PROGRESS ON IMPLEMENTATION OF THE MONTREAL PROCESS ON CRITERIA AND INDICATORS FOR THE CONSERVATION AND SUSTAINABLE MANAGEMENT OF TEMPERATE AND BOREAL FORESTS

February 1997

TABLE OF CONTENTS

EXECUTIVE SUMMARY

In June 1992, the United Nations Conference on Environment and Development (UNCED) focused world attention on the importance of sustainable forest management as a key component of sustainable development. In adopting the Statement of Forest Principles and Chapter 11 of Agenda 21, UNCED recognized the importance of sustainably managing all types of forests, including temperate and boreal forests, to meet the needs of present and future generations.

Following UNCED, in September 1993, the Conference on Security and Cooperation in Europe sponsored an international seminar in Montreal, Canada on Sustainable Development of Boreal and Temperate Forests. This conference provided the conceptual basis for subsequent regional and international initiatives to develop criteria and indicators for sustainable forest management.

In June 1994, the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests was formed to advance the development of internationally agreed criteria and indicators through a series of meetings

hosted by participating countries. This Working Group is now known as the Montreal Process.

The Montreal Process Working Group includes Argentina, Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russian Federation, United States of America and Uruguay. These countries cover five continents and together represent 90 percent of the world's temperate and boreal forests (as well as areas of tropical forests) and 60 percent of all forests. They also account for 45 percent of world trade in wood and wood products and 35 percent of the world's population. The Working Group is supported by a Liaison Office hosted by Canada in Ottawa.

The Santiago Declaration

In February 1995 in Santiago, Chile, the original 10 Montreal Process countries endorsed a statement of political commitment known as the "Santiago Declaration," together with a comprehensive set of seven criteria and 67 indicators for the conservation and sustainable management of temperate and boreal forests for use by their respective policy-makers at the national level. Argentina and Uruguay have since endorsed the Santiago Declaration and joined the Montreal process.

The Santiago Declaration is an important step to implementing the UNCED Forest Principles and Agenda 21, and to furthering the joint commitment made by tropical timber consumer countries in January 1994 to the goal of achieving sustainable management of their respective forests by the year 2000.

The Montreal Process Criteria and Indicators

The seven criteria of the Montreal Process, which are defined by their respective indicators, are viewed as essential components of the sustainable management of forest ecosystems. Six of the criteria and indicators relate to forest conditions, attributes, functions or benefits. Criterion 7 relates to the overall policy framework that can facilitate sustainable forest management and support efforts to conserve, maintain or enhance the conditions, attributes and benefits captured in Criteria 1-6.

Taken together, the Montreal Process criteria and indicators provide a common understanding and implicit definition of what is meant by sustainable forest management. They are tools for assessing national trends in forest conditions and management and provide a common framework for describing, monitoring and evaluating progress toward sustainability at the country level. They are not performance standards and are not intended to assess directly sustainability at the forest management unit level.

Application of the criteria and indicators will help provide an international reference for policy-makers in the formulation of national policies, improve the quality of information available to decision-makers and the public, and better inform the forest policy debate at national and international levels.

Progress on Implementation

Since endorsing the Santiago Declaration, the Montreal Process countries have initiated steps to apply the agreed criteria and indicators based on national circumstances. Working Group meetings have been hosted by New Zealand (Auckland, November 1995) and Australia (Canberra, June 1996) to clarify implementation issues and facilitate initial efforts.

The first step was an initial survey by the Liaison Office to determine the current availability of data for indicators in each country and the capacity of countries to report on indicators.

Interim survey results indicate that while data availability and reporting capacity varies greatly among the 12 countries, most countries have data for and can report on 50 percent or more of the 67 indicators.

The Liaison Office survey also indicates that while resolution of some of the data gaps and reporting problems would involve new research and monitoring systems and new reporting methods, others could be resolved by better defining terms and elaborating measurement approaches.

The variations in data availability and reporting capacity found by the survey highlights the wide differences among the Montreal Process countries in terms of forest quality and quantity, land ownership, population, system and structure of government, and economic development. These differences pose special challenges in each country on how to apply the criteria and indicators. They also point to one of the great strengths of the Montreal Process, which is the diversity of the countries involved.

Future Outlook

Based on the results of the Liaison Office survey, the Montreal Process countries have agreed on a course of action for the future. The Working Group has established an ad hoc Technical Advisory Committee (TAC) to provide advice to the Group on technical and scientific issues arising in connection with implementing the criteria and indicators. The TAC met for the first time in September 1996 in Pasadena, California to develop recommendations on definitions for key terms used in the Montreal Process and approaches to gathering data on various indicators.

The Montreal Process Working Group is also preparing a first approximation report on the results of initial country efforts to measure the criteria and indicators. The report will be distributed at the Eleventh World Forestry Congress in Antalya, Turkey in October 1997.

Korea intends to host the Ninth Meeting of the Montreal Process Working Group in Seoul in July 1997. The focus of the meeting will be to review recommendations emanating from the September 1996 meeting of the TAC and to finalize preparations for the first approximation report.

Participation in meetings of the Montreal Process includes other countries, international organizations, environmental non-governmental organizations, industry groups and other interested groups, as well as representatives of other initiatives on criteria and indicators.

MONTREAL PROCESS: DEFINITION OF KEY TERMS

Criterion:
- A category of conditions or processes by which sustainable forest management may be assessed.

- *A criterion is characterized by a set of related indicators which are monitored periodically to assess change*

Indicator:
- A measure (measurement) of an aspect of a criterion.

- *A quantitative or qualitative variable which can be measured or described and which when observed periodically demonstrates trends.*

Ecosystem:	• A dynamic complex of plant, animal, fungal and micro-organism communities and the associated non-living environment with which they interact.
Forest type:	• A category of forest defined by its vegetation, particularly composition, and/or locality factors, as categorized by each country in a system suitable to its situation.
Monitoring:	• The periodic and systematic measurement and assessment of change of an indicator.

ACKNOWLEDGEMENTS

The Liaison Office expresses appreciation to the Montreal Process Working Group members for their collaboration and support in responding to the request for information and in preparing the Progress report on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests.

The time available for responses has been limited but the high quality of the information submitted has greatly facilitated the preparation of this report.

Kathryn Buchanan
Liaison Office
Canadian Forest Service
Ottawa, Canada

SECTION I -- INTRODUCTION AND BRIEF HISTORY

Forests are essential to the long-term well being of local populations, national economies, and the earth's biosphere as a whole. The UN Conference on Environment and Development (UNCED), which met in Rio de Janiero in June 1992, focused world attention on the importance of sustainable forest management as a key component of sustainable development. In adopting the Statement of Forest Principles and Chapter 11 of Agenda 21, UNCED recognized the importance of sustainably managing all types of forests, including temperate and boreal forests in order to meet the needs of present and future generations.

The development of criteria and indicators for the sustainable management of temperate and boreal forests is an important step in implementing the UNCED Forest Principles and Agenda 21, and in furthering the joint commitment made by tropical timber consumer countries in January 1994 to the goal of achieving sustainable management of their respective forests by the year 2000.

Launching the Montreal Process

Following UNCED, Canada convened an International Seminar of Experts on Sustainable Development of Boreal and Temperate Forests. This seminar, held in Montreal in September 1993 was sponsored by the Conference on Security and Cooperation in Europe (CSCE). The seminar focused specifically on the development of criteria and indicators for the sustainable management of temperate and boreal forests and provided the conceptual basis for subsequent regional and international work on criteria and indicators.

Following the CSCE seminar, some thought was given to having countries participating in the seminar develop criteria and indicators for sustainable forest management. European countries decided it was important to work as a region under the framework of the Helsinki Ministerial Declaration and its four resolutions to which they were all signatories. The Pan-European effort on criteria and indicators is now known as the Helsinki Process.

