FIRST APPROXIMATION REPORT OF THE MONTREAL PROCESS

THE MONTREAL PROCESS
Working Group on Criteria and Indicators
for the Conservation and Sustainable Management
of Temperate and Boreal Forests
31 August 1997

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FOREWORD

At the Eighth Meeting of the Montreal Process Working Group held in Australia in 1996, member countries agreed to share lessons learned by preparing a First Approximation Report for distribution at the Eleventh World Forestry Congress in Turkey in October 1997. The purposes of the Report are to provide support to countries with common problems, to identify technical and scientific issues which can be addressed through the Technical Advisory Committee, to identify areas requiring research, to present an initial response to the criterion assessment process, and to provide a report to the international community on the status of the Montreal Process. Accordingly, the Report presents a general overview of the status of data and the ability to report on the Montreal Process criteria and indicators. Although key issues identified for each criterion in the comprehensive country reports are summarized, the Report does not include detailed information on indicators nor country-specific comment. The Report includes background on the criteria and indicators, information concerning the implementation of the Process, overview summaries of the key issues identified for each criterion and consideration of future direction.

Eleven of the twelve member countries contributed to the content of the Report. The Liaison Office would like to express its appreciation to Montreal Process Working Group members for submitting their country reports.

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31 August 1997

EXECUTIVE SUMMARY

This First Approximation Report reviews briefly the history of the Montreal Process and its criteria and indicators and provides a summary of more recent Process activities, including early implementation. The report concludes with consideration of possible future actions arising from the discussions of the member countries at their meeting in July 1997 in Seoul, Republic of Korea, from points made in the country submissions, or from needs perceived or apparent as the result of the preparation of the report. The majority of the report is devoted to member country responses to the call for updates on the current status of data assembly and on key issues associated with the implementation of the Montreal Process. The information is provided in the form of criterion overview summaries and figures which depict levels of indicator response within each criterion.

The Montreal Process is an international response to the call of the 1992 United Nations Conference on Environment and Development to improve the quality and management of the global forest estate. It brings together, in common purpose, twelve countries from the southern and northern hemispheres. At its Sixth Meeting in Santiago, Chile (February 1995), the Montreal Process Working Group, which now includes Argentina, Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russian Federation, United States of America and Uruguay, endorsed the "Santiago Declaration", a statement of political commitment with an associated, comprehensive set of criteria and indicators for the conservation and sustainable management of temperate and boreal forests outside Europe.

The Montreal Process identifies seven criteria as essential components of the conservation and sustainable management of temperate and boreal forests. The criteria are defined by 67 indicators. The criteria and indicators provide to member countries a common understanding of what characterizes sustainable forest management. They are tools for assessing national trends in forest condition and management and a common framework for describing, monitoring and evaluating progress towards sustainability at both national and international levels.

The Montreal Process member countries have actively pursued their desire to foster sustainable forest management internationally and within their own countries. The Canadian Forest Service agreed to host a Liaison Office in Ottawa. The Working Group has held three meetings since the Santiago session. Following a member country survey in 1996, the Liaison Office prepared reports titled *Status of Data and Ability to Report on the Montreal Process Criteria and Indicators and Progress on Implementation of the Montreal Process on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests*.

At the Eighth Meeting of the Working Group, held in Australia in 1996, the member countries agreed that the Liaison Office should prepare the current report, the *First Approximation Report of the Montreal Process*. Member countries were asked to submit information on data assembly within their respective countries by criterion and indicator according to a set response format. Eleven of the twelve member countries responded. Of those, nine provided detail on both criteria and indicators; the remaining two supplied criterion information only.

Most countries responded well to Criterion 1 (biological diversity). Comprehensive information is available in most countries and databases are improving although the assembly of national-level data proved difficult in some cases. More data are available for publicly-owned forests than for private forest lands. Data related to forest type distribution appears to be readily available but information on age class distribution is limited. Fragmentation data are limited also and there is uncertainty surrounding the definition of fragmentation. Most countries have information available on the existence and extent of protected areas but their classification appears to be poorly developed. Data for species at risk are generally available but those for higher flora and fauna are much more readily available than for microflora and microfauna. Limited data are available on forest-dependent species and uncertainty was expressed over the selection of appropriate representatives for species groupings. There is a view that the indicators of the criterion, while appropriate, do not permit full description of the status of biodiversity conservation and that new or redesigned tools are required to develop adequate monitoring and assessment systems.

The best responded to of all the criteria, Criterion 2 (productive capacity) is viewed as important and its indicators are seen as meaningful and useful. However, the level of productive capacity to be attained for a range of wood and non-wood products to be considered sustainable is not yet adequately defined and the sustainability of current levels of production is not well understood. Area of forest land and net area available for timber production are generally available. The best information exists for timber products and plantations with less information available for non-commercial forests. Measures of change over time are lacking. In some countries there has been a significant decline in the area of natural forest available for timber production arising from the designation of conservation reserves and other exclusions. Least data are available for non-wood products and tend to be fragmentary and local. National-level data are difficult to assemble. Publicly-owned lands tend to be better managed than private forest lands.

The response to Criterion 3 (forest ecosystem health) was slightly below the average for all criteria. Most countries consider their forests to be generally healthy and vigorous. Information is broadly available on losses from major forest disturbances although the data can be difficult to aggregate to the national level. There is a general inability to relate levels of damage to the range of historic variation. Wildfire constitutes a dominant ecological disturbance for many countries. Air pollution is not considered to have a significant effect on forest health or vitality in southern hemisphere countries. The concern is greater in northern hemisphere countries, particularly with respect to acid deposition and ozone effects. There are substantial gaps in knowledge of air pollution in many forested areas. This lack of data, coupled with some monitoring inadequacies, is seen as affecting the ability to appropriately evaluate some pollution effects. New monitoring technologies are being developed and utilized to improve monitoring capabilities.

Criterion 4 (soil and water resources) was found to be a difficult criterion to respond to. Data availability varied widely across the countries and national-level data were difficult to assemble. Best information is generally available for regions where logging occurs, in near-urban areas and in research watersheds. There is a lack of historical data for comparison against current levels of activity. Soil erosion is not well monitored although in some

countries codes of practice are in place to regulate erosion-causing activities. Data on soil properties such as organic matter and physical and chemical properties are generally not available. Catchment and run-off studies have been widely conducted but the application of results to larger-sized areas is seen as tenuous. Not all countries have data available concerning the accumulation of toxic substances although it is noted that persistent chemicals are being decreasingly used and mill effluents are being increasingly controlled and reduced. Protection forests have played an important role in preventing natural erosion disasters and in water conservation. To enhance reporting capability, there is a need to develop improved measurement and monitoring approaches.

There was considerable variation amongst countries in the reporting on Criterion 5 (global carbon cycles). The reporting rate was the second lowest of all and the data collection rate was only slightly above average indicating a criterion with which countries were having some difficulty. Forest biomass data are incomplete in many areas and carbon cycle data are frequently estimated. Estimates of the contribution of forest carbon to global cycles have been made by several countries but specific measurement protocols are not always in place. Forests and forest products are viewed as carbon sinks; however, there is little information that deals specifically with forest products. Research is needed on forest and woodland biomass and growth rates and on the translation of these into carbon stocks and fluxes. There is no agreed methodology for reporting on the contribution of forest products to the global carbon budget. There appears to be a need to coordinate the data requirements for this criterion of the Montreal Process with those for the Framework Convention on Climate Change.

