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DEVELOPMENT OF NATIONAL-LEVEL CRITERIA AND INDICATORS FOR THE SUSTAINABLE MANAGEMENT OF DRY FORESTS OF ASIA: BACKGROUND PAPERS

Bhopal, India

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Cover photo: Typical dry forest type in Maharashtra State, India

Note: This photo is the right hand portion of the scene portrayed in the photo used in the accompanying volume containing the Workshop Report. When these two photos are put together, the entire scene can be viewed.

Photo credit: M. Kashio

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FOREWORD

Many Asian countries are currently involved in developing and implementing criteria and indicators for sustainable forest management. Involvement is generally proceeding in collaboration with existing international initiatives, including those supported by the International Tropical Timber Organization (ITTO), the Montreal Process, the Association of Southeast Asian Nations (ASEAN), UNEP and FAO.

In several countries of the region, however, there is still poor understanding of criteria and indicators and their potential usefulness in supporting sustainable forest management. Moreover, until recently, there was no specific initiative to focus explicitly on the development and implementation of criteria and indicators for the dry forests in the region, which have unique characteristics and management requirements.

The seventeenth session of the Asia-Pacific Forestry Commission (APFC), convened in 1998, recognized the progress of many countries in the region in developing and applying criteria and indicators. At the same time, however, the Commission noted that several countries in the region remained outside the recognized international processes working to implement criteria and indicators. Therefore, the Commission requested its *ad hoc* Working Group on Sustainable Forest Management to "assess issues pertaining to the development of criteria and indicators for sustainable forest management in the region." The FAO Council and the Committee on Forestry endorsed this recommendation at later sessions.

Subsequently, FAO, ITTO, UNEP, USDA Forest Service and the Indian Institute of Forest Management (IIFM) collaborated to promote greater understanding of criteria and indicators for sustainable forest management, and to integrate Asian countries with dry forests into the international dialogue on criteria and indicators. A major activity was a "Workshop on National-level Criteria and Indicators for Sustainable Management of Dry Forests in Asia," convened from 30 November to 3 December 1999, in Bhopal, India. The report of the Bhopal workshop has been published as a separate publication (RAP Publication 2000/07).

Several technical background papers were prepared for the Bhopal workshop and help to highlight the special issues associated with managing the dry forests of Asia and to advance ideas for the development of criteria and indicators for the sustainable management of these forests. This publication is a compilation of those technical background papers.

FAO was privileged to work together with ITTO, UNEP, USDA Forest Service and IIFM in organizing the workshop and in preparing these publications. These efforts provide a positive model for cooperation among international, regional and national forestry organizations. FAO is particularly grateful to Dr Ram Prasad, Director of IIFM, and his staff for the outstanding support provided in hosting the workshop.

The workshop in Bhopal gave rise to the "Regional Initiative for the Development and Implementation of National-level Criteria and Indicators for the Sustainable Management of Dry Forests in Asia." It is hoped that through this initiative countries in the region – with continuing support from FAO, ITTO, UNEP and other international organizations – will equip themselves with new and effective means for monitoring progress toward the sustainable management of the important dry forests of Asia.

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WHY NATIONAL AND FOREST MANAGEMENT UNIT LEVEL CRITERIA AND INDICATORS FOR SUSTAINABLE MANAGEMENT OF DRY FORESTS IN ASIA?

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INTRODUCTION

Following the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, the Food and Agriculture Organization of the United Nations (FAO) was given the lead role, among UN Agencies, to promote and coordinate international activities towards the identification, development and implementation of national-level criteria and indicators for sustainable forest management, in all various regions of the world. FAO carries out this work within the overall framework of the Inter-Governmental Panel on Forests[1] (IPF) and the UN Inter-Agency Task Force for Forests (ITFF).

In the above capacity, FAO has closely followed and supported ongoing international criteria and indicators initiatives in this field, including those of the International Tropical Timber Organization (ITTO), Pan-European Forest Process (previously known as the Helsinki Process), Montreal Process, Tarapoto Proposal, Dry Zone Africa Process, Near East Processes, and the Lepaterique Process of Central America, and has helped facilitate contacts among them. In accordance with the FAO/ITTO Meeting on Harmonization of Criteria and Indicators for Sustainable Forest Management (13 – 16 February 1995, Rome), attention has been paid to identifying similarities and differences among these national-level processes which are aimed at monitoring the effects of forest management interventions, and trends over time.

