective.

Other experts argue that the use of enforcement measures in international agreements is over-estimated and often ineffective (Chayes and Chayes, 1995 and Mumme, 1994). Their work is also based on a review of lessons from international agreements, both design and practice. They emphasise the need for better management approaches, including the following elements:

- greater use of management instruments with co-operation as a central feature;
- active policy review and assessment;
- development of and open access to performance data;
- establishing effective linkages with multi-lateral banks and other financial institutions;
- strengthening the role of non-governmental organisations.

Under the UNFCCC and the Kyoto Protocol, it will be important to find a balance in the use management and enforcement approaches. A compliance system should be designed to draw from the continuum of options to respond to the full range of compliance problems. Institutions to address problems and devise solutions will be required. The effective use of management approaches will depend on the availability of resources, and in particular on access to expertise and financial assistance for capacity-building. Access to such resource needs must be anticipated and developed over time under the agreement. It will also be important to ensure that the various compliance provisions of the UNFCCC and the Kyoto Protocol work together, in a consistent way, to cast a wide net around possible compliance problems.

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 considered among the management options. For example, to publicly recognise failure could be considered a penalty. Issuing cautions is perhaps the most easily implemented and politically acceptable of possible penalty approaches. Although it would not have 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 organisation 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.

More research is needed to conclude on whether multilateral enforcement approaches, such as trade measures or financial penalties, are relevant to a climate change agreement. The management of greenhouse gases implies a level of international co-operation that is deeper than that found in most MEAs. Thus, enforcement mechanisms would also need to address a much broader set of socio-economic activities than are addressed under other agreements. Deeper co-operation may require stronger enforcement mechanisms, but it is also likely that implementation of such an agreement will be more difficult to achieve. To improve compliance and effectiveness over the long term, a compliance system should be established in the early stages of the Kyoto Protocol and allowed to evolve over time to benefit from early experience.

REFERENCES

Ausubel, J.H., and D.G. Victor (1992), "Verification of International Environmental Agreements" *Annual Review of Energy Environment*.

Benedick, R.E. (1991), *Ozone Diplomacy: New Directions in Safeguarding the Planet*. Harvard University Press, Cambridge.

Brazil (1997), "Proposed Elements of a Protocol to the UN Framework Convention on Climate Change, Presented by Brazil in Response to the Berlin Mandate."

Cameron, James, Jacob Werksman and Peter Roderick (1996), *Improving Compliance with International Environmental Law*, Earthscan Publications Ltd, London.

Cameron, James, "Compliance, Citizens and NGOs" in Cameron *et al*., eds. *Improving Compliance with International Environmental Law*,Earthscan Publications Ltd., London.

Charnovitz, Steve (1996), "Trade Measures and the Design of International Regimes," in *Journal of Environment and Development*, Vol. 5, No. 2, June 1996.

Chayes, Abram and Antonia H. Chayes (1995), *The New Sovereignty: Compliance with international regulatory agreements*. Harvard University Press, Cambridge and London..

Chayes, Abram and Antonia H. Chayes (1993), "On Compliance," *International Organization*, Spring 1993, vol. 47, no. 2, pp. 175-205.

Chayes, Abram and Antonia H. Chayes (1991), "Compliance without enforcement: State behavior under regulatory treaties," *Negotiation Journal*, July 1991, p. 311-330.

Corfee-Morlot J. and P. Schwengels (1994), "Verification, Evaluation and Monitoring" in Katscher W. *et al*, eds. *Greenhouse Gas Verification -- Why, How and How Much?* Proceedings of a Workshop, Forschungszentrum Juelich.

Corfee Morlot, Jan, R. Hornung and L. Michaelis (1994), "Reducing Greenhouse Gases Under the UNFCCC" in Mathai C.V. and G. Stensland, eds. *Global Climate Change: Science, Policy and Mitigation Strategies*; Proceedings published by the Air & Waste Management Association, Pittsburgh, Penna.