The responses on Criterion 6 (socio-economic benefits) were also highly variable. The overall reporting rate was above average but the data collection rate was below average. Countries were well able to respond on certain indicators, but there was a common inability to respond on a number of others. Supply and consumption data for wood and wood products are generally available but data for non-wood products are difficult to obtain for most countries. Responses with respect to recycling were most frequently related to paper products. Little information is available on the recycling of solid wood and manufactured wood products. Most countries were able to provide general information on recreation areas but few could provide information on facilities and usage. Most countries had difficulty responding to investment-related indicators. Professional and occupational training in forestry is widespread and well advanced. Research is seen as having made major contributions to forest management but there is concern over the adequacy of funding to research programs. Information provided on forest-related cultural, social and spiritual needs is not extensive and data are fragmentary. Designation of forest lands for these purposes is, in general, being increased. The level of direct and indirect employment in forestry varies but is reported to be significant in most countries and there was little difficulty in reporting injury and wage rate data. There is considerable variation in the occurrence of forest-dependent communities and the use of forests for subsistence purposes. In part this stems from uncertainty over the definition of "subsistence" and of "forest-dependent".

Overall, Criterion 7 (legal, institutional and economic frameworks) was the least well-responded to of all the criteria. This was borne out by the specifics of many of the answers as well as the confusion that seemed to exist in how to respond to many of the indicators. Many of the indicators tend to be qualitative in nature rather than quantitative which also affects the approach to response. All countries have well-established legal frameworks for the management of forest lands although this commonly excludes full regulatory management of private lands. Most countries have now embodied the principles of sustainable forest management in legislation. Decentralization of responsibility in larger

countries makes the assembly of national-level data more complex. Data incompatibility within and amongst countries is of concern. Public participation in decision-making processes is becoming increasingly common. Forest management guidelines, codes of practice and best practices approaches are becoming more common as well. The rights of indigenous peoples are often entrenched in legislation and are being given increasing recognition. Research is frequently the responsibility of government although industry is often a strong player and partner. There is a view that, despite shrinking budgets, more research is needed. A number of countries made reference to GATT-related commitments and to the need for non-discriminatory trade practices.

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SECTION I - INTRODUCTION AND HISTORY

Forests are essential to the long-term well-being of local populations, national economies, and the earth's biosphere as a whole. The first concerted effort to deal with forest issues on a global scale took place at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in June 1992. This conference focussed world attention on the importance of sustainable forest management as a key component of sustainable development[1]. 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.

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 focussed specifically on criteria and indicators and provided the conceptual basis for subsequent regional and international work.

Subsequent to the CSCE seminar, thought was given to having the participating countries develop criteria and indicators for sustainable forest management. However, European countries decided to work as a region under the framework of the Helsinki Ministerial Declaration and its four resolutions to which they were all signatories.

Canada took the lead in launching an initiative among the non-European countries having temperate and boreal forests. The specific purpose was to develop and encourage implementation of internationally agreed national-level criteria and indicators for sustainable forest management. This initiative led to the formation in Geneva in June 1994 of the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, which is now known as the Montreal Process.

The Montreal Process Working Group includes twelve countries - Argentina, Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russian Federation, United States of America and Uruguay. These countries occur in five of the seven continents (Africa and Antarctica excluded) and together represent about 90 per cent of the world's temperate and boreal forests, as well as areas of tropical forest, and 60 per cent of all forests. They account for about 45 per cent of the world trade in wood and wood products and 35 per cent of the world's population.

Between June 1994 and February 1995, the Montreal Process countries met five times to pursue the development of internationally agreed criteria and indicators. At the Sixth

Meeting in Santiago, Chile in February 1995 the ten original participating Working Group 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 respective policy makers. Subsequently, Argentina and Uruguay have endorsed the *Santiago Declaration* and have become members of the Montreal Process. At the same time, the Canadian Forest Service offered to host in Ottawa the Liaison Office of the Montreal Process. The office still resides there and provides a number of important services including document preparation and distribution, process coordination and various clearing house functions.

1: Sustainable development is defined as meeting the needs of today without hurting the ability of future generations to meet their needs.

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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. The seven criteria are defined by 67 associated indicators which are aspects of the criteria that can be measured or described. No priority or order is implied in listing the criteria or indicators. All are important.

The seven criteria, with the number of indicators in each in parentheses, are as follows. The indicators are listed in Appendix 1.

1. Conservation of biological diversity (9);
2. Maintenance of productive capacity of forest ecosystems (5);
3. Maintenance of forest ecosystem health and vitality (3);
4. Conservation and maintenance of soil and water resources (8);
5. Maintenance of forest contribution to global carbon cycles (3);
6. Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies (19);
7. Legal, institutional and economic framework for forest conservation and sustainable management (20).

Criteria 1-6 and associated indicators characterize sustainable management of a nation's forests. They are not intended to apply to a specific forest management regime, either for natural forests or for plantations. 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 associated indicators relate to the overall legal, institutional and economic frameworks 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 characterizes sustainable forest management, recognizing that different countries may call for different emphasis to be placed on specific indicators while acknowledging that all indicators are important. 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 a common format for reporting country progress, improve the quality of information available to decision-makers and the public, and provide better information for the forest policy debate and formulation of policies at national and international levels.

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 reported on, others will involve better organization of local data, 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 need to 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 the measurement of indicators, advances in technology, and changing public demands for forest products and services.

Each country is unique in terms of the quantity, quality, characteristics and description of its forests. Countries also differ in terms of forest conditions relative to national population, such as the amount of forest per capita, the amount reforested annually per capita or the annual forest growth per capita. National circumstances further differ with respect to stages

of economic development, land ownership patterns, population patterns, forms of social and political organization, and expectations of how forests should contribute or relate to society.

Given the wide differentiation in natural and social conditions among 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. It has been anticipated that individual countries would develop specific measurement schemes appropriate to national conditions to address how data would be gathered. Qualitative terms such as "significant" or "low", which are used as indicator descriptors in some cases, would also be defined based on national conditions. Despite these differences, efforts should be made to harmonize the approaches of countries to measuring and reporting on indicators.

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SECTION III - IMPLEMENTATION

Since the approval of the Santiago Declaration, the Montreal Process countries have initiated a process to pursue country specific application of the criteria and indicators based on national circumstances. Meetings in Auckland, New Zealand in November 1995 and in Canberra, Australia in June 1996 have clarified implementation issues and have facilitated initial efforts.

Status of Data and Ability to Report

Following the New Zealand meeting and in preparation for the Australia meeting, the Liaison Office prepared in May 1996 an initial survey report *Status of Data and Ability to Report on the Montreal Process Criteria and Indicators*. This report summarized data availability and the capacity to report on the criteria and indicators.

Results of the survey indicated that while the availability of data for indicators varied among the 12 countries, most had data for 50 per cent or more of the 67 indicators. On average most data were reported to be available for indicators within Criteria 2 and 7 and for some of the indicators within Criteria 1 and 6. Data were reported to be least available for indicators within Criteria 3 and 4. It was also found that quality of data was closely linked with availability of data.

Most countries indicated that they had the capacity to report on many of the indicators within Criteria 1, 2, 6 and 7 and that reporting at this time would be more difficult for the indicators of Criteria 3 and 4. Several countries indicated that they currently would have difficulty in reporting on Criterion 5.