In addition, FAO considers that there is a need to ensure appropriate linkages between internationally agreed criteria and indicators at the national level on the one hand, and criteria and indicators at the forest management unit[2], or working, level on the other; and the testing and implementation of the latter ones.

FAO'S OBJECTIVES IN THE IMPLEMENTATION OF CRITERIA AND INDICATORS FOR THE MANAGEMENT OF DRY FORESTS IN ASIA

The main objectives of FAO's role and support for the development and implementation of national-level criteria and indicators for the sustainable management of dry forests in Asia are as follows:

- Assist countries in selecting a set of national-level criteria and indicators for the management of dry forests in accordance to the region's social, environmental, ecological and economic conditions, and to assist regional countries to start the implementation of such tools.
- Inform and make countries aware of other international initiatives on criteria and indicators and to facilitate dialogue among them, including exchange of information.
- Support countries in their efforts to chose and clarify methods of measurement or assessment of corresponding indicators (how and when to measure or assess and the responsibilities implied in these activities).

[1] The mandate of IPF expired in March 1997 and a follow-up mechanism, the Inter-Governmental Forum on Forests, IFF, has been put into place by countries.
[2] A "forest management unit" is a well defined and demarcated land area, predominantly covered by forests, managed on a long-tern basis and having a set of clear objectives specified in a forest management plan.

- Assist countries in measuring and monitoring progress towards sustainable management of all kinds of forests and reporting needs at national, regional and international levels.
- Assist countries in securing outside assistance (including technical and financial support) for national implementation.

WHY CRITERIA AND INDICATORS FOR DRY FORESTS IN ASIA?

More than 150 countries are currently actively participating in one or more of the several ongoing international initiatives for the development and implementation of eco-regional, national and management unit-levels criteria and indicators (Annexes 3 and 4). These initiatives cover mostly humid tropical, boreal and temperate forests, although there are also some focusing on dry forests, mainly in Africa and the Near East. They include, for example, the Dry Zone Africa Process, the Near East Process, and the South African Development Community (SADC) Initiative Within the Framework of the Dry Zone Africa Process and the UNEP/FAO/CILSS (Permanent Interstate Committee for Drought Control in the Sahel) Initiative, also within the framework of the Dry Zone Africa Process.

Although some of the Asian countries participate in other ongoing international initiatives which deal with humid tropical, boreal and temperate forests, they also have considerable large areas of dry forests. Criteria and indicators specific for dry forests in Asia have yet to be developed and implemented although indicators from other initiatives, such as the ones of ITTO and the Bhopal-India Initiative, could potentially be useful in monitoring sustainability of forest management activities in the ecosystems in the region. It is perceived that the criteria and indicators for Asian dry forests will partially be derived from those previously developed by ITTO, the Indian Institute of Forest Management Workshop of January 1999 and those already developed for other dry regions of the world, notably Dry Zone Africa, SADC and Near East.

GLOBALLY AGREED-UPON ELEMENTS OF CRITERIA FOR SUSTAINABLE FOREST MANAGEMENT

- Extent of Forest Resources
- Biological Diversity
- Forest Health and Vitality
- Productive Functions of Forests
- Protective Functions of Forests
- Socio-economic Benefits and Needs
- Legal, Policy and Institutional Framework

In developing criteria and indicators for the sustainable management of dry forests in this region, it is important to bear in mind results of considerable discussions and debate during past meetings of the ongoing international initiatives dealing with the identification of such tools. Definitions of the corresponding indicators have indicated that it may be possible to develop a globally agreed-upon core set of national-level criteria, centered around seven fundamental elements by which sustainable forest management can be, and has been, independently defined in all ongoing international processes.

Most sets of criteria developed for national application seem to be fully applicable locally, but the case may not necessarily apply for all indicators. National indicator schemes will have a greater dependency on local schemes than vice-versa.