Subsequently, Canada took the lead in launching an initiative among other temperate and boreal countries, with the specific purpose of developing and implementing internationally agreed criteria and indicators for sustainable forest management. This initiative led to the formation in June 1994 of the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, now known as the Montreal Process.

The Montreal Process Working group includes Argentina, Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russian Federation, United States of America and Uruguay. These countries cover five continents and together represent about 90 percent of the world's temperate and boreal forests (as well as areas of tropical forests) and 60 percent of all forests. They also account for 45 percent of the world trade in wood and wood products and 35 percent of the world's population.

Santiago Declaration

Over the period from June 1994 to February 1995, the Montreal Process countries met five times to pursue the development of internationally agreed criteria and indicators. At the Sixth Meeting of the Working Group in Santiago, Chile, in February 1995, the original 10 participating countries endorsed a statement of political commitment known as the "Santiago Declaration", together with a comprehensive set of criteria and indicators for the conservation and sustainable management of temperate and boreal forests for use by their respective policy makers. Argentina and Uruguay have since endorsed the Santiago Declaration and become members of the Montreal Process.

At this time, Canada generously offered to host the Liaison Office of the Montreal Process in Ottawa, where it still resides today. The Liaison Office provides a number of important services to the Montreal Process, including document preparation and distribution, process coordination and various clearing house functions.

Implementation phase

Since endorsement of the Santiago Declaration in February 1995, the Montreal Process countries have initiated a follow up process to pursue country specific application of the agreed criteria and indicators based on national circumstances. Subsequent meetings of the Working Group have been hosted by New Zealand (Auckland, November 1995) and Australia (Canberra, June 1996) to clarify implementation issues and facilitate initial efforts.

Following the meeting in New Zealand and in preparation for the meeting in Australia, the Liaison Office prepared an initial survey report on the "Status of Data and Ability to Report on the Montreal Process Criteria and Indicators", which summarizes key issues raised by countries on data availability and the capacity to report on the criteria and indicators. The Montreal Process Working Group expects to complete by October 1997 a "first approximation report" on the results of initial country efforts to apply the criteria and indicators. The Working Group has also established an ad hoc Technical Advisory Committee (TAC) to provide advice to the Group on technical and scientific issues arising in connection with implementing the criteria and indicators, including preparation of the first approximation report.

These recent activities of the Montreal Process Working group are discussed in greater detail in the sections on "Current Status" and "Future Actions".

SECTION II -- BACKGROUND: CRITERIA AND INDICATORS

Description of criteria and indicators

The Montreal Process identifies seven criteria as essential components of the conservation and sustainable management of temperate and boreal forests:

- Conservation of biological diversity;

- Maintenance of productive capacity of forest ecosystems;

- Maintenance of forest ecosystem health and vitality;

- Conservation and maintenance of soil and water resources;

- Maintenance of forest contribution to global carbon cycles;

- Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies;

- Legal, institutional and economic framework for forest conservation and sustainable management.

The seven criteria are defined by 67 associated indicators which are aspects of the criteria than can be measured or described. The full set of Montreal Process criteria and indicators is included in Appendix 2. No priority or order is implied in listing the criteria or respective indicators. All are important.

Criteria 1-6 and related indicators characterize sustainable forest management. They relate specifically to forest conditions, attributes or functions, and to the multiple values or benefits associated with the environmental and socio-economic goods and services that forests provide.

Criterion 7 and related indicators relate to the overall policy framework that can facilitate the conservation and sustainable management of a country's forests. This includes broad social conditions and processes that are often external to the forest itself but which may support efforts to conserve, maintain or enhance one or more of the conditions, attributes, functions and benefits captured in criteria 1-6.

Purpose of criteria and indicators

The Montreal Process criteria and indicators provide a common understanding of what is meant bysustainable forest management. They are tools for assessing national trends in forest conditions and management and provide a common framework for describing, monitoring and evaluating progress towards sustainability at the country level. They are not performance standards and are not intended to directly assess sustainability at the forest management unit level.

Application of the criteria and indicators will help provide an international reference for policy-makers in the formulation of national policies, improve the quality of information available to decision makers and the public, and better inform the forest policy debate at

national and international levels. The criteria and indicators could also help provide a basis for international cooperation in support of sustainable forest management.

Conceptual framework of criteria and indicators

An ecosystem based approach to forest management is reflected in the Montreal Process criteria and indicators. Taken together, the seven criteria and associated indicators suggest an implicit definition of sustainable management of forest ecosystems at the country level. No single criterion or indicator alone is an indication of sustainability. Rather, individual criteria and indicators should be considered in the context of other criteria and indicators.

Given the wide differences in natural and social conditions among Montreal Process countries, the specific application and monitoring of the criteria and indicators, as well as the capacity to apply them, will vary from country to country based on national circumstances. Therefore, each country will develop its own measurement schemes and protocols for data gathering suitable to national conditions. Despite these differences, efforts should be made to harmonize the approaches of countries to measuring and reporting on indicators.

While many of the Montreal Process indicators can be readily measured, others will involve the gathering of new and additional data, a new program of systematic sampling or even basic research.

Concepts of the conservation and sustainable management of forests are continually evolving. The Montreal Process criteria and indicators will be reviewed and adjusted as appropriate to reflect improvements in scientific knowledge as to how forest ecosystems function and respond to human interventions, increased experience in and capability to measure indicators, advances in technology and changing public demands for forest products and services.

SECTION III -- CURRENT STATUS OF DATA AVAILABILITY AND REPORTING

Since endorsement of the Santiago Declaration in February 1995, the Montreal Process countries have initiated steps to report on the agreed criteria and indicators based on national circumstances. The first step has been to get a better understanding of what data are available for indicators in each country and the current capacity of countries to report on the indicators. Subsequent meetings of the Working Group have been hosted by New Zealand (Auckland, November 1995) and Australia (Canberra, June 1996) to clarify implementation issues and facilitate initial efforts.

Following the meeting in New Zealand and in preparation for the meeting in Australia, the Liaison Office prepared an initial survey report on the Status of Data and Ability to Report on the Montreal Process Criteria and Indicators, which summarizes key issues raised by countries on data availability and the capacity to report on the criteria and indicators.

Results to date indicate that while the availability of data for indicators varies among the 12 countries, most countries have data for 50 percent or more of the 67 indicators, particularly for criterion 2 (productive capacity of forest ecosystems), criterion 7 (policy framework), and some of the indicators under criterion 1 (biological diversity) and criterion 6 (socio-economic benefits). Data are least available for criterion 3 (forest ecosystem health and vitality) and criterion 4 (soil and water resources).

The capacity to report on indicators also varies from country to country and is generally linked with data availability. Most countries are able to report on many of the indicators under criteria 1, 2, 6 and 7 but have difficulty reporting on criteria 3 and 4. Several countries have difficulty reporting on criterion 5 (global carbon cycles). Further information on data availability and reporting capacity by criterion is provided in Appendix 1 of this report.

While some of these data gaps and reporting problems will require new research and monitoring systems and new reporting methods, others can be more easily resolved. To this end, the Technical Advisory Committee (TAC) of the Montreal Process Working Group has been asked to develop common definitions for a number of key terms used in the indicators (e.g. biodiversity, age class, successional stage, forest dependent community), drawing where possible on existing definitions.

The Working Group has also asked the TAC to explore how forest type can be used to effectively characterize biodiversity, and to develop explanatory notes for a number of indicators under criteria 1-6 in order to provide a clearer basis for countries to develop protocols for collecting data.