The Montreal Process - Progress Report - February 1997

As agreed at the 1996 Australia meeting, a report outlining *Progress on Implementation of the Montreal Process on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests* was prepared for the fourth meeting of the Intergovernmental Panel on Forests held in New York in February 1997. In addition to providing information on the implementing process, the report also included "vignettes" from several Montreal Process countries that illustrate the unique experience of the country, the great variation from country to country, and the particular challenges or issues faced by individual countries. The "vignettes" also included some preliminary comments concerning implementation of the Montreal Process. It was also agreed at the Australia meeting that this First Approximation Report would be prepared describing country situations and

outlining the implementation of the Process as a means of sharing with other interested parties. It will be made available at the Eleventh World Forestry Congress in Antalya, Turkey in October 1997. The Report includes information relating to implementation of the criteria and indicators by each country and provides a general analysis of the data that countries are currently able to collect on indicators.

Technical Advisory Committee

While some of the data gaps and reporting challenges can be easily resolved, others will require new research, monitoring systems or reporting methods. To this end, a Technical Advisory Committee (TAC) of the Montreal Process Working Group was established to provide advice 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 common definitions for twelve key terms used in the indicators including biodiversity, age class, successional stage and forest-dependent community, drawing where possible on existing definitions. The TAC was also requested to explore how forest type can be used to effectively characterize biodiversity, and to develop explanatory notes for 24 indicators under Criteria 1-6 in order to provide a clearer basis for countries to develop protocols for collecting data. A report was prepared for preliminary consideration at a meeting on the margins of the fourth session of the Intergovernmental Panel on Forests. The TAC submitted a second report in May 1997 in which a number of opportunities for future work by TAC were identified. Additionally, potential areas of common interest in the technical work of the Montreal Process with that being undertaken by other international organizations were identified and an ongoing role for the TAC was elaborated. More detailed consideration was given to the two reports at the Ninth Meeting of the Working Group in the Republic of Korea in July 1997.

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SECTION IV - CRITERION SUMMARIES

Overall Summary

The material of this First Approximation Report is derived from information received in response to the call for first approximation reports from the 12 Montreal Process countries. Eleven countries (Argentina, Australia, Canada, Chile, Japan, Republic of Korea, Mexico, New Zealand, the Russian Federation, the United States of America and Uruguay) submitted reports that included information on the criteria. Nine of the countries (Australia, Canada, Chile, Japan, Mexico, New Zealand, the Russian Federation, the United States of America and Uruguay) included detail on the indicators of the seven criteria and included statements on most indicators.

Reporting rates were strong for all criteria. (See Table 1 for explanation of terms.) The lowest rate was for Criterion 7 (legal, institutional and economic frameworks) (74%). All others were reported at a rate of 85% or higher. Countries reported that data were being collected, or were available, on more than 60% of the indicators for all but Criterion 4 (soil and water resources) which was reported at 50%. Criterion 7 was not included in this latter evaluation as many of the indicators are descriptive and do not lend themselves to data-based assessment.

In the provision of indicator detail (tables, charts, figures), the overall returns slipped considerably. Only Criteria 2 (productive capacity) and 5 (global carbon cycles) (Criterion 7

again being excluded) had response rates of 50% or better. In keeping with the view that it would be amongst the most difficult to report on, Criterion 4 was not well addressed at just over 14%. Other criteria ranged from 33% for Criterion 3 (forest ecosystem health) to 42% for Criterion 6 (socio-economic benefits).

One of the important pieces of information to be drawn from the country submissions is the identification of gaps (knowledge, database, and monitoring gaps, amongst others) needing to be addressed if more complete reporting on indicators is to be achieved. Most countries contributed freely to this but some, mainly those which had no data to report, did not extend their analyses to identifying areas where difficulties might be encountered.

The identification of gaps does not suggest only a current inability to report on an indicator. As commonly, it suggests an inability to report fully. For six of the seven criteria, the identification of gaps exceeded 50%. Interestingly, Criterion 7 was lowest at just 25%.

There is little relation between the rate of reporting, data collection or submission of detailed responses and the identification of gaps. A criterion well-responded to, e.g., Criterion 1 (biological diversity), could just as easily have a large percentage of identified gaps as could a less well responded to criterion, e.g., Criterion 4.

Most frequently, reference to methods of collection, extent of application and data reliability, was not included in the responses to individual indicators. Although such information was not critical to this reporting of the Montreal Process, it would bring much additional understanding to the responses and could usefully be considered for inclusion as requested information in future reportings.

In conclusion, it is evident that the majority of the Montreal Process countries have put considerable effort into preparing the country reports and that there is a strong commitment to participate in the implementation of the Process. In reporting, each country has constructively identified issues and gaps, many of which are common to more than one country. Obviously the countries have the desire to share information and to ensure that the Montreal Process approach is meaningful and successful.

Table 1: Indicator reporting by criterion

Criterion	Reporting Rate (%)	Data being Collected (%)	Detail Provided (%)	Gaps Identified (%)
C1 (biological diversity)	96	88	41	69
C2 (productive capacity)	100	87	51	67
C3 (forest ecosystem health)	93	67	33	70
C4 (soil and water resources)	90	50	14	61
C5 (global carbon cycles)	85	70	59	59
C6 (socio-economic benefits)	90	61	42	53
C7 (legal, institutional and economic frameworks)	74	--	--	25
All Criteria	87	68	39	50

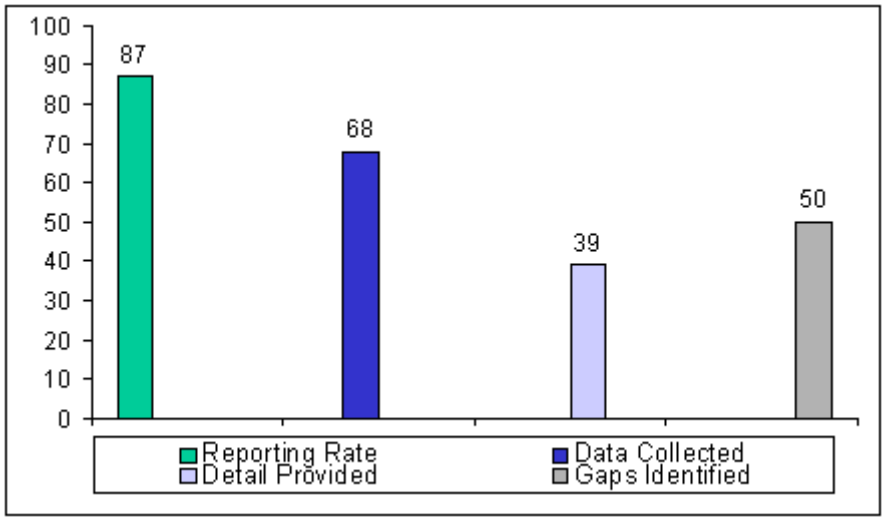
Reporting rate: Indicators were addressed in country reports although there may not have been any detail or text presented.

Data being collected: The country has indicated that it is collecting data on the indicators or it is clear from the

	presentation that data are being collected.
Detail provided:	The country has provided detail beyond text on indicators in the form of tables, charts, figures, etc.
Gaps identified:	The country has indicated that there are information gaps or it is clear from the presentation that such gaps exist.

NOTE: Data were not summarized for the "Data being Collected" and "Detail Provided" columns in Criterion 7 because the text tends to be descriptive rather than quantitative and does not lend itself to quantitative analysis.