CURRENT STATUS ON THE ACTIVITIES OF CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT IN THE PARTICIPATING COUNTRIES[3]

ITTO has developed a set of criteria and indicators applicable to the natural tropical forests in this region, but these were initially meant to be applicable mainly to humid tropical forests. Consequently, there is a perceived need at national and regional levels to review available criteria and indicators developed for dry zone forests with a view to adapting these for implementation by countries in Asia in a manner compatible with local conditions and circumstances.

India has a history of dealing with the issue of criteria and indicators which dates back to June 1994, i.e. the "Indo-British Forestry Initiative." The objective of the "initiative" was to help develop "formats" and indicators for reporting to the Commission on Sustainable Development (CSD) in 1995 on post-UNCED forestry activities. During 25-27 July 1994, the Governments of India and the United Kingdom, in cooperation with FAO, sponsored a workshop in New Delhi entitled "Towards Sustainable Forestry: Preparing for CSD 1995." The objectives of the workshop were to develop recommended formats for reporting to the CSD in 1995 on forestry issues, as well as indicators for assessing progress in implementing the Forest Principles and forestry-related aspects of Agenda 21.

However, it turned out that the Delhi workshop focused mostly on the format of reporting progress in implementing UNCED agreements in forestry to the 1995 CSD session. Consequently, the "indicators" of progress were then perceived more in terms of "progress makers". The Delhi workshop did not discuss the issue of criteria and indicators as perceived today in ongoing international processes as it was considered then that other groups were dealing with this issue. Meanwhile India has been active on the issue of criteria and indicators as part of ITTO activities and as a collaborator with research organizations, such as the Center for International Forestry Research (CIFOR).

It was not until January 1999 that a "preliminary" set of 8 national-level criteria and 47 indictors for sustainable forest management was developed for India during a workshop held in Bhopal, India (21 - 23 January 1999) (Prasad, R. *et al.*, 1999). Since then, this set has been slightly modified and the number of criteria and indicators is now officially 8 and 51, respectively. Based on the national-level set, India is proposing a set for forest management unit level consisting of 8 criteria and 59 indicators.

No documented records of past nation-wide involvement with criteria and indicators are available from the other participating countries in this workshop (Bangladesh, Bhutan, Mongolia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand and China) despite their active participation in international meetings.

UNDERSTANDING THE CONCEPT OF CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT

"Criteria" define the essential components of and/or the range of forest values to be addressed in sustainable forest management. "Indicators" are ways to measure or describe a criterion; they gauge specific attributes or forest values of each criterion. Thus indicators can be mainly quantitative but also descriptive or qualitative. An indicator of a given criterion defines what the latter is and what it means. Together they constitute a useful tool in decision-making at any level for assessing progress towards sustainable forest management and for monitoring trends towards sustainability over time in forests.

[3] More details on the activities of other ongoing international initiatives, including a summary of their most recent achievements, on criteria and indicators for sustainable forest management, can be found in Annexes 3 and 4.

Indicators should have the following characteristics:

Clarity: they should be well defined, scientifically sound and easy to understand at all political, technical and public levels.
Flexibility: they should be applicable to all types of forests in the country.
Feasibility: preferably, they should be based on readily available data/or they should be easily measurable by available techniques.
Applicability: they should be practical and not require excessive administrative workloads, and be cost-effective.
Limitations: the number of indicators selected should be within the country's limitations.
Compatibility: consider other processes as examples only and not to totally imitate what there are doing.
Adaptability: they should be adaptable to the country's prevailing social, economic, political and environmental conditions.

Reviewing the sets of criteria and indicators of the various international processes, one can make some observations (FAO, 1997):

- Most processes have "standard indicators," meaning indicators that appear in most cases and that deal mainly with (a) assessment of resources, i.e. those relating to the state and changes of national forest resources, (b) socio-economic functions, i.e. value of wood and non-wood forest products, share of forest sector in the GNP, and (c) legal and institutional framework, i.e. national forest policy and regulation.
- Likewise, most have "particular indicators," that is those dealing with national problems such as fuelwood and demographic pressures, i.e. average fuelwood consumption per capita per year and forest area by ownership types.
- One will also find indicators that are difficult to use. These are indicators that are listed but that cannot be assessed because the information is not currently available in the country, or cannot be measured because of country's present lack of technology and knowledge. Examples of these may include, in some countries, the following: area affected by insects and diseases, change in the balance of nutritional elements and soil acidity, and number of tree species with a reduced distribution area.