The Montreal Process Working Group will give preliminary consideration to the results and recommendations of the TAC in a meeting on the margins of the fourth session of the Intergovernmental Panel on Forests in New York in February 1997. More detailed consideration will be given to the TAC report at the Ninth Meeting of the Working Group in Korea in July 1997.

SECTION IV -- COUNTRY "VIGNETTES"

One of the great strengths of the Montreal Process is the diversity of countries involved. Covering five continents, the Montreal Process countries differ greatly in terms of the quantity, quality, characteristics and descriptions of their forests. The countries also differ in extent of forest, rate of forest growth, and extent of reforestation and afforestation per capita. National circumstances further differ with respect to stages of economic development, land ownership patterns, population patterns and trends, forms of social and political organizations, and expectations as to how forests should contribute or relate to society.

These differences pose special challenges in each country on how to apply the Montreal Process criteria and indicators, including how to collect data and report on indicators at the national level. The following "vignettes" from several Montreal Process countries illustrate the unique experience of each country, the great variation from country to country, and the particular challenges or issues faced by individual countries.

- Argentina

- Australia

- Canada

- Chile

- Japan

- Korea

- [Mexico](#)

- [New Zealand](#)

- [United States of America](#)

- [Uruguay](#)

Argentina

For many of the criteria and indicators, Argentina currently lacks data, while for others, existing data is dispersed in various institutions. However, it is anticipated that this situation will improve.

The World Bank is financing a large scale forestry program in Argentina. This program includes a detailed inventory of both native forests and plantations. The program will also finance research activities directed to improve productivity and to diminish negative environmental impacts in plantations and in native forests and to improve knowledge concerning the restoration of forest ecosystems. Research on planted forests will begin in 1996 and on native forests in 1997.

Both the inventory and research programs will contribute to an improved data base which will be centralized at the Secretary of State level and hopefully also at the National Institute for Agricultural Technology (INTA). While this information will be useful in providing information for the various indicators, it is doubtful, in view of the five-year duration of the program, that it will provide dynamic information concerning forest ecosystems. Accordingly, there is a need to ascertain whether monitoring programs should be scheduled at 5, 10 or 15 year intervals.

At a sub-regional scale, other opportunities to develop the necessary information for the indicators appear promising. Large companies, mostly from the United States, are acquiring native forests. As these companies are to practice sustainable forest management, they are being asked to implement an Environmental Impact Assessment program. One of the main recommendations from the first Environmental Impact Assessment at Tierra del Fuego, Patagonia, was to manage the forest following adaptive management prescriptions. For this purpose considerable research and monitoring is necessary which will provide high quality static and dynamic information for the indicators. This development will occur at the sub-regional level - hundreds of thousands of hectares that represent one type of forest, in this case the Andean Patagonian forest.

Australia

Australia has approximately 44 million hectares of dense forest and 112 million hectares of sparse forest (woodland). The most common forest and woodland types are those dominated by *Eucalyptus* and related species. Rainforests are important in temperate, sub-tropical and tropical areas. Dense and sparse *Acacia* forests are important in drier parts while dense and sparse *Callitris* forests are Australia's largest stands of indigenous softwood species. Forested areas in Australia are distributed in an arc around the northern, eastern, south eastern and south western coasts of Australia, and across Tasmania. The 44 million

ha (or 5% of the total land area) represents about 60% of that occurring prior to the arrival of Europeans in 1778. Australia also has over one million hectares of plantations of which about 90% are exotic pines and 10% are indigenous species, mainly eucalypts.

The three levels of government in Australia have specific interests in and responsibilities for forest management. State and Territory governments have primary responsibility for forest management, in recognition of the constitutional responsibility of the States for land use decisions and their ownership of large areas of forest. Local governments have responsibilities for local land use planning and rating systems. The Commonwealth Government is responsible for coordinating a national approach to both environmental and industry-development issues and is responsible for Australia's participation in international forest initiatives. In addition to the three levels of government, private owners have responsibility for management of private forests. The above arrangements have provided challenges for all parties in developing a national approach to sustainable forest management issues.

There are basically four types of tenure for forests and woodlands in Australia: conservation reserves where no timber harvesting is permitted (11%); State forests managed for multiple use including timber production (9%); private forests (both fully owned plus leased) usually used for timber harvesting or livestock grazing (69%); and other public forest that is not vested as State forest or conservation reserve (10%). The latter may have grazing leases on them. In addition to the 11% of forests that are in declared conservation reserves a further 7.5% are managed as conservation reserves within State forests.

For the Montreal Process, Australia will primarily report on its forests in regions where production forestry is a significant activity but the report will include conservation reserves. Australia recognises that the Montreal Process criteria and indicators are applicable to all forests, and not simply to temperate and boreal forests. Australia will work towards applying the Montreal Process indicator framework to report on its temperate forests, tropical forests and its plantation resources.

The availability of data on the Montreal Process criteria and indicators varies between land tenures and within and between the States. At present most information is available for State forests. The State and Territory forest management agencies have collected and hold most information on forests but over the last eight years have been working with the Commonwealth to collate a national forest inventory. Information on the productive capacity of State forests and on long-term multiple socio-economic benefits for major commercial forest uses is relatively well known. Information on other criteria also exists but is variable in quality and availability. Although historical data are limited, work is being done by governments to develop cost-effective approaches to monitoring and interpreting the effects of forest management. It is expected that long-term monitoring programs for selected indicators will be developed.

Information for conservation reserves also varies within and between regions and States. This information will be considerably enhanced through the completion of the detailed environmental and heritage assessments that will be undertaken as part of current efforts to establish a comprehensive, adequate and representative forest reserve system.

Information is generally unavailable for private forests in most regions. The application of criteria and indicators to areas other than State forests, particularly forests managed primarily for conservation and private forests, will require some innovative methods to develop data collection techniques. The indicators and monitoring methods developed for State forests could be used as a basis on which to build these techniques.

A great deal of work has been and is being done to resolve data standards issues and more broadly, sustainable forest management issues. The first national State of the Forests report, due to be published in early 1997, is the first detailed survey of the extent and condition of all of Australia's forests. In the future it is envisaged that the report, which will be repeated at five-yearly intervals, will be aligned with Montreal Process criteria and indicators.

Given the decentralised nature of the management and data collection efforts in Australia, it will be necessary to make linkages between the Montreal Process criteria and indicators and regional forest management programs as part of the implementation process in Australia.

Canada

Forests are a dominant feature of Canada's landscape, covering 417.6 million ha or 45% of the country. Canada's vast forest resource has been integral to the development of Canada as a nation and to Canada's culture, traditions and history.

Canadians depend on their forests for a wide range of values and uses. Forests sustain the economies of hundreds of communities across the country, moderate the climate, prevent soil erosion, improve air and water quality, and provide habitat for countless species of plants and animals. They also offer a multitude of recreational opportunities that are enjoyed by Canadians and visitors from abroad.

The forest land base in this country is not only immense, it is also extremely varied. Canada's forests are essential to the survival of many plants, animals and other organisms. More than 200,000 species, representing two-thirds of all species found in Canada, are dependent on forest habitats. Eleven of Canada's fifteen terrestrial eco-zones, based largely on climate and landform variations, have 15% or more forest cover each with distinct groupings and numbers of tree species. Forty tree species are found within Canada's boreal forest, for example, whereas the Carolinian forest in southern Ontario contains twice that number. In total there are approximately 165 tree species in Canada. The age composition of Canada's forests, however, is relatively uniform due to cyclical and widespread disturbances, such as fire and insect infestations.

Canada is unique in that the vast majority of its forests (94%) are publicly owned. On behalf of the public, provincial governments manage 71%, while the federal and territorial governments are responsible for approximately 23%. The remaining 6% of the forests are privately owned - the property of more than 425,000 landowners.