Reporting Indicator Data - All Criteria



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CRITERION 1: CONSERVATION OF BIOLOGICAL DIVERSITY

Most countries responded well to this criterion with some information available for the three categories of diversity. The overall reporting rate for the indicators within the criterion was 96%, while the data collected rate averaged 88%. Detail was provided for 41% of the indicators while data gaps were identified for 69%. The criterion was considered important, particularly in countries where reforestation programs make extensive use of introduced species and in cases where specific species of flora and fauna are found in only one country.

Comprehensive information is available in most countries and databases are improving. In countries where individual states, provinces or territories maintain their own records, national-level data can be difficult to assemble. In instances where there are a number of jurisdictions responsible for forestry the comparability of data is problematic. Further, data for various categories of forest may differ. In general, there are more data available for publicly-owned forests than for privately-owned forests and also for areas where commercial forestry is practiced. It was also noted by some countries that there may be more data available for plantation forests than for natural forests.

Within the five indicators concerned with **ecosystem diversity**, most data appear to be available for the indicator dealing with the extent of area by forest type relative to total forest area. There is less information concerning age class distribution and reporting has sometimes been based on ?maturity classes? rather than on definitive age classes. Least information is available concerning fragmentation. Where countries have reported on fragmentation, it has been based on case studies or on proxy data such as road density.

There seems to be little commonality of view on the definition of forest fragmentation or on how it should be measured.

Most countries have information available concerning **protected areas**, but the ability to categorize the areas using the IUCN classification system varied widely. It has been noted that the area of protected land that is privately-owned is difficult to ascertain. All countries appear to recognize the importance of setting aside areas for the protection of biodiversity and the area of such land is increasing. However, it should be emphasized that protected areas are used for different purposes by different countries. It has also been suggested that the current data sets do not provide answers to questions related to unique ecosystems or ecosystems at the edge of their natural range.

In some countries forests and woodlands have been cleared for such purposes as agriculture, pastoralism and urbanization and the impacts of this clearing on biodiversity conservation are yet to be fully assessed.

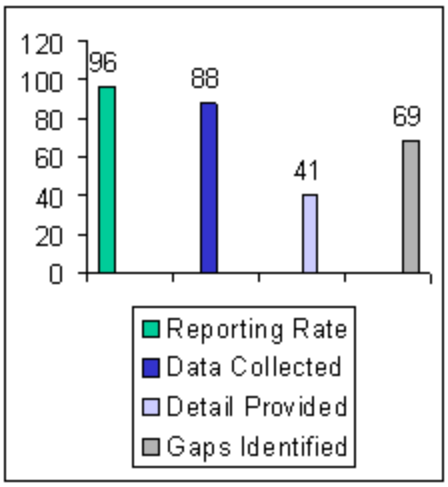
Most countries have some information available concerning the status of forest **species at risk** of not maintaining viable breeding populations as well as on the **number of forest-dependent species**. In general, data for endangered species are available. Some countries have been able to provide numerical information on the number of rare, vulnerable, endangered or extinct categories. Most information is available for plants, mammals, birds, reptiles and amphibians with little information available for microflora and microfauna or for aquatic flora and fauna. Some detailed and localized data have been provided for threatened mammal populations. However, the minimum size requirements for specific forest types cannot be addressed with current data.

Limited data are available in some countries concerning the numbers of forest- dependent species that occupy only a small portion of their former range. The focus of this information is on species that are generally sensitive to commercial forest management. Limited monitoring of population levels was reported for a few selected species and in some instances information on genetic variability within species is available. A number of countries expressed uncertainty over species groupings and the selection of appropriate "representative" species.

While the Montreal Process countries believe that the indicators identified in this criterion are appropriate, they are concerned that available methodologies do not permit an accurate description of the status of biodiversity conservation within their countries, especially with respect to genetic variation. In many instances, existing tools and measurements designed for other purposes may be redesigned or expanded in order to provide better information.

CRITERION 1: Conservation of Biological Diversity

- most countries responded well
- information comprehensive and databases improving
- monitoring systems often not designed for biodiversity purposes
- national-level data can be difficult to assemble
- data compatibility problematic for multi-jurisdiction countries



- information better on accessible forest lands
- terrestrial endangerment data well in hand for higher flora/fauna
- area of protected forest land is increasing
- countries experienced difficulty in responding to indicators where age class breakdown was required
- little commonality of view on the definition of forest fragmentation and how it should be measured
- indicators identified may not permit full description of the status of biodiversity conservation

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CRITERION 2: MAINTENANCE OF PRODUCTIVE CAPACITY OF FOREST ECOSYSTEMS

Most countries indicated that they were able to respond well to most indicators in this criterion. The overall reporting rate for the indicators was 100%, while the data collection rate averaged 87%. Specific detail was provided for 51% of the indicators, while gaps were identified for 67%. The criterion was considered important and most indicators were seen as meaningful and useful in evaluating sustainability from a productive capacity point of view. The indicators will also provide information on the degree to which current management systems are effective in maintaining the productive capacity of forest and woodland ecosystems, including both natural forests and plantations, and considering all goods and services provided by these ecosystems. However, the level of productive capacity to be attained for a broad range of wood and non-wood products and to be considered sustainable is not yet adequately defined or understood and the sustainability of current levels of production, particularly of non-wood products, is not well understood. In at least one country, the allowable annual cut has been used as a proxy to determine the sustainability of the timber harvest, while in some other countries the current harvest is considered to be less than the sustainable harvest. As is the case with the indicators in Criterion 1, there is less information available for privately-owned forests than for publicly-owned forests.

Area of forest land and net area available for timber production are generally available, or will be in the near future as current inventory programs are completed. The best information is available for timber products and for forest plantations, with less information available for non-commercial forests. Less information is also available relative to the quantity and quality of growing stock. Measures of changes in **growing stock** over time are lacking and one country has noted problems in determining plantation volumes because of the small size of trees.

In some countries there has been a significant decline in the area of natural forest available for timber production. This has often resulted from decisions to designate large areas of publicly-owned forest as conservation reserves. Additionally, some forest lands are not available for timber harvesting under codes of practice designed to protect watershed, riparian and other values. In contrast, there has been in certain countries an increase in the area of plantations, particularly of introduced species of pines and eucalypts.

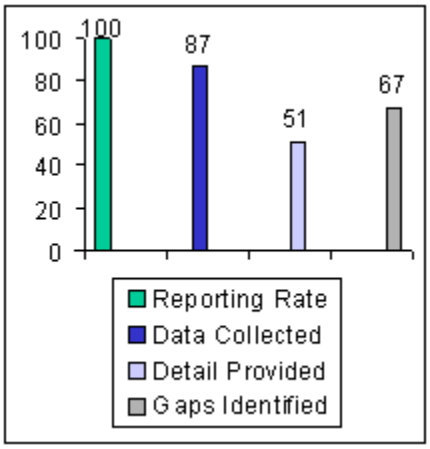
Least data are available for **non-wood products** and data that are available tend to be fragmentary and local in nature. National-level data is generally difficult to assemble as the

majority of the products are localized. The countries have provided preliminary information on a variety of non-wood products such as fuelwood, wildlife for hunting and subsistence use, wild flowers, foliage and live-plants, foods such as berries, maple syrup and mushrooms, medicines, and turpentine gum.