IMPLEMENTATION OF NATIONAL-LEVEL CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT

National-level criteria and indicators were driven by the commitment and need for countries to report on progress towards sustainable forest management over time within the framework of international non-legally binding agreements.

These criteria and indicators are meant to help guide countrywide policies, regulations and legislation. They are intended to help countries monitor and report on overall trends over time in forest management and its quality. Positive trends in sustainability will be demonstrated by an aggregate in trends of the identified criteria, that is, the trends in all criteria must show a positive development over time. Based on information on status and trends at the national level and on subsequent forecasts for the future, policy and decision-making can be rationalized and improved. The ultimate aim of the process is to promote improved forest management practices over time, and to further the development of a gradually healthier and more productive forest estate, which can meet the social, economic and environmental needs of countries concerned.

The national implementation of regional/eco-regional strategies guided by internationally developed criteria and indicators, requires review of the relevance of defined criteria to the

national situation and their adoption, in principle, by all concerned parties. Countries should also review and test the practical possibilities to measure and monitor specified national-level indicators, and assess and reconfirm the relevance of these to prevailing environmental, economic, social and institutional realities.

Success in implementing criteria and indicators at this level depends on much more than just pure technical knowledge. It takes strong and decisive political support and commitment from government and notably from the national forestry authorities. The Pan-European Forest Process, the Tarapoto Proposal and the Lepaterique Process of Central America are very good examples where national forestry authorities are very much involved in the process offering needed support. Furthermore success requires that individual countries review and test the indicators at the field level to reconfirm their relevance.

Implementation at this level does not come without problems. Results from a test including 31 of the 38 participating countries in the Pan-European Forest Process showed that there were difficulties at the national level to implement and report on six of the 27 indicators. This problem would make it harder to compare advances towards the achievement sustainable forest management among participating countries (Ministry of Agriculture, Rural Development and Fisheries, 1996). Some reasons given included variations among the countries in (a) the reference years and timing intervals of data collection, (b) the definitions used that are applicable to national inventories and statistics and, (c) the classification of some the indicators (Veltheim, 1996). Indicators pertaining to the criterion "maintenance of forest ecosystem health and vitality" were considered more troublesome to measure. The Montreal Process also faced similar problems in the implementation of criteria and indicators.

Since criteria, in essence, define what sustainable forest management means, national-level criteria and indicators can help stimulate and assist in the identification of criteria and indicators at the forest management unit level. The criteria and indicators identified at these two levels, while different in purpose and scope, should be mutually compatible. Not all national-level criteria and indicators apply, as such, to the forest management unit level. Indicators at this level are more site-specific, depending on various local conditions and priorities.

FOREST MANAGEMENT UNIT-LEVEL CRITERIA AND INDICATORS

FAO's work and involvement have largely concentrated on assistance to countries at the regional and national levels. However, within the frameworks of the "Tarapoto Proposal for Criteria and Indicators for Sustainability of the Amazon Forest" and the "Central American Expert Meeting on Criteria and Indicators for Sustainable Forest Management," (which FAO helped organize jointly with the Amazon Conservation Treaty Secretariat, the Government of The Netherlands and the Central American Commission on Development (CCAD), respectively), countries manifested their interest in developing criteria and indicators also for the forest management unit level, within the established common, regional and sub-regional frameworks. The Pan-European Forest Process has also recently embarked on elaborating "Guidelines" for management at the forest unit level. It is expected that the Montreal Process will also start implementation at this level.