Forest management in Canada is a matter of provincial jurisdiction, and each province has its own set of legislation, policies and regulations governing forest activities within its boundaries. The same can be said of the Northwest Territories. In the Yukon Territory, however, the federal government oversees the management of forest lands through the Department of Indian Affairs and Northern Development. The federal government's role in forestry focuses on forest science and technology, trade and investment, international relations, national statistics, Aboriginal affairs and environmental regulations.

Canada is one of the few developed nations still richly endowed with large areas of natural forests. Of the 417.6 million ha, 57% are considered "commercial forests" - capable of producing a range of both timber and non-timber benefits. However, only half of these forests are currently accessible and managed for timber production and, of this area, in the

order of 5% are plantations. More than 12% (50 million ha) of Canada's forests have been protected from harvesting by policy or legislation. Heritage forests are protected by legislation, while protected forests are sensitive sites that are protected by policy. The area of protected forests is roughly equivalent in size to the total forest land in Finland, Norway, Germany, Switzerland and Austria, combined.

For the Montreal Process, Canada will report primarily on the forest area covered by its 1991 national forest inventory. Canada's Forest Inventory 1991 is the authoritative national statement on the distribution and structure of Canada's forests. The inventory is a spatially referenced database containing the best information available in 1991. Forest management agencies have recently begun to broaden the scope of forest inventories to encompass non-timber values. Information is most readily available for Crown lands. This is generally not the case for privately-owned land.

Although Canada has a national program to monitor forest health, it does not yet have a program to monitor changes to its forests. The reproductive resilience of disturbed forests in Canada, the low rates of change to other land uses, the size of the forest, and the concentration of effort on map-based inventories for the areas of most active forest management has so far lessened the urgency for surveys to monitor change in land use and forest cover. Data on destructive agents and activities affecting Canada's forests are reported at a national scale by administrative, but not by ecological boundaries.

New data sets and monitoring systems will be required for most of the indicators related to cultural, social and spiritual needs and values, both in terms of resources and benefits. The Canadian Council of Forest Ministers (CCFM) has identified the data gaps and is developing an implementation plan to acquire the data needed to report on indicators for sustainable forest management.

Canada has been working to develop ways to monitor its progress to achieve sustainable forest management for almost five years. The federal Minister of Natural Resources is required to table in Parliament each year a report on the state of Canada's forests. The State of Canada's Forests 1991 first introduced a series of reference points or indicators to help keep track of the nation's progress in achieving sustainable forest management.

To address the commitment to develop criteria and indicators contained in the National Forest Strategy, as well as the forestry commitments made at UNCED, the CCFM established a process in 1994 to define criteria and indicators of sustainable forest management of Canadian forests. The development of the Canadian framework, contained in *Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators*, was managed by a Steering Committee composed of representatives from government, industry, environmental organizations, Aboriginal groups, associations of small-woodlot owners and the academic community. This work was supplemented by a Science Panel and a Technical Committee of scientists and other experts. Many of the criteria and indicators of the Canadian framework and the Montreal Process are similar, although each framework contains some indicators not found in the other. Canada is preparing its first report describing its ability to assess the country's progress in sustainable forestry. Canada is also developing an implementation plan that will guide future reports.

Chile

Forest products are now a major export item in Chile, second only to minerals. In spite of the environmental and financial importance of their forests, many Chileans still see them more as an obstacle to progress than a valuable asset. This view developed in colonial times because forests were considered worthless and only deforested land could be used to grow crops or graze livestock; wood availability was never a limiting factor in those days. Mining has been the economic mainstay of the country for centuries, while forest products achieved prominence very recently.

The approach to the application of the criteria and indictors has focused on the involvement of different actors, including the academic community, non government organisations (NGOs), Forest Service staff and technical advisors to public policy decision makers. The basic tool has been a series of workshops that had a twofold effect: providing information about the Montreal Process Criteria and Indicators to people not familiar with the concept; and getting from them valuable information about data availability and reliability.

In Chile, data are usually available and reliable when market prices exist, for instance planted forest area and timber volume, or forest products contribution to the economy. A caveat is necessary here; for some indicators such as cultural and social values and lands managed for protection purposes, it is known that there is no forest area devoted to such aim. Therefore data are available and reliable, but the information does not convey good news. These cases might contribute to give the report a deceptively positive outlook. Sometimes, particularly in the case of legal and institutional indicators, the information exists but the interpretation of its meaning is rather difficult.

In other cases data quality is uneven; this is particularly evident with data collected for purposes not related to reporting forest conditions. In such cases the information is dispersed among different sources and each one of them has collected the data under different formats and covering issues which often have only a marginal relationship with forestry. Biodiversity is an example; knowledge about certain taxa might include forest and non forest species. The heterogeneous nature of Chilean Forests compounds the problem, certain forest types are better known due to accessibility, scientific interest or commodity production potential.

There are a few cases where it is doubtful if the data will be collected in the near future. The historical range of variation is not known for certain variables and it is not possible to predict the effect of certain changes upon forest conditions. This applies particularly when the problems have not originated within the forest sector and the solutions will also be reached by changes not related to the improvement of forestry practices.

Forest policy and legislation are now being actively discussed and revised in Chile; Chile's Montreal Process activities face the challenge of providing inputs to such process as demanded by many people and, at the same time, to start defining the way data should be interpreted in order to assess sustainability.

Japan

1. Forest types

Due to the north-south geography of Japan, the following range of forest types is distributed:

- Boreal forest - most of Hokkaido Island

- Temperate forest - Southern Hokkaido Island, and Honshyu, Shikoku and Kyushyu Islands.

- Sub-tropical forest - Amami and Okinawa Islands.

In each forest type widely diverse and complex forest ecosystems with a variety of species are found. The plantation forests, which mainly comprise Japanese cedar (*Cryptomeria japonica*), Japanese cypress (*Chamaecyparis obtusa*) and Japanese red pine (*Pinus densiflora*), account for 40 per cent of the forest area. Forestry activities are centred in plantation forests and marginally in the natural forest.

2. Forest ownership

Forests are divided into national forests (8 million ha) and non-national forests (17 million ha). Non-national forests are further divided into public forests (3 million ha) owned by the local governments and the private forests (15 million ha) owned by citizens and private enterprises. The private forests are divided among some 2.5 million forest owners, the majority of whom are farmers. The average ownership is as small as 5 ha. The number of large-scale forest owners, who own more than 500 ha, is about 1,200 and their gross ownership covers only 2 million ha or 14 per cent of the total private forest.

3. Application of criteria and indicators in Japan

3.1 Direction

Due to the vital and multiple importance of forests a variety of institutional frameworks have been developed and operated for the respective dimensions of sustainable forest management. Under such circumstances, the criteria and indicators are considered as a supplemental measure with which existing policy frameworks and measures are implemented in pursuit of the well balanced forest.

3.2 Activities

It has been recognized that the criteria and indicators need to be sufficiently operable to assess the sustainability of forest management at the field level. In order to ensure the practical use of the criteria and indicators, the following activities are planned and have partly started.

3.2.1 Measurement methodology development

The Forestry and Forest Products Research Institute (FFPRI) has started its research activity at Kasama Forest Technology Centre to develop appropriate methodologies to measure the indicators.

3.2.2 Field Testing

FFPRI and the respective local governments have set up two model forests in Japan (in Kochi and Hokkaido) for the purpose of monitoring the indicators and developing appropriate ecosystem management methods.

3.2.3 Monitoring system development

Establishment of a nation-wide monitoring system after 1997 through which indicators would be monitored at nationally distributed fixed plots is being considered.