In recent decades there has been a high level of forest productivity research undertaken in most countries. The research has had a marked influence on the manner in which forests are being managed. Specifically, it has resulted in the proliferation of codes of practice and the development of ?best management? approaches, especially on publicly-owned lands. In contrast, the management of private lands has not benefitted from these developments. It has been noted that the quality of management of private forests, especially on small parcels of forest, is poorer than on publicly-owned forest lands.

Larger countries may have extensive areas of remote forest land which are often difficult to access and are frequently unavailable for most commercial purposes. The more remote areas are generally not as well monitored and have less comprehensive or less frequent data collected on them.

CRITERION 2: Maintenance of Productive Capacity of Forest Ecosystems



- countries well able to respond
- indicators seen as meaningful in evaluating sustainability
- data readily available for timber products and production areas
- non-wood products data localized and fragmentary
- areas for timber production have declined in recent decades
- codes of practice/best management practices have proliferated
- private forest lands less managed
- large countries have large areas of less accessible forest land
- more remote areas not as well monitored and have older or less comprehensive data available
- forest change data are difficult to assemble
- sustainability levels for a broad range of wood and non-wood products not yet adequately defined
- sustainability of current levels of production, particularly of non-wood products, not well understood

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CRITERION 3: MAINTENANCE OF FOREST ECOSYSTEM HEALTH AND VITALITY

Overall, the response to the three indicators in this criterion was slightly below the average for all criteria. Although the general reporting rate was high at 93%, data are being collected at the much lower rate of just 67%. Detail was provided for only 33% and data gaps were identified for 70% of the indicators. In general, there was an indication that considerable work is being done and that forests are generally seen to be healthy and vigorous.

Maintenance of the health and vitality of forested ecosystems is essential to sustainable forest management and it is essential that data be collected to provide information on factors causing deterioration of the forests. However, it has been noted that natural and human-caused disturbances may occur as a continuum and may range from small random periodic episodes to larger, long-term disturbance regimes such as insect infestations. Some difficulties in applying this criterion result from the fact that all forests have pathogens that are a part of the natural processes of the forest life cycle and "normal" limits have not been adequately documented.

Most countries reported that information is available concerning losses from **major forest disturbances**, although in some instances there are difficulties in aggregating information on a national basis. Prominent among these disturbances are fire, insects, diseases and weather. Most countries consider their forests to be generally healthy and vigorous. One country noted that damaging agents consumed as much timber as harvesting. Generally, regular monitoring programs are being introduced or are already in place. However, current information may be inadequate to ascertain if present levels of damage are beyond the range of historic variation.

Introduced insects, fungal diseases, plants and animals have had significant impacts in some countries. The presence of introduced pests is a concern and serves as an indicator of stress and disturbance. It is one of the parameters for measuring the health and sustainability of forests.

Wildland fire may threaten forest ecosystems and local residents, or may constitute a needed ecological process. Some countries have observed that the area affected by fire is decreasing as a result of national fire programs and may be resulting in unhealthy forest conditions. Many countries are introducing fire under controlled conditions.

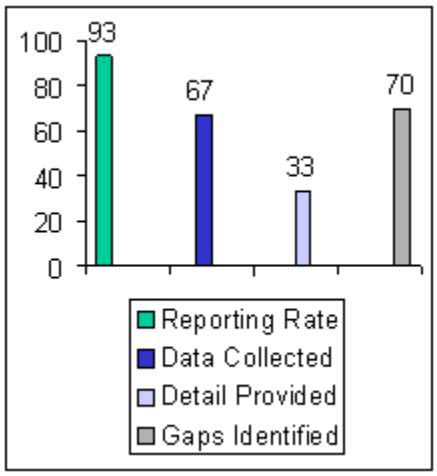
In southern hemisphere countries, **air pollution** was not considered to have significant affect on forest health or vitality, although there is evidence of localized forest damage. In northern hemisphere countries there is more concern with the potential impacts of acid deposition and with high levels of ozone, and there are permanent networks for monitoring pollution of the natural environment. Observations are being made on air pollution, soil pollution, trans-boundary transfer of air pollutants and impacts of air pollution on the natural environment and on vegetation. Pollutants impact upon forest ecosystems through dry and wet deposition pathways. Forest ecosystem sensitivity to acid deposition is dependent upon a number of factors, including the physical and chemical soil characteristics.

There are substantial gaps in knowledge of air pollution in many forested areas and this lack of data, coupled with inadequate monitoring of some aspects, is seen as affecting the ability to appropriately evaluate pollution effects on some biological components and in some potentially affected areas. Long-term monitoring and analysis of these elements needs to be designed and implemented.

Monitoring of air pollution levels and effects is in varying stages of development amongst the countries reporting and new technologies are being developed and utilized to improve

monitoring capability. These improved monitoring programs, together with directed research, will provide information on major forest stressors and serve as indicators of change occurring or anticipated in the health of forests.

CRITERION 3: Maintenance of Forest Ecosystem Health and Vitality



- lower than average response but considerable work being done
- forests are seen to be generally healthy and vigorous
- prominent disturbance agents are fire, insects, diseases, and weather
- damage agents consume as much timber as harvesting in at least one country
- air pollution not seen as a major contributor to decreases in forest health or vitality by southern hemisphere countries
- new technologies being developed to improve pollution monitoring
- improved monitoring and data collection needed by some countries
- lack of data and inadequate monitoring capability affected the evaluation of pollution effects

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CRITERION 4: CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCES

In general, countries found this the most difficult of all the criteria for which to provide data at this time. The overall reporting rate for the indicators was 90%, but the data collected rate was only 50%. Detail was provided for only 14% of the indicators and gaps were identified for 61%. It was found that data availability varied widely across the countries. Further, it was reported that national-level data are difficult to accumulate, although some countries noted that good information was available for local conditions.

Best information is generally available for regions where commercial logging is occurring, in areas near urban and industrial development and for research water-sheds. In concert with other criteria, indicators calling for information on the historic range of variation caused difficulty, as there is simply a lack of historical data.

Soil erosion is not monitored on a systematic, coordinated basis. Erosion concerns tend to be at a local scale and centre on the quality of management. In some countries codes of practice are commonly established to regulate such erosion-causing activities as road construction and harvesting. They call for setting aside of riparian buffer zones and specify erosion control measures. These guidelines limit ground disturbance and recommend practices and equipment for the reduction of soil erosion and compaction. Riparian strips

and riparian vegetation management are commonly used to improve the habitats of aquatic flora and fauna.

Data on other soil properties, including organic matter and physical and chemical properties, are generally not available on anything but a local scale. Countries approached the **soil indicators** in different ways. Some measured compliance with best management practices schemes to protect soils, whereas most tended to report soil conditions. The impacts of grazing and recreation on soil properties was noted by some countries.

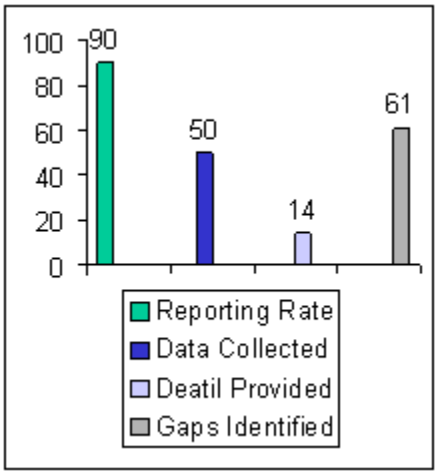
The chemical, physical and biological characteristics of water bodies provide excellent synoptic indicators of the condition of **aquatic ecosystems** and surrounding forest ecosystems. Catchment studies and local runoff studies have been conducted quite widely, but the application of resulting data to large-scale situations is seen to be tenuous. Additionally, it has often been difficult, using current methods, to distinguish between the effects of forest-related activities and activities in other industrial sectors which may impinge on the quality of water flowing through forested areas.