Di Primio, Juan Carlos (1997), "Data Quality and Compliance Control in the European Acid Rain Regime 205" in Victor, D.G. et. al., eds. (1997) *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice*, MIT Press, Cambridge.

EMEP/CORINAIR (1996), *Atmospheric Emission Inventory Guidebook*, Volume I and II.

Fischer, W. (1991), *The Verification of International Conventions on Protection of the Environment and Common Resources: A Comparative Analysis of the Instruments and Procedures for International Verification with the Example of Thirteen Conventions*. Forshungszentrum Julich GmbH, Germany.

Fischer, W. (1991), *The Verification of a Greenhouse Gas Convention - A new task for international politics?* Forshungszentrum Julich GmbH, Germany .

General Accounting Office US Congress (1992), *International Environment: International Agreements are Not Well Monitored*. (GAO/RCED-92-43).

Greene, O. (1991), "Building a global warming convention: Lessons learned from the arms control experience" in M. Grubb and N. Stern (Eds.), *Pledge and Review processes: Possible Components of a Climate Change Convention;* Royal Institute of International Affairs.

Greene, O. and S. Comes (1996), "Aims and Design Principles for an EU Implementation Review System" in *Greenhouse Gas Inventories: National Reporting Processes and Implementation Review Mechanisms in the EU; Volume 1: Analysis and Conclusions*; Forschungszentrum Julich GmbH, Germany July 1996.

IGAC (1994), Global Measurement Standardisation of Methane Emissions from Irrigated Rice Cultivation, A Report of the Rice Cultivation and Trace Gas Exchange Activity (RICE) of the International Global Atmospheric Chemistry (IGAC) Project (Convenors, R. Sass and H.U. Neue), IGAC Core Office, Cambridge, Mass.

IEA (1997), "Possible incentives for international compliance with legally-binding QELROs", (IEA/SLT(97)22).

IPCC (1997b), Draft Summary Report from the Expert Group Meeting on Methods for the Assessment of Inventory Data Quality, in Bilthoven, the Netherlands, 5 November 1997.

IPCC (1997), Draft Summary Report from the Expert Group Meeting on Biomass Burning and Land-use Change and Forestry, in Rockhampton, Australia, 15-18 September 1997.

IPCC/OECD/IEA (1997), *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*.

Greenspan Bell, Ruth (1997) of Resources for the Future. Personal Communication.

Haas, P.M., Keohane, R.O. and M.A. Levy (1993), *Institutions for the Earth Sources of Effective International Protection*. MIT Press, Cambridge.

Kemper, R. "The International Energy Agency Country Review Process" in M. Grubb and N. Stern (Eds.), *Pledge and Review processes: Possible Components of a Climate Change Convention*; Royal Institute of International Affairs, London, England 1991.

Lanchberry, J., Greene, O. and Salt, J. (1992), "Verification and the Framework Convention on Climate Change." A briefing document for UNCED, Rio de Janiero, VERTIC, May 1992.

Lanchberry, J., Fischer, W., Katscher, W. and G. Stein (1992), "Verification of a Climate Change Convention: Role and limitations of a space based remote sensing system" Proceedings from the European International Space Year Conference, Munich, Germany, March/April 1992.

Lanchberry, J. (1996a), "A Summary and Guide to the Project" in *Greenhouse Gas Inventories: National Reporting Processes and Implementation Review Mechanisms in the EU; Volume 1: Analysis and Conclusions*; Forschungszentrum Julich GmbH, Germany July 1996

Lanchberry, J (1996b), "EU Systems for Reporting and Implementation Review" in *Greenhouse Gas Inventories: National Reporting Processes and Implementation Review Mechanisms in the EU; Volume 1: Analysis and Conclusions*; Forschungszentrum Julich GmbH, Germany July 1996

Lanchberry, John (1997), "Long-Term Trends in Systems for Implementation Review in International Agreements on Fauna and Flora" in Victor, D.G. K. Raustiala, E.B. Skolnikoff, eds. (1997) *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice*, MIT Press, Cambridge.