Korea

In reporting the assessment of data on criteria and indicators, there have been difficulties in defining the meanings of some indicators. For some indicators the assessment could be reported in various ways, depending upon the interpretation of the indicators. In general, data for many indicators within the conservation of biological diversity criterion have been accumulated relatively widely for past years. However, assessment of some indicators such as the status of forest- dependent species at risk was based on limited data for threatened and rare species. Information on indicators of genetic diversity in forests posed definitional problems which should be further refined.

Information on productive capacity of forest ecosystems in Korea has been generally available and accurate because related data have been collected through remote sensing techniques. This includes aerial photographic interpretation and, more recently, satellite data as well as by field checking surveys. There is a need to clarify the methods to determine the sustainable level of timber harvest and non-timber forest products.

In past years, Korea has put much emphasis on the protection of forests and the reduction of damage. Therefore, data on the area of forest affected by insects and disease and by forest fire have been extensively collected because strong control measures have been applied nationally to protect forest resources. However, information on the impact of air pollutants has not been collected and a research monitoring system has just started. Surveys on ecological processes and continuity would require a lot of time and effort.

Some data on soil and water conservation are readily available as erosion control measures and forest reserve systems have been actively pursued across the country in recent years. However, information on the biological, chemical and physical changes of forest lands and water bodies and/or streams is not currently available and it is doubtful whether such data will be collected in the near future. Some scientific research has been conducted at very specific sites.

A preparatory study on forest contribution to the carbon budget has commenced only since the Rio Summit with data on total forest biomass and carbon pool now being collected. However, information on carbon absorption and release of coarse woody debris, peat and soil carbon is non existent because of lack of data on these components. Surveys on duration and amount of various forest products have started and results could be available in the near future.

In general, data related to production and consumption of forest products have been assessed on a regular basis. In the recreation and tourism sector, information is available except for recreation visitor days which could be provided only through detailed surveys. Because of the forest reserve systems in Korea, forest lands for cultural, social and spiritual values are easily quantified. But some information on forest investment and employment are currently lacking.

Legal and institutional frameworks to support the conservation and sustainable management of forests in Korea have generally been incorporated in the forest-related laws, guidelines and regulations. An economic framework for sustainable forest management is also included and will be enhanced in laws and regulations. Some indicators in research and development capability, including human impacts, cannot be assessed. Overall assessment of much data could be easily accessible, but it could take a long time to obtain data on not-easily-available indicators.

Mexico

The Montreal Process countries currently are facing the stage of implementation of criteria and indicators for the conservation and sustainable management of their forests. However, there are a number of issues that impose limits on the ways of reporting on all indicators. From Mexico's point of view, there are several problems regarding the availability of information for several criteria and indicators and a lack of information for others. For these reasons there is a need to develop a standardized method of reporting for all countries.

During the development of Mexico's national report for the Canberra meeting, difficulties in reporting forest ecosystems at the national level became apparent. This is because in Mexico there are three types of land ownership and four classes of forest ecosystems (temperate forest, tropical rain and dry forests and arid vegetation); there are natural forests managed for multiple uses, natural forests managed for conservation, and forest plantations managed for restoration of forest ecosystems and for wood production. The availability of data differs in each case according to the level of forest management activities carried out. It should be noted that the major issues faced by Mexico were presented for each criterion in Mexico's national report.

From Mexico's perspective, the main difficulty in filling information gaps for several criteria and indicators is the time for monitoring all forest ecosystems and different types of land ownership at the same level. In the meantime, Mexico considers it very important to work in developing a weighted methodology for all Montreal Process countries, that permits reporting at the national level in order to enable international comparisons between countries in the Montreal Process. Justifications for this approach are:

1. The status of some indicators varies significantly depending on the type of forest land ownership.

2. The status of some indicators varies significantly depending on the forest ecosystem.

3. The accuracy and availability of data on several indicators for the kind of characteristics above are significantly different. For example, Mexico has more detailed information for temperate forest than for tropical rain and dry forest.

4. The status of some indicators varies significantly depending on the forest type.

5. Mexico considers that one method of reporting can be based on the three forest types presented at the Eighth Working Group meeting. However,

further discussion is required in order to confirm that all member countries can develop the proposal.

Mexico proposes that methodology be developed in order that data may be aggregated and weighted by forest type, land ownership and forest ecosystem in order to develop the best approach to obtain the national report for each country.

New Zealand

The New Zealand Situation - Reporting of Different Forest Types

The reporting of different forest types and the manner in which data are aggregated are issues which must be considered in national reports under the Montreal Process.

During the development of New Zealand's national report for the eighth meeting of the Montreal Process, difficulties were seen in reporting on all forest types. Of particular note was the reporting on the different requirements of:

- natural forests managed for conservation values

- natural forests managed for multiple use including wood production

- planted forests managed for wood production.

A key issue for New Zealand's involvement in the Montreal Process is to ensure the rather unique position of relying predominantly on planted forests for its timber resource is recognised. The planted forests have allowed New Zealand to set aside a high proportion of its natural forests. The natural forests are primarily managed for their conservation values, including the maintenance of biological diversity.

In order to effectively develop a national report each country needs to undertake an assessment of the status of each forest type and aggregate the data. In the aggregation process it is very easy to lose important information on the status of each forest type.

New Zealand put forward a proposal at the eighth meeting of the Montreal Process suggesting that countries could, if appropriate report separately on each forest type. The meeting agreed that aggregation of data should occur and that there was a need to be transparent in methods used when reporting on criteria and indicators. To achieve transparency it was also agreed that countries should provide narrative comment on how data was sourced and used in reporting.

As undoubtedly comparisons will be made between countries New Zealand supports the concept of transparency being achieved by providing narrative comment when data is aggregated.

United States of America

The Challenge of Multiple Government Jurisdictions and Land Ownerships

The United States of America is a federated republic and a constitutional democracy. The government is highly decentralized. All powers and responsibilities not clearly reserved by the federal (national) government due to overriding national importance rest with the 50 states and, where the States have further delegated their authorities, with more than 3,000 local government units.

In the U.S., the 50 states are individually responsible for providing land management guidance for state-owned and private forests, which account respectively for about 5% (15 million ha) and 60% (180 million ha) of all U.S. forests. There are 10 million private forest owners in the U.S. whose land comes under State jurisdiction.

Nationally, several agencies of the federal government (Forest Service, Park Service, Fish and Wildlife Service, Bureau of Land Management, Department of Defense, etc.) are responsible for managing the remaining 35% of U.S. forests (105 million ha) which are publicly owned and occur largely in the western part of the country.

The size and distribution of private forest land varies tremendously across the country, and reflects evolving patterns of settlement from early colonization and independence through successive waves of western expansion. Most eastern forests, the first settled, belong to millions of small owners. By contrast, in the West, vast tracts of forest are managed by a wide variety of federal and state agencies and Native American tribes. Throughout the country, large forest areas are owned by forest product companies.

Forest inventory and data collection to date

Decentralized government responsibilities, historic settlement patterns and multiple public and private forest owners (with various socio-economic and cultural perspectives) have had a direct bearing on the data collected and maintained on forest lands in the U.S. in several ways.

First, agricultural and industrial development in the country has traditionally valued forests for wood production. Since 1930, the U.S. has had a national plot Forest Inventory and Assessment (FIA) system that collects data on forest extent, type, growth and other timber values. However, while these data include public and private forests and are statistically adequate for most national level assessments, they exclude the significant portion of federal forests that are closed to wood production, such as national parks, wildlife refuges and wilderness areas.

Secondly, because of the traditional interest in wood production, very little economic data exists on non-timber forest gathering activities and products, such as berry picking and mushroom collection, even on federally managed forests where these activities tend to occur.