Not all countries have data available concerning the accumulation of **toxic substances** in soils. However, it was noted that persistent chemicals are being decreasingly used and mill effluent effects, both chemicals and dissolved solids, are being increasingly controlled and reduced.

Information on forested **areas managed primarily for soil or water conservation** is sparse and few countries reported having such data. Protection forests have played an important role in maintaining the multiple functions of these forests, in preventing natural disasters, including land slides and mud and stone flow, and in conserving water and other environmental characteristics.

A key issue in reporting for this criterion is the need to develop appropriate measures, scale and monitoring approaches. A number of research proposals designed to develop such methods have been advocated for some countries.

CRITERION 4: Conservation and Maintenance of Soil and Water Resources



- respondents found this a difficult criterion to respond to
- data availability varies widely across countries
- national-level data are difficult to accumulate
- data from catchment studies not easily applied to large-scale areas
- difficult to differentiate causes of aquatic effects
- persistent chemicals are being decreasingly used
- mill effluents are being increasingly controlled and reduced
- indicators calling for information on "historic range of variability" caused difficulty
- soil erosion not well monitored on a systematic basis

- information on forested areas managed primarily for soil or water conservation is sparse
- data on soil organic matter and changes in soil chemistry generally not available
- some countries lack data for accumulation of toxic substances resulting from forest-related operations

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CRITERION 5: MAINTENANCE OF FOREST CONTRIBUTION TO GLOBAL CARBON CYCLES

There was considerable variation amongst countries in the reporting of this criterion. On average the reporting rate was 85%, the second lowest rate overall. However, data are being collected for 70% of the indicators, the third highest rate. Detail was provided for 59% of the indicators, the highest for all of the criteria. Gaps were identified for an identical 59%. Although there was a good reporting response to this criterion, the countries did experience considerable difficulty as monitoring and analysis systems for wide-scale carbon cycle data are only recently developed or still under development.

Forest biomass data are incomplete in many areas and, as a result, carbon cycle data are frequently estimated. Information concerning forest ecosystem biomass by forest type, age and successional stage is not generally available. In some countries, estimates of total biomass have been made through carbon budget models as inventory methods do not appear to be able to provide the necessary information. Such models are not used by all countries.

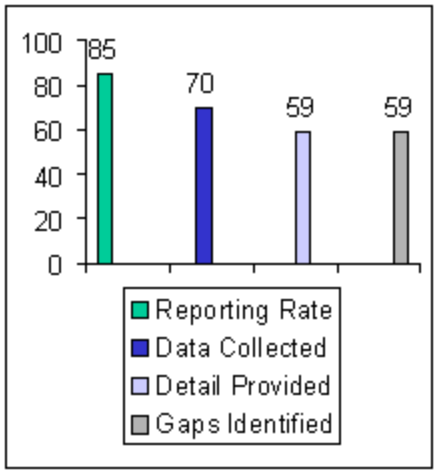
Estimates of the **contribution of forest carbon to global cycles** have been made by several countries although specific measurement protocols are not always in place. Some countries have noted that carbon budget and carbon flux data are difficult to obtain at the national level.

Forests and **forest products** are viewed as carbon sinks; however, there is little information available that deals specifically with forest products. One country reported that its forests had begun to lose carbon in the 1980s, primarily as a result of increased fire and insect disturbances, whereas a second country has noted the impact of changing land use, from forest to non-forest uses.

Research is needed to generate data sets for both above and below ground forest and woodland biomass and growth rates and to translate these into carbon stocks and fluxes. There is also a need to review the methodologies employed in current forest inventory methods in order to satisfy criterion requirements. It is noted that there is no agreed methodology for reporting on the contribution of forest products to the global carbon budget.

Some countries are collecting information for reporting on the Framework Convention on Climate Change and there appears to be a need to coordinate the data requirements between the Convention and the Montreal Process.

CRITERION 5: Maintenance of Forest Contribution to Global Carbon Cycles



- country response was mixed with considerable difficulty in some aspects
- forests seen as net sinks for carbon dioxide
- country forest biomass data frequently incomplete
- most countries have estimated the contribution of forest carbon to global cycles
- monitoring and analysis systems for wide-scale carbon cycle data developed or being developed
- most countries unable to categorize elements of this criterion by forest type, age class or successional stage
- inventorying procedures unable to satisfy criterion requirements in some cases
- carbon budget and carbon flux data difficult to obtain at the national level for most countries

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CRITERION 6: MAINTENANCE AND ENHANCEMENT OF LONG-TERM MULTIPLE SOCIO-ECONOMIC BENEFITS TO MEET THE NEEDS OF SOCIETIES

The responses across the five elements of this criterion were highly variable. It was evident that data for some indicators were commonly available for many countries. Similarly, many countries expressed a common inability to report on certain other indicators. In between was a wide range of indicators which were responded to sporadically. Amongst the areas which were found difficult to respond to were indicators dealing with non-wood forest products, forest products recycling other than paper and paper products, recreation and tourism, value added and rates of return, non-consumptive values, and subsistence.

The overall reporting rate for the criterion was 90%, a good response and slightly above the average of 87%. The data collection rate of 61% was a marked drop from the reporting rate and lower than the overall average. Detail was provided 42% of the time and gaps were identified for 53% of the responses. In both cases this was slightly above the average for all criteria.

Production data for wood products were generally well reported, although value added data appeared to be difficult to obtain or to express in meaningful terms. Information on **non-wood forest products** was frequently fragmentary. National-level data are difficult to assemble for what are generally seen as regional or local values. Supply and consumption data for wood and wood products are generally available although data on consumption is less readily available than on supply and some countries expressed apprehension about being able to gather appropriate consumption information. Supply and consumption data for non-wood products appears difficult to obtain for most countries at this time. Throughout, data are more readily available for publicly-owned forest lands than for private forest lands. Responses with respect to recycling were most frequently related to pulp and paper products and were generally not well-developed. Little information is available on the

recycling of solid wood or other manufactured wood products and difficulty is currently seen in obtaining it. Information on the value of wood and non-wood products as a percentage of gross domestic product was also sparse.

Although most countries were able to provide general information on **area of parks and reserves** for recreation, few were able to provide any detailed information on facility availability and usage. This element was amongst the most sparingly answered of any across the seven criteria. The values of recreation and tourism appear to be well recognized but are not well described quantitatively, suggesting that relevant data monitoring parameters and techniques have not yet been adequately developed. Investment related information was disparate and would be difficult to summarize.

Most countries had difficulty in responding to indicators dealing with **investment**. In general, this information is less difficult to obtain from the public sector than the private sector, although even public sector information was not provided in detail. The response to the indicator on rates of return was very limited and inconclusive. The prevailing view would appear to be that investment in forestry is essential or, at least, a "good thing", but there is little evidence presented. Professional and occupational education in forestry is widespread and well advanced. There is some concern that current training may not be preparing graduates and workers adequately for the developing needs of sustainable forest management.