Lang, W. (1996) ed., *The Ozone Treaties and their Influence on the Building of International Environmental Regimes; Special Issue: Oesterreichische aussenpolitische Dokumentation*; Federal Ministry for Foreign Affairs, Vienna, Austria.

McKenzie Hedger, M. (1997), "Why the Net Approach is Premature" draft paper, personal communication, 16 October 1997.

Mullins, Fiona and Baron, R. (1997), "Questions and Answers on Emission Trading Among Annex I Countries" Secretariat Information Paper for the Annex I Expert Group, December 1997, OECD, Paris.

Mullins, Fiona (1997b), "Relationship Between Inter-Governmental Trading and Industry-level Join Implementation Projects Within Annex I Parties," unpublished paper for Chatham House meeting, 3 September 1997 OECD, Paris.

Mullins, Fiona (1997), "Lessons from existing trading systems for international GHG emissions trading," Secretariat information paper for the Annex I Expert Group, May 1997, OECD, Paris.

Moran A. and J.E. Salt (1996), "CORINAIR and IPCC" in *Greenhouse Gas Inventories: National Reporting Processes and Implementation Review Mechanisms in the EU; Volume 1: Analysis and Conclusions*; Forschungszentrum Julich GmbH, Germany July, 1996

OECD (1995), *Dispute Settlements in Environmental Conventions and Other Legal Instruments*, OCDE/GD(95)138

OECD (1996), *Pollutant Release and Transfer Registers: A Tool for Environmental Policy and Sustainable Development; Guidance Manual for Governments*. OECD/GD(96)32.

OECD (1997), *OECD Environmental Performance Reviews: A Practical Introduction*; OECD/GD(97)35

OECD (1997c), "Issues Paper" by the OECD Secretariat for the IPCC Expert Meeting on Methods For the Assessment of Inventory Data Quality. Meeting held 5-7 November 1997; paper drafted 30 October 1997, Paris.

OECD (1997d), *Experience With the Use of Trade Measures in the Convention on International Trade in Endangered Species of Wild Fauna and Flora*; OECD/GD(97)106OECD

OECD (1997e), *Experience With the Use of Trade Measures in the Montreal Protocol on Substances that Deplete the Ozone Layer*; COM/ENV/TD(97)107

OECD (1998, forthcoming), *Experience with the Use of Trade Measures in the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal*, forthcoming OECD "General Distribution" Document.

OECD (1998a), *Methods for Producing Greenhouse Gas Emission Projections and Estimating the Effects of Measures*. Secretariat Paper prepared for the Annex I Expert Group, ENV/EPOC(98)6.

O'Riordan, Timothy, Chester L. Cooper, Andrew Jordan, Steve Raynor, Kenneth R. Richards, Paul Runci, and Shira Yoffe (1989), "Institutional Frameworks for Political Action," in Steve Rayner and Elizabeth L. Malone (eds), *Human Choice and Climate Change, Volume 1, The Societal Framework of Climate Change*. Battelle Press, 1989.

Parson E. (1993), "Protecting the Ozone Lawyer" in Haas, P.M., Keohane, R.O. and M.A. Levy *Institutions for the Earth Sources of Effective International Protection; MIT Press, Cambridge.*

Raustiala, K. and David G. Victor (1997), "Conclusions" in Victor, D.G. K. Raustiala, E.B. Skolnikoff, eds. *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice*, MIT Press, Cambridge.

Schally, H. M. (1996), "The Role and Importance of Implementation Monitoring and Non-compliance Procedures in International Environmental Regimes" in *The Ozone Treaties and their Influence on the Building of International Environmental Regimes; Special Issue: Oesterreichische aussenpolitische Dokumentation*; Federal Ministry for Foreign Affairs, Vienna, Austria.