Thirdly, data on recreation and other public uses, and related natural resource values (e.g. biodiversity, forest health and vitality) is only available for federal and some state managed forests. The coverage and extent of the data can vary widely from state to state or even forest to forest. For example, while a great deal of site level resource data describing natural forest values on public forests (primarily in the West) has been collected in response to site-specific environmental assessments, the data cannot be easily aggregated.

In addition, very little data is available for private lands. In the U.S., private owners are not obliged to permit public access or activity on their land. Most owners, particularly in the East, prohibit public trespass of any kind.

Regarding the legal and institutional framework for sustainable forest management, the U.S. has relevant policies, regulations, and programs at all levels of government. However, the 50 states, and in some cases local communities, have jurisdiction over activities on the 60% of U.S. forests that are privately owned. State regulations and institutions vary widely based on state policies and priorities. While information on state and local laws and practices could be surveyed to form a complete national picture, this has not been done to date.

Implications for the Future

In summary, a vast amount of forest data is available in the U.S., including a relatively comprehensive national inventory of wood production values. However, much of the non-wood data has been collected by different entities at different times for different purposes using different approaches. Therefore, much of the existing data on biodiversity, forest health, soil and water conservation, and public use lacks consistency and is inadequate for national level assessments, especially as little data is available for private lands. Virtually no data exist for non-timber products.

The challenge is to obtain adequate national data on indicators in these areas. To help meet this challenge, work is underway to develop a new national forest health monitoring system in the U.S. Ideally, this would be designed to enhance and complement the existing FIA system by including many of the non-wood indicators under criteria 1-5 of the Montreal Process. This will take time and resource commitments at the national level. It will also require the full cooperation of the 50 states and a number of local governments. Equally important, where data cannot be collected through remote sensing, it will require the cooperation of the vast number of private forest owners in the U.S.

Uruguay

Uruguay has a total area of 667,315 ha of natural forests and 314,758 ha of man-made forests. Of the latter, 164,138 ha are classified as commercial forest, while 150,620 are protection and farm forests. For the past three years, and within the framework of the new forest policy, the afforestation rate has been 35,000 ha annually. With such increasing forest development, Uruguay has determined that it will start a program to develop criteria and indicators.

The current national situation with respect to the seven criteria is as follows:

Criterion 1: *Conservation of biological diversity*

Since 1980 there has been no forest inventory and accordingly all available data are estimated. However, the first stage of a forest inventory project will commence this year and the indicators under the criterion will be considered in the inventory.

Criterion 2: *Maintenance of productive capacity of forest ecosystems*
With the basic forest inventory information, the sustainable volume will be determined with higher accuracy.

Criterion 3: *Maintenance of forest ecosystem and vitality*

Since 1990 a national forest protection program has been approved and a national survey aimed at determining causes of forest damage is being planned. Even though there are not historical records, the degree of damage is not considered significant.

Criterion 4: *Conservation and maintenance of soil and water resources*

A program dealing with the impacts on the forest environment is starting. Emphasis will be placed on soil and water conservation.

Criterion 5: *Maintenance of forest contribution to global carbon cycles*

The comment relative to Criterion 4 is applicable.

Criterion 6: *Maintenance and enhancement of long-term socio-economic benefits to meet the needs of society*

Work started last year on the multiple social and economic benefits of forestry. The work will be finalized this year; future work is expected to be carried out by the Statistics and Census Service in a manner similar to that done for the industry, livestock and agriculture sectors.

Criterion 7: *Legal, institutional and economic framework for forest conservation and sustainable management*

The Uruguayan forest policy and legislation address the following goals:

1. natural forest protection, through forbidding clear cutting unless the Forestry Division approves a management plan,

2. forest resources improvement by promoting man-made forests with the proper species on low productivity soils normally used for other purposes such as agriculture and livestock,

3. forbidding the afforestation with exotic species on non suitable soils and in areas exceeding 100 ha, except where environmental impact assessments have been carried out.

There are no land ownership problems in Uruguay and there is no indigenous population.

By the end of 1996 the Forestry Directorate will contact and coordinate with other government agencies those actions aimed at completing the assessment of the indicators. By 1997 information will be available concerning all indicators.

SECTION V -- FUTURE ACTION

Eighth Meeting Decisions

The recent meeting of the Montreal Process was held in Canberra, Australia, June 3-7, 1996. The meeting was attended by representatives of all twelve participating countries and by representatives of the Helsinki Process, the Tarapoto Process, the Food and Agriculture Organization of the United Nations (FAO), the International Tropical Timber Organization (ITTO), the International Union of Forestry Research Organizations (IUFRO), the Intergovernmental Seminar on Criteria and Indicators for Sustainable Forest Management

(ISCI), international environmental NGOs such as the Global Forest Policy Project, other countries, Australian agencies and other interest groups, including forest industry groups.

At this meeting the Montreal Process countries agreed on a course of action for the future.

Technical Advisory Committee

The Technical Advisory Committee (TAC) of the Montreal Process Working Group met for the first time in Pasadena, California in September 1996 to begin developing recommendations for the Working Group on definitions for key terms used in the indicators, on the utility of forest type as a means to characterize biological diversity, and on text for explanatory notes for a number of indicators under criteria 1-6.

The formation of the TAC is expected to greatly assist the Montreal Process Working Group in efforts to collect data and report on criteria and indicators. A continuing role is foreseen for the TAC as technical and scientific issues arise based on experience gained and problems encountered in the course of implementation efforts.

First Approximation Report

The Montreal Process Working Group is in the early stages of preparing a first approximation report on implementing the Montreal Process criteria and indicators. The Report, which will be distributed at the Eleventh World Forestry Congress in Antalya, Turkey in October 1997, will include information relating to countries' implementation of the criteria and indicators and provide a general analysis of the data that countries are currently able to collect on indicators.

In order to promote transparency in methods used by individual countries when reporting on criteria and indicators, the country reports will contain narratives for indicators explaining how data was sourced and used in reporting. This type of information will be synthesized as appropriate in the first approximation report.

While many countries will have minimal data for several indicators, as indicated in the section on Current Status, the report will provide a good baseline for future efforts to implement the Montreal Process criteria and indicators.

Next Montreal Process Meeting

Korea will host the Ninth Meeting of the Montreal Process Working Group in July 1997. The major focus of the meeting will be to review recommendations of the TAC with respect to common definitions for key terms used in the criteria and indicators and on approaches to gathering data. The meeting will also finalize preparations for the first approximation report.

Joining the Montreal Process

The Montreal Process Working Group is open-ended. Member countries are united by their endorsement of the *Santiago Declaration*, which is a joint statement of political commitment to the application of national level criteria and indicators for sustainable forest management in their respective countries.

The procedure for other countries to join the Montreal Process is a diplomatic one. An interested country should, by diplomatic channels, inform the Government of Chile that its government endorses the *Santiago Declaration*. Chile will inform Canada as the Liaison Office, which will inform the other Montreal Process countries.

APPENDIX 1 -- OVERVIEW OF DATA AVAILABILITY AND REPORTING BY CRITERION FOR MONTREAL PROCESS COUNTRIES

Criteria: 1 2 3 4 5 6 7

Criterion 1. Conservation of biological diversity

Data availability

Most countries have data available to report on the indicators dealing with the extent of area byforest type and with the extent of protected area. However, less data are available when this information is qualified by age or successional status. With the exception of Mexico, there is virtually no information available concerning forest fragmentation.

Regarding species diversity, most countries have data available for at least one of the two indicators. There is little data available for the indicators on genetic diversity.