Most countries view **research** as having made major contributions to forest management and consider it essential for advancement. However, adequacy of available funding for research and development is an almost universal concern. Most countries are actively promoting the use of new and improved technologies in their forest management and wood products industries and see this as vital to maintaining market advantage and to economic advancement.

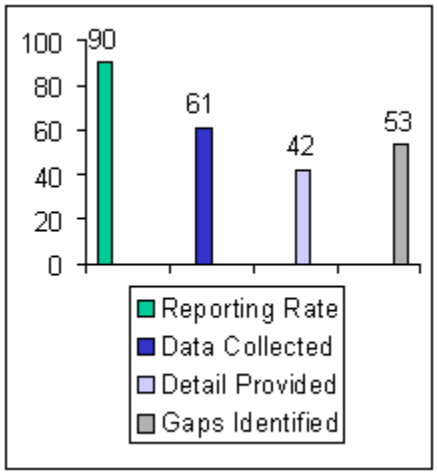
Information provided on **cultural, social and spiritual needs** and uses relative to forest land is not extensive. Data are fragmentary and need- or use-specific where reported. Comprehensive, national-level data are sparse and difficult to assemble. Designation of forest land for cultural, social and spiritual purposes is, in general, being increased. It is entrenched in law in some countries. Such designation frequently relates to the needs and rights of indigenous peoples but the needs of societies at large are gaining increasing importance through recreational and biological reserves and the protection of areas for specific purposes. There are few data available on non-consumptive use of forest values, largely because of difficulty of quantification. Notwithstanding, these uses are seen as an important element of forest land management and the need to preserve intrinsic values is well recognized.

Employment in the forest sector is of considerable importance to the economies of most, if not all, Montreal Process countries. The level of direct and indirect employment varies but is reported to be significant in most countries. Direct employment information is much more readily available than is indirect employment information. Where provided, the latter is generally estimated or derived. Most countries appear to have had little difficulty in providing injury and wage rate data but this was not always done in the context of "major employment categories". Also, there is little indication of trends in injury and wage rates.

Some countries reported that they had no **forest-dependent communities** or that the ability to establish a threshold level for dependency was constrained because of inadequate definition. Others were quite specific in their having communities dependent on the forest or forest industry for livelihood. Similarly, there was a disparate response concerning the use of forest land for subsistence purposes. Some countries were uncertain as to the definition

of "subsistence" and felt that they were unable to answer the question meaningfully. In most cases, subsistence use of the forest was related to indigenous peoples although the concept was also applied to other population segments. A call has been made for better definition of both "forest-dependence" and "subsistence" in order that these indicators may be more appropriately addressed.

CRITERION 6: Maintenance and Enhancement of Long-term Multiple Socio-economic Benefits to Meet the Needs of Society



- response across the elements of this criterion were highly variable
- data more readily available for the public lands than private lands
- wood products data well reported
- supply data more readily available than consumption data
- recycling responses usually related to paper products only
- investment data for public sector easier to obtain than for private sector
- funding for R&D is common concern
- cultural, social, and spiritual needs and uses not well understood -comprehensive, national-level data sparse
- supply and consumption data for non-wood products limited and difficult to obtain
- integration of environmental and social costs and benefits into markets and public policies not well advanced
- current training may be inadequate to meet the needs of sustainable forest management
- some countries have difficulty identifying forest-dependent communities
- uncertainty exists as to what constitutes "subsistence" with suggestions that the concept should be further defined

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CRITERION 7: LEGAL, INSTITUTIONAL AND ECONOMIC FRAMEWORK FOR FOREST CONSERVATION AND SUSTAINABLE MANAGEMENT

Although the overall response rate to the indicators of this criterion was quite good, it was, at 74%, the least well responded to of all the criteria. Further, and as somewhat of an anomaly, it was also the criterion for which there was the lowest level of gap identification. At 25% it was just one-half the rate for all criteria combined.

Although the volume of material presented might suggest otherwise, countries appeared to find this criterion a difficult one to respond to and were much less certain of the information required. As a result, more difficulty was experienced in focussing on salient points. As the indicators of the criterion are often qualitative, rather than quantitative, and there was uncertainty as to what was required, responses tended to be lengthy. (The qualitative nature of the indicators was the reason for excluding from the charts analysis of the responses for data collection and availability and the provision of detail in the country reports. The responses simply did not lend themselves to this type of analysis.) In many cases, responses simply described the appropriate legal, institutional and economic circumstances of the country without an attempt to evaluate them in terms of need, adequacy, implementation, or domestic and international pressures.

Most countries have now embodied, to one degree or another, the principles of sustainable forest management in their forest management legislation and are actively managing publicly-owned forests to that end. All countries have well-established legal frameworks for the management of forest lands, although their application on private and public lands differs. Implementation of laws varies by country and regions within countries. In most larger countries, the legal or constitutional responsibility for the management of public forest lands rests with regional governments. In smaller countries, the central government more commonly has primary responsibility. The decentralization of responsibility in the larger countries tends to make the assembly of national-level data complex and frequently raises the prospect of incompatibility between data sets. (It also raises the more general question of data compatibility between countries and whether this aspect of the reporting process has been adequately addressed by Montreal Process countries.)

Public participation in decision-making processes is becoming increasingly common. The extent to which, and the manner in which, that participation is employed appears to vary widely, from informal input to formal hearings and from participation at the information gathering stages to participation in the implementation of decisions made. In some cases, public input is a legal requirement.

Forest management guidelines, codes of forest practice and best practices approaches are becoming more common as countries strive to improve forestry practices and forest management. They may be embodied in legislation, a basic tenet of membership in organizations concerned with forest land management, e.g., industrial associations, private land cooperatives and other non-governmental organizations, or simply guidelines for forest managers. Most, but not all, countries indicated satisfaction with their ability to enforce forest management requirements.

Many countries now recognize cultural, social and spiritual values, in legislation. Protection schemes for such values have been instituted in some countries. Several noted that the rights of indigenous peoples are recognized in legislation. Such rights are receiving increasing recognition and attention.

Forestry training and education are seen to be the foundation for the application of good forestry practice. However, funding for forestry-related training is deemed to be inadequate in some cases. Educational emphasis varies amongst countries. Professional-level training is seen to be essential to forest management and for the delivery of research and development programs whereas technical-level and worker training is seen as essential to the implementation of forest management programs.

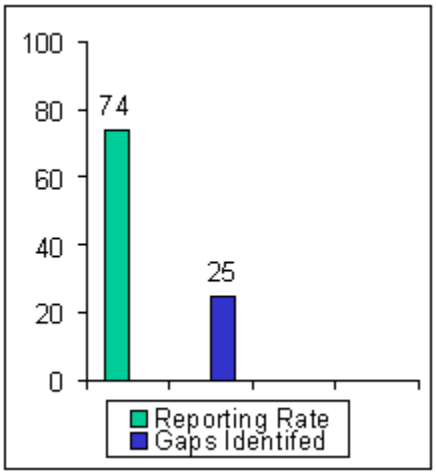
Research has contributed immensely to forest management capability and is frequently the responsibility of government agencies. Industry is also a strong player and partner in some countries but generally less so than government. Although research is needed to address

future challenges, research capacity is threatened in some countries as a result of shrinking budgets. In fact, interest in sustainability makes it clear that even greater research effort is required, particularly on exploring how to reduce environmental impacts and identifying the mechanisms by which ecosystems operate.