Szell, P. (1996), "Implementation Control: Non-compliance Procedure and Dispute Settlement in the Ozone Regime" in *The Ozone Treaties and their Influence on the Building of International Environmental Regimes; Special Issue: Oesterreichische aussenpolitische Dokumentation*; Federal Ministry for Foreign Affairs, Vienna, Austria.

Taylor, John (1997), "Global Modelling of Carbon Sources and Sinks". A discussion paper prepared for Environment Australia, Environment Protection Group, Department of Environment, Sport and Territories, 1 August.

UNFCCC 1997d (FCCC/AGBM/1997/MISC.4), Response from Parties on Issues Related to Sinks; Comments by Parties; Note by Secretariat. 18 November 1997.

UNFCCC 1997c (FCCC/SBI/1997/19/Add.1), National Communications; National Communications from Parties Included in Annex I to the Convention; First Compilation and Synthesis of Second National Communications from Annex I Parties. Addendum; Tables of Inventories of Anthropogenic Emissions and Removals for 1990-1995 and Projections up to 2020. October 1997.

UNFCCC 1997b (FCCC/SBI/1997/19), National Communications; National Communications from Parties Included in Annex I to the Convention; First Compilation and Synthesis of Second National Communications from Annex I Parties. 30 September 1997.

UNFCCC 1997a (FCCC/SBI/1997/INF6), National Communications from Parties Included in Annex I to the Convention: Progress with Regard to In-depth Review of the First National Communications of Parties and Status of Submission of Second National Communications

UNFCCC 1996b (FCCC/CP/1996/12/Add.2), Review of the Implementation of the Convention and of Decisions of the First Conference of the Parties, Commitments in Article 4: Second compilation and synthesis of first national communications from Annex I Parties: Executive summary by the secretariat.

UNFCCC 1996a (FCCC/CP/1996/15/Add.1), Decisions to Promote the Effective Implementation of the Convention, Decision 9/CP.2, Communications from Annex I Parties, Addendum: Guidelines for the Preparation of National Communications from Annex I Parties.

UNFCCC 1995b (FCCC/CP/1995/7/Add.1), Report on the Conference of the Parties on its First Session, held in Berlin from 28 March to 7 April 1995: Addendum, Part II, Action Taken by the Conference of the Parties at its First Session.

UNFCCC 1995a (INC/FCCC/1994/1), Guidelines for the Preparation of First Communications by Annex I Parties.

United Nations "Verification in all its aspects: Study of the role of the United Nations in the field of verification". Report of the Group of Qualified Experts to the Secretary General in accordance with resolution 43/81B of the General Assembly (A/45/372).

UK (1994) Climate Change: The UK Programme: United Kingdom's Report under the United Nations Framework Convention on Climate Change.

US Climate Action Network and Climate Network Europe (1995), Independent NGO Evaluations of National Plans for Climate Change Mitigation: OECD Countries, Third Review, January 1995.

Victor, D.G., K. Raustiala, E.B. Skolnikoff, eds. (1997), *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice*, MIT Press, Cambridge.

Victor, D.G. (1996) "The Early Operation and Effectiveness of the Montreal Protocol's Non-compliance Procedure," IIASA paper, May, 1996

Victor, D.G. (1995) "Design Options for Article 13 of the Framework Convention on Climate Change: Lessons from the GATT Dispute Panel System," IIASA paper, November 1995.

Werksman, Jacob (1996) "Designing a Compliance System for the UN Framework Convention on Climate Change" in J. Cameron et. al. (eds) *Improving Compliance with International Environmental Law*, Earthscan Ltd. Publications, London.

WTO (1996) "Report (1996) of the Committee on Trade and Environment" WT/CTE/W/40, 7 November 1996.

Young, O.R. (1992) The effectiveness of international institutions: Hard cases and critical variables. In J.N. Rosenau and E. O. Czempiel (Eds.) *Governance without Government: Order and Change in World Politics*; Cambridge University Press, New York.

Younger, D. (1997) in *Mobilising Global Effort*, OECD, Paris.