Key issues concerning data availability tend to be country specific and include the need for a meaningful classification of forest types, the problem of assigning age to uneven-aged stands, the availability of comparable trend information, conflicting definitions regarding multiple use forest management and designation of protected areas, limited data on genetic diversity, costs of funding a periodic national forest inventory and the variety in land tenure arrangements. There is also a general lack of consensus on measurements for forest fragmentation.

Reporting

Most countries have effective methodologies to assess many indicators under this criterion. However, Uruguay lacks methodologies for most indicators with the exception of ecosystem diversity, and the United States has reliable data for only a few indicators that include the extent of forest type relative to forest area and age class. In addition, a number of countries lack the capacity to report on fragmentation and genetic diversity.

Key issues include the need to develop methodologies to report on fragmentation of forest types, the need to establish new monitoring systems for species diversity and the need for inventories, research and development.

Criterion 2. Maintenance of productive capacity of forest ecosystems

Data availability

Data are generally available for all indicators for the majority of countries. The exception is the indicator dealing with the annual removal of non-timber forest products, for which no country has adequate data.

Key issues include limited availability of data for forests on private land, comparability of historical data, and lack of information on sustainable volume removals of both wood and non-wood products.

Reporting

Most countries have some capacity to report on the indicators under this criterion with the exception of the removal of non-timber forest products.

Key issues include the need to develop methodologies for reporting on sustainable levels and types of forest products, the lack of national monitoring programs or protocols and base line productivity levels, the need for research on ecological interactions between species and forest ecosystems and the need for research to stratify forests by eco-zones, to improve evaluation methodologies and standardize inventory programs.

Criterion 3. Maintenance of forest ecosystem vitality and health

Data availability

This is one of the criteria for which there is a minimum of data. However, about half the countries indicated they have some data for the indicator dealing with forest damage. No countries have data for indicators on air pollutants and diminished biological components. Two countries indicated that data are not presently available for any of the three indicators.

Key issues include the fact that historic variation in some cases can only be considered in the context of the past few decades and that the effect on forests of air pollution is not yet perceived to be a widespread problem in some countries.

Reporting

Most countries indicate they will face challenges in reporting on the three indictors in this criterion. With the exception of Canada, Korea, New Zealand (for plantations) and Russia, countries have limited or no capacity for reporting.

Key issues include the lack of national standard protocols for monitoring and summarizing results, the need for clarification of terms such as diminished biological components and vitality, the need for new monitoring systems for all three indicators and the need for further research.

Criterion 4. Conservation and maintenance of soil and water resources

Data availability

With the exception of the indicator dealing with forest land managed primarily for protective functions, most countries do not have data available for the other indicators. Only China, Korea and Mexico have data available for soil erosion.

The key issue is the need for new systems of data collection.

Reporting

All countries indicate they will face challenges in reporting on the eight indicators in this criterion. China and Russia have the best capability with China having some information on four of eight indicators (soil erosion, protective functions of forests, streamflow damage, changes in soil chemical properties) and Russia on three (soil erosion, protective functions

of forests, toxic substances). Canada has some information on two indicators (protective functions of forests, toxic substances).

The key issue is the need for new monitoring systems.

Criterion 5. Maintenance of forest contribution to global carbon cycles

<u>Data availability</u>

Countries vary considerably in data availability for the three indicators. Data are more readily available for the indicator dealing with forest ecosystem biomass and least available for the indicator concerning the contribution of forest products to the global carbon budget.

Key issues include the need for research to provide improved data, especially for certain eco-zones.

<u>Reporting</u>

This criterion poses difficulties in reporting for many countries, with the exceptions of New Zealand (for plantations), Russia and the United States. Canada has some capacity in all three indicators and reporting capacity will be easy to moderate. China has capacity to report on the three indicators although reporting will be moderate for the forest ecosystem biomass indicator and difficult for forest products in the global carbon budget. Information is sketchy to incomplete, at best, limiting the reporting capacities for other countries. Australia is undertaking research to improve its reporting capability for the three indicators particularly for global carbon estimates.

Key issues include the need for new methodologies for estimating and reporting carbon budget and forest ecosystem biomass and for new monitoring systems to report on the indicators in this criterion.

Criterion 6. Maintenance and enhancement of long term multiple socio- economic benefits

<u>Data availability</u>

With the number of and variation in the 19 indicators within this criterion, the wide range in data availability is not surprising. Most data are available for the production and consumption indicators while least data are available for certain indicators dealing with recreation and tourism, cultural, social and spiritual needs, and for employment and community needs.

In general, those indicators with most data available are related to the value and volume of wood production, the supply and consumption of wood products, and average wage rates in the forestry sector. Data are limited or lacking for about six of the 19 indicators.

Key issues include the lack of data for non-wood products, the limitation of data to specific products such as Christmas trees and maple products, the lack of data on recycling of products other than pulp and paper, the lack of data on recreation and tourism on private

land and the lack of data on investment and on research and development expenditures by the private sector.

Reporting

All countries have some capacity, if limited, to report on the first six indicators dealing with production and consumption. However, most countries have limited experience assessing the status of forest dependent communities, forest land for subsistence purposes and non-consumptive forest values.

Key issues include the need to enhance inventories, research and development to improve reporting capacity, the need for all countries to agree on the use of multipliers regarding indirect employment in the forestry sector, the need for development of assessment systems for indicators concerning new and improved technologies, forest dependent communities and non-consumptive use forest values, and the lack of information about cultural, social and spiritual needs.

Criterion 7. Legal, institutional and economic framework

Data availability

Data availability is high for the 20 indicators within this criterion, with most data or some data available for virtually all indicators. There are some differences, however, with indicators dealing with legal, institutional and economic frameworks generally having more data available than indicators that measure and monitor change and with research and development. Only two countries have indicated that data are not available for several indicators.

Key issues include the fact that performance indicators are required for some indicators, that for certain indicators it will be difficult to assess their impact on sustainable forest management, that some data will be difficult to collect from private industry and that surveys will be required to collect information for many of the indicators.

Reporting

Reporting will be easy to moderately difficult for the majority of countries for most of the indicators. Some countries will have difficulty reporting on indicators dealing with impacts on sustainable management, measuring environmental and social costs and benefits and predicting impacts of human interventions on forests. Most will have difficulty with the five research and development indicators.

Key issues include the need for development of new research systems and reporting methodologies for indicators dealing with the ability to measure and monitor change, the need for new methods of reporting, the need for a uniform interpretation of indicators and the lack of an ability to predict impacts of possible climate change on forests.

APPENDIX 2 -- MONTREAL PROCESS CRITERIA AND INDICATORS FOR THE CONSERVATION AND SUSTAINABLE MANAGEMENT OF TEMPERATE AND BOREAL FORESTS

Criteria: 1 2 3 4 5 6 7

Criterion 1: Conservation of biological diversity

Biological diversity includes the elements of the diversity of ecosystems, the diversity between species, and genetic diversity in species.

Indicators:

1.1 Ecosystem diversity
    1.1.a. Extent of area by forest type relative to total forest area-(a);[1]
    1.1.b. Extent of area by forest type and by age class or successional stage-(b);
    1.1.c. Extent of area by forest type in protected area categories as defined by IUCN[2] or other classification systems-(a);
    1.1.d. Extent of areas by forest type in protected areas defined by age class or successional stage-(b);
    1.1.e. Fragmentation of forest types-(b).

1.2 Species diversity
    1.2. a. The number of forest dependent species-(b);
    1.2. b. The status (threatened, rare, vulnerable, endangered, or extinct) of forest dependent species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment-(a).

1.3 Genetic diversity
    1.3. a. Number of forest dependent species that occupy a small portion of their former range-(b);
    1.3. b. Population levels of representative species from diverse habitats monitored across their range-(b).