Several countries made strong reference to their international commitments through GATT and other international organs and expressed concern over the meeting of international goals. Reference was made frequently to the need for, and efforts at achieving, non-discriminatory trade practices and to the continuance of progress towards tariff reductions in the forest products sector.

A number of the indicators of this criterion appear closely related to indicators in other criteria. This probably resulted in some indicators not being responded to or, as was the case for a number of countries, the combining of several indicators into a generalized element response with a resultant inability to sort out the information on an indicator-by-indicator basis. It also resulted in considerable duplication of information between this criterion and specific sections of other criteria. Finally, countries frequently noted that the information was not available or required more work to assemble. On occasion, it was simply stated that the indicator did not apply.

CRITERION 7: Legal, Institutional, and Economic Framework for Forest Conservation and Sustainable Management



- criterion had lowest overall rate of response with only a small number of identified gaps
- all countries have well-established legal frameworks
- forest management often rests with regional governments
- most countries have sustainable forest management principles in legislation
- public participation in decision-making is increasingly common
- many countries now recognize special values in legislation

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SECTION V - FUTURE CHALLENGES

It has been agreed by Montreal Process countries that the Technical Advisory Committee (TAC) should be tasked to provide technical and scientific support for the Working Group. A number of specific issues identified by the Working Group were given to the Committee for recommendation. For example, further definition of terms and concepts such as subsistence and forest-dependent communities is required, and a multi-lingual glossary is needed to ensure that definitions and meanings are available in the various Montreal Process languages.

It was suggested that more explanatory material must be made available as to how the indicators are relevant measures of sustainable forest management. In particular, many are not clear on how indicator trends can be interpreted within the context of the criteria to which they refer and how they relate to the overall assessment of sustainability. Additionally, due to differences among member countries, it has been noted that there is a diversity of approaches as to how the national-level criteria and indicators can be linked with on-ground management. The Working Group considers that it would be useful for the TAC to develop long-term, standardized approaches to the monitoring of selected indicators. The collection of data for criteria and indicators for private forests, or those managed primarily for conservation, will require innovative collection techniques. The TAC is to begin working on these tasks.

The usefulness of the large number and variety of indicators in Criterion 7 has been questioned by some countries, either directly or by an inability to adequately address them or by the combining of responses for certain indicators. Certainly, concise, focussed reporting was found difficult in many cases. It was suggested that, for future reports, the Working Group explore the grouping of indicators for response, particularly the legal, institutional and economic indicators, rather than reporting by individual indicator.

There is a need to ensure, wherever possible, that the Montreal Process coordinate with the Framework Convention on Climate Change and with other environmental indicator programs noted by some countries.

The Working Group recognizes the challenge of maintaining wide public awareness, interest, and support for both sustainable forest management and the use of criteria and indicators as an important tool for achieving that goal.

Future Reporting

A small group is to be established to prepare a proposal on the content, nature and time frame for the next report which is to be considered at the Tenth Meeting of the Working Group. There will be a need to ensure that the kind of information to be provided in country reports is consistent, and that there is a prescribed format and table of contents. This will be important from the point of view of overall Montreal Process reporting.

Unfortunately, reference to methods of collection, extent of application and data reliability, was not included in the country reports. Although such information was not critical to the preparation of the First Approximation Report, it would bring much additional understanding to the responses and should be considered for inclusion as requested information in future reports.

Some members of the Working Group suggested that future reports concentrate on a selected number of specific indicators, rather than attempting to report on all sixty-seven. It was also suggested that indicators be selected where quantitative information is available for most countries and that the information to be provided be summarized in tables or charts in the Montreal Process report. Some members felt that the original intention of encouraging each country to implement data collection for the indicators at their own pace should continue to be the approach taken and that this would provide for faster progress.

Next Steps

Montreal Process countries have agreed on the following next steps:

- To coordinate among countries attending relevant international meetings in order to identify a representative of the Montreal Process for those meetings and report back to the Liaison Office.
- To prepare a brochure that could be used to explain the origins and objectives of the Montreal Process to interested parties and provide a selection of data on the state of forests in member countries. The Liaison Office will write to member countries on the establishment of a sub-group to consider the preparation of a brochure.
- To establish a contact point within each country to act as a clearing house for the exchange of information and country experiences.
- To report to the Montreal Process Liaison Office on specific proposals for changes to existing rationale statements in the light of experiences in drafting the First Approximation Report.

Tenth Meeting of the Working Group

The next meeting of the Working Group will be held in 1998 in either China or Russia. If, as proposed, the Tenth Meeting is held in China, the Eleventh Meeting will be held in Russia.

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APPENDIX 1 - MONTREAL PROCESS CRITERIA AND INDICATORS FOR THE CONSERVATION AND SUSTAINABLE MANAGEMENT OF TEMPERATE AND BOREAL FORESTS

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;

1.1.b. Extent of area by forest type and by age class or successional stage;

1.1.c. Extent of area by forest type in protected area categories as defined by IUCN[1] or other classification systems;

1.1.d. Extent of areas by forest type in protected areas defined by age class or successional stage;

1.1.e. Fragmentation of forest types.

1.2 *Species diversity*

1.2.a. The number of forest dependent species;

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.

1.3 *Genetic diversity*

1.3.a. Number of forest dependent species that occupy a small portion of their former range;

1.3.b. Population levels of representative species from diverse habitats monitored across their range.

Criterion 2: Maintenance of productive capacity of forest ecosystems

Indicators:

2.a. Area of forest land and net area of forest land available for timber production;

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

2.c. The area and growing stock of plantations of native and exotic species;

2.d. Annual removal of wood products compared to the volume determined to be sustainable;

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

Criterion 3: Maintenance of forest ecosystem health and vitality

Indicators:

3.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;

3.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;

3.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.).

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:

4.a. Area and percent of forest land with significant soil erosion;

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

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

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

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

4.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;

4.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;

4.h. Area and percent of forest land experiencing an accumulation of persistent toxic substances.

Criterion 5: Maintenance of forest contribution to global carbon cycles

Indicators:

5.a. Total forest ecosystem biomass and carbon pool, and if appropriate, by forest type, age class, and successional stages;

5.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);

5.c. Contribution of forest products to the global carbon budget.

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, inclu-ding value added through downstream processing;

6.1.b. Value and quantities of production of non-wood forest products;

6.1.c. Supply and consumption of wood and wood products, including consump-tion per capita;

6.1.d. Value of wood and non-wood products production as percentage of GDP;

6.1.e. Degree of recycling of forest products;

6.1.f. Supply and consumption/use of non-wood products.

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;

6.2.b. Number and type of facilities available for general recreation and tourism, in relation to population and forest area;

6.2.c. Number of visitor days attributed to recreation and tourism, in relation to population and forest area.

6.3 ***Investment in the forest sector***

6.3.a. Value of investment, including investment in forest growing, forest health and management, planted forests, wood processing, recreation and tourism;

6.3.b. Level of expenditure on research and development, and education;

6.3.c. Extension and use of new and improved technologies;

6.3.d. Rates of return on investment.

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;

6.4.b. Non-consumptive use forest values.

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;

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

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

6.5.d. Area and percent of forest land used for subsistence purposes.

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 environ-mental, 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, aware-ness 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 manage-ment 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 in-dicators 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 ***Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services, including:***

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: 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.

Criteria **1** **2** **3** **4** **5** **6** **7**
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