National-level sets of criteria and indicators for various regions of the world should be complemented by the development and implementation of sets of criteria and indicators defined for the forest management unit level. Many of the ongoing processes have (also as described before), in fact, developed forest management unit-level criteria and indicators in addition to the national-level ones. Due to a wide range of social, economic, environmental and geographical conditions in the countries involved, results from these latter efforts differ widely.

Forest management unit-level criteria and indicators were from the beginning, in principle, a sort of an "extension" to the national-level concept. While acknowledging that these two levels would need different, albeit partly overlapping indicators, the idea was still clearly based on a time series, and monitoring activity. In fact, early documents stressed – and still do – this issue mentioning that there is a need for linkages between the two levels to the extent that these two should be mutually consistent.

Countries for which trade in forest products is economically important, are likely to be increasingly involved in forest products certification which indirectly calls for better and more efficient forest management. Certification and the associated issue of labeling are today among the most topical and controversial subjects in forestry. The former seeks to link trade, particularly international trade in forest products, to the sustainable management of the forest resource, and to enable those who so wish to purchase products coming from allegedly "sustainably managed forests" (FAO, 1997).

Definition of criteria and indicators for their application at the national (aggregated over the forest estate) and the forest management unit (the individual forest area) levels, may contribute directly to improving forest management practices. However, definition and implementation of forest management unit-level criteria and indicators can potentially also contribute to clarifying issues related to environment and trade in forest products, including forest products certification. While criteria and indicators provide a means to measure, assess and demonstrate progress in sustainability of forest management activities in a given country or in a specified forest area over time, certification is a means to certify the achievement of certain, pre-defined standards of forest management in a forest area, at a given point in time, agreed upon between producers and consumers.

Internationally agreed indicators of sustainable forest management at the forest management unit level, can contribute directly to improving forest management practices in the field and in specific forests. Certification indirectly aims at improving the management of forests and more directly to provide market access for the products from such forests. The basis for forest product certification is "standards," through which agreed-upon, minimum levels of performance in forest management are defined. The purpose of these standards is to assist users and consumers to identify those products which come from a forest with "good forest management" practices, as judged by conformity to these common performance standards, and thus to provide an incentive for good management to owners and management of the resources through ensuring better access to markets. While assessment results from criteria and indicators work cannot be compared from one country to another, the specified performance standards used for certification purposes are, by definition, comparable among countries.

While there are linkages between national and forest management unit-level criteria and indicators, there may, or may not, be linkages between the latter ones on the one hand, and forest products certification standards on the other. Direct linkages do not exist between national-level criteria and indicators and certification.

OPTIONS AVAILABLE FOR THE IMPLEMENTATION OF NATIONAL-LEVEL CRITERIA AND INDICATORS

The Work of the Inter-Governmental Panel on Forests

FAO has been involved and instrumental in catalyzing and assisting to pursue a number of international, regional and eco-regional initiatives on criteria and indicators in accordance with its mandate and priorities. This is also in line with the Organization's role as Task Manager for Chapter 11 of Agenda 21 of UNCED, "Combating Deforestation," and focal point for this issue among UN Agencies in the work of the IPF of the Commission on Sustainable Development. Furthermore, through a series of deliberations, mainly focusing on technology transfer[4], the IPF has been able to establish the need to adapt forestry action programmes in the context of diverse social, economic, environmental and political conditions.

National forest programmes (NFPs) are long-term iterative processes meant to help countries to continuously improve their policies and strategies and to formulate, implement, monitor and evaluate forestry and forestry related action plans and programmes for the achievement of sustainable forest management at the national and sub-national levels. These programmes, which are carried out by countries in collaboration with FAO, help them to determine and define objectives and strategies for implementation of forestry programmes in which all concerned actors participate. At the operational level, the process of the NFPs consists of four phases[5]: (1) organization and identification of actors in the forestry sector and elaboration of a communication strategy, (2) strategic planning based on studies of current situation and analysis of scenarios, (3) implementation including detailed formulation of investment programmes and projects including assisting countries in fund raising for projects, and (4) revision, evaluation and updating of activities and basic strategies.