Criterion 2: Maintenance of productive capacity of forest ecosystems

Indicators:

    a. Area of forest land and net area of forest land available for timber production-(a);

    b. Total growing stock of both merchantable and non-merchantable tree species on forest land available for timber production-(a);

    c. The area and growing stock of plantations of native and exotic species-(a);

    d. Annual removal of wood products compared to the volume determined to be sustainable-(a);

    e. Annual removal of non-timber forest products (e.g. fur bearers, berries, mushrooms, game), compared to the level determined to be sustainable-(b).

Criterion 3: Maintenance of forest ecosystem health and vitality

Indicators:

a. Area and percent of forest affected by processes or agents beyond the range of historic variation, e.g. by insects, disease, competition from exotic species, fire, storm, land clearance, permanent flooding, salinisation, and domestic animals-(b);

b. Area and percent of forest land subjected to levels of specific air pollutants (e.g. sulfates, nitrate, ozone) or ultraviolet B that may cause negative impacts on the forest ecosystem-(b);

c. Area and percent of forest land with diminished biological components indicative of changes in fundamental ecological processes (e.g. soil nutrient cycling, seed dispersion, pollination) and/or ecological continuity (monitoring of functionally important species such as fungi, arboreal epiphytes, nematodes, beetles, wasps, etc.)-(b).

Criterion 4: Conservation and maintenance of soil and water resources

This criterion encompasses the conservation of soil and water resources and the protective and productive functions of forests.

Indicators:

a. Area and percent of forest land with significant soil erosion-(b);

b. Area and percent of forest land managed primarily for protective functions, e.g. watersheds, flood protection, avalanche protection, riparian zones-(a);

c. Percent of stream kilometres in forested catchments in which stream flow and timing has significantly deviated from the historic range of variation-(b);

d. Area and percent of forest land with significantly diminished soil organic matter and/or changes in other soil chemical properties-(b);

e. Area and percent of forest land with significant compaction or change in soil physical properties resulting from human activities-(b);

f. Percent of water bodies in forest areas (e.g. stream kilometres, lake hectares) with significant variance of biological diversity from the historic range of variability-(b);

g. Percent of water bodies in forest areas (e.g. stream kilometres, lake hectares) with significant variation from the historic range of variability in pH, dissolved oxygen, levels of chemicals (electrical conductivity), sedimentation or temperature change-(b);

h. Area and percent of forest land experiencing an accumulation of persistent toxic substances-(b).

Criterion 5: Maintenance of forest contribution to global carbon cycles

Indicators:

a. Total forest ecosystem biomass and carbon pool, and if appropriate, by forest type, age class, and successional stages-(b);

b. Contribution of forest ecosystems to the total global carbon budget, including absorption and release of carbon (standing biomass, coarse woody debris, peat and soil carbon)-(a or b);

c. Contribution of forest products to the global carbon budget-(b).

Criterion 6: Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

Indicators:

6.1 Production and consumption
  - 6.1.a. Value and volume of wood and wood products production, including value added through downstream processing-(a);
  - 6.1.b. Value and quantities of production of non-wood forest products-(b);
  - 6.1.c. Supply and consumption of wood and wood products, including consumption per capita-(a);
  - 6.1.d. Value of wood and non-wood products production as percentage of GDP-(a or b);
  - 6.1.e. Degree of recycling of forest products-(a or b);
  - 6.1.f. Supply and consumption/use of non-wood products-(a or b).

6.2 Recreation and tourism
  - 6.2.a. Area and percent of forest land managed for general recreation and tourism, in relation to the total area of forest land-(a or b);
  - 6.2.b. Number and type of facilities available for general recreation and tourism, in relation to population and forest area-(a or b);
  - 6.2.c. Number of visitor days attributed to recreation and tourism, in relation to population and forest area-(b).

6.3 Investment in the forest sector
  - 6.3.a. Value and volume of wood and wood products production, including value added through downstream processing-(a);
  - 6.3.b. Level of expenditure on research and development, and education-(b);
  - 6.3.c. Extension and use of new and improved technologies-(b);
  - 6.3.d. Rates of return on investment-(b).

6.4 Cultural, social and spiritual needs and values
  - 6.4.a. Area and percent of forest land managed in relation to the total area of forest land to protect the range of cultural, social and spiritual needs and values-(a or b);
  - 6.4.b. Non-consumptive use forest values-(b).

6.5 Employment and community needs
  - 6.5.a. Direct and indirect employment in the forest sector and forest sector employment as a proportion of total employment-(a or b);

6.5.b. Average wage rates and injury rates in major employment categories within the forest sector-(a);

6.5.c. Viability and adaptability to changing economic conditions, of forest dependent communities, including indigenous communities-(b);

6.5.d. Area and percent of forest land used for subsistence purposes-(b).

Criterion 7: Legal, institutional and economic framework for forest conservation and sustainable management

Indicators:

7.1 Extent to which the legal framework (laws, regulations, guidelines) supports the conservation and sustainable management of forests, including the extent to which it:

7.1.a. Clarifies property rights, provides for appropriate land tenure arrangements, recognizes customary and traditional rights of indigenous people, and provides means of resolving property disputes by due process;

7.1.b. Provides for periodic forest-related planning, assessment, and policy review that recognizes the range of forest values, including coordination with relevant sectors;

7.1.c. Provides opportunities for public participation in public policy and decision-making related to forests and public access to information;

7.1.d. Encourages best practice codes for forest management;

7.1.e. Provides for the management of forests to conserve special environmental, cultural, social and/or scientific values.

7.2 Extent to which the institutional framework supports the conservation and sustainable management of forests, including the capacity to:

7.2.a. Provide for public involvement activities and public education, awareness and extension programs, and make available forest-related information;

7.2.b. Undertake and implement periodic forest-related planning, assessment, and policy review including cross-sectoral planning and coordination;

7.2.c. Develop and maintain human resource skills across relevant disciplines;

7.2.d. Develop and maintain efficient physical infrastructure to facilitate the supply of forest products and services and support forest management;

7.2.e. Enforce laws, regulations and guidelines.

7.3 Extent to which the economic framework (economic policies and measures) supports the conservation and sustainable management of forests through:

7.3.a. Investment and taxation policies and a regulatory environment which recognize the long-term nature of investments and permit the flow of capital in and out of the forest sector in response to market signals, non-market economic valuations, and public policy decisions in order to meet long-term demands for forest products and services;

7.3.b. Non-discriminatory trade policies for forest products.

7.4 Capacity to measure and monitor changes in the conservation and sustainable management of forests, including:

7.4.a. Availability and extent of up-to-date data, statistics and other information important to measuring or describing indicators associated with criteria 1-7;

7.4.b.   Scope, frequency and statistical reliability of forest inventories, assessments, monitoring and other relevant information;

7.4.c.   Compatibility with other countries in measuring, monitoring and reporting on indicators.

7.5   <u>Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services, including:</u>

7.5.a.   Development of scientific understanding of forest ecosystem characteristics and functions;

7.5.b.   Development of methodologies to measure and integrate environmental and social costs and benefits into markets and public policies, and to reflect forest-related resource depletion or replenishment in national accounting systems;

7.5.c.   New technologies and the capacity to assess the socio-economic consequences associated with the introduction of new technologies;

7.5.d   Enhancement of ability to predict impacts of human intervention on forests;

7.5.e.   Ability to predict impacts on forests of possible climate change.

1: Indicators followed by an "a" are those for which most data are available. Indicators followed by a "b" are those which may require the gathering of new or additional data and/or a new program of systematic sampling or basic research.

2: IUCN categories include: I. Strict protection, II. Ecosystem conservation and tourism, III. Conservation of natural features, IV. Conservation through active management, V. Landscape/Seascape conservation and recreation, VI. Sustainable use of natural ecosystems.