The IPF has recognized the importance of NFPs as comprehensive forest policy frameworks to achieve sustainable forest management. As a result, it has made nine proposals to help countries strengthen their NFPs:

- Develop, implement, monitor and evaluate NFPs;
- Integrate criteria and indicators into the overall process;
- Include capacity building as an objective of NFPs;
- Involve indigenous people and local communities in decision-making;
- Develop, test and implement participatory mechanisms to integrate continuous multidisciplinary research in planning cycle;
- Establish sound national coordination mechanisms;
- Use NFPs as a basis for international cooperation; and
- Further develop the concept and practice of partnership, and for international and bilateral agencies to ensure adequate provision of overseas development aid (ODA).

Programmeme Elements of the IPF in Direct Support of Sustainable Forest Management

One of the results of the final, 4th Session of the IPF (June 1997), was a proposed plan of action, drafted by ITFF. The proposed plan has a goal to help support the implementation of the IPF's proposals for action through well executed and coordinated activities by ITFF members in

[4] "Technology transfer" related to criteria and indicators in support of sustainable forest management in this context is referred to as seen by the IPF. It encompasses techniques as well as methods, technical knowledge and information sharing and therefore it is component of a wide range of programmes and projects at various levels from research and scientific information to technical cooperation and extension.
[5] Details can be found in FAO, 1996a.

association with other international organizations, multilateral agencies and instruments. The plan which addresses needs at the regional and international levels recognizes opportunities for participation by other potential partners such as governments, NGOs and other international organizations, for a more effective response to IPF's proposal for action.

Six of the most relevant "Programme Elements" of the IPF plan in direct support of sustainable forest management (IPF/ITFF, 1997) and which specifically refer to criteria and indicators in the framework of technology transfer and capacity building are (see also Tables 1 and 2 which show UN and non-UN collaborating agencies and their degree of involvement[6]):

- Programme Element I.1: "Progress through National Forest and Land-use Programme"
- Programme Element I.4.2: "Impact of Air-borne Pollution on Forests"
- Programme Element II: "International Cooperation in Financial Assistance and Technology Transfer"
- Programme Element III.1 (a): "Assessment of the Multiple Benefits of All Types of Forests"
- Programme Element III.2: "Criteria and Indicators for Sustainable Forest Management"
- Programme Element IV: "Trade and Environment In Relation To Forest Products and Services"

The IPF recognized that this issue of criteria and indicators is a key Programme Element in support of programmes by which countries can achieve sustainable development. In this respect, the IPF recommends that countries develop and implement such tools. Given the widespread international interest in the subject of criteria and indicators, the IPF has made six proposals including the following:

- Prepare and implement national-level criteria and indicators;
- Use internationally, and nationally-agreed criteria and indicators as a framework for advancing best forest practices, and promote their compatibility at all levels; and
- Encourage efforts by countries and international organizations to achieve a common international understanding on concepts and definitions related to criteria and indicators, on mutual recognition among sets of criteria and indicators, and on transparent methods for measurement and dissemination.

Other United Nations Agencies Involved

In addition to FAO, the other UN bodies involved in follow-up to the recommendations of the IPF are listed Table 1. These agencies also promote sustainable forest management by undertaking, for example, surveys and collecting, analyzing and disseminating data which have incidences applicable to measuring and monitoring sustainable forest management. The activities of the ad hoc ITFF, which supports the work of the IPF and helps to strengthen and streamline concerted action by international agencies, will continue in support of the work of the Inter-Governmental Forum on Forests (IFF).

[6] For details on how each Programme Element refers to criteria and indicators, see: Castañeda, 1998.

Table 1: Some United Nations Agencies and Convention Secretariats Promoting, Supporting and Assisting Countries in the Development and Implementation of Criteria and Indicators for Sustainable Forest Management

Major United Nations Partners[7]	Programme Elements					
	I.1: Progress through national forests and land-use programmemes	**I.4.2: Impact of air-borne pollution of forests**	**II: International cooperation in financial assistance and technology transfer for sustainable forest management**	**III.1(a)/1: Assessment of the multiple benefits of all types of forests**	**III.2: Criteria and indicators for sustainable forest management**	**IV. Trade and environment relating to forest goods and services**
FAO	F[8]	F	X	F	F	X
UNDP	X	-	F	-	X	-
UNEP	X	X	X	X	X	X
UNESCO	-	-	-	-	X	-
WBG	X	-	X	-	X	-
UNIDO	X	-	-	-	-	-
UN/CTAD	-	-	-	-	-	X
UN/ECE	-	-	-	X	-	-
CCD	X	-	-	-	-	-
CBC	X	X	-	-	X	-
CCC	-	X	-	-	-	-
FACILITATOR						(ITTO)

INTERNATIONAL COLLABORATION

IPF reports emphasize the need for more international coordination in research and for "new cultures" of research, putting emphasis on demand-driven, holistic and integrated approaches. This was also one of the recommendations of the Government of Japan/FAO/ITTO Kochi Workshop on Integrated Application of Sustainable Forest Management Practices (Kochi, Japan; November 22 - 25, 1996). The following are examples of some of the other institutions which are directly or indirectly involved in technology transfer, research and improving countries' capacity building in relation to the development and implementation of criteria and indicators at the national and/or field levels (Table 2).

[7] FAO: Food and Agriculture Organization of the United Nations; UNDP: UN Development Programmeme; UNEP: UN Environment Programmeme; UNESCO: UN Educational, Scientific and Cultural Organization; WBG: World Bank Group; UNIDO: UN Industrial Development Organization; UN/CTAD: UN Conference on Trade and Development; UN/ECE: UN Economic Commission for Europe; CCD: Convention on Combating Desertification; CBC: Convention on Biological Diversity and CCC: Convention on Climate Change.

[8] F: Facilitator; X: Agency or Secretariat which explicitly appears as a "major" partner for the Programme Element; -: means that it does not fully appear as a partner although it may eventually become one; (blank): Non UN Facilitators.

Table 2: Non-UN Institutions Supporting and Assisting Countries in the Development and Implementation of Criteria and Indicators for Sustainable Forest Management

PROGRAMMEME ELEMENT	OTHER MAJOR PARTNERS[9]					
	ITTO	IUFRO	CIFOR	RDB	BD	EFI
I.1: Progress through national forests and land-use programmes	X	-	-	X	-	-
I.4.2: Impact of air-borne pollution of forests	-	-	-	-	-	-
II: International cooperation in financial assistance and technical transfer for sustainable forest management	X	-	-	X	X	-
III.1(a)/1: Assessment of the multiple benefits of all types of forests	X	X	X	-	-	-
III.1(a)/2: Forest research[10]	-	X	F	-	-	X
III.2: Criteria and indicators for sustainable forest management[11]	X	X	X	X	-	-
IV: Trade and environment relating to forest goods and services	F	-		-	-	-

The International Union of Forestry Research Organizations (IUFRO)

IUFRO is a major partner, along with other international research institutions, mentioned in Part 2: Forestry Research of Programme Element III. 1(a) as a complement of this element's Part One: "Assessment of the Multiple Benefits of All Types of Forests." IUFRO is also active in relation to Programme Elements III.1(a)/2: "Forest Research" and III.2: "Criteria and Indicators for Sustainable Forest Management" (Table 2). Their involvement thus far has been mainly in the organization of international meetings on the issue (Melbourne, Australia, 24 - 28 August 1998; CATIE/Turrialba, Costa Rica, December 1999; Nancy, France, 21 - 25 March 2000).

The Center for International Forestry Research (CIFOR)

The participation of the private and other non-government sectors appears to be even more important for the implementation of criteria and indicators at the forest management unit level. The Programme Elements in which CIFOR is involved are depicted in Table 2. In relation to Programme Element III.1(a)/2: "Forest Research," CIFOR executes field oriented research in various countries (such as in Brazil, Cameroon, Côte d'Ivoire and Indonesia) focused on the identification and testing of criteria and indicators at this level. CIFOR expects that results of this research project will assist forest managers in the development of methodologies and scientifically sound, practical guidelines for the assessment and monitoring of sustainable forest management at the field level. Along with the Australian Council for International Agricultural Research (ACIAR) and the Kerala Forest Research Institute, India, CIFOR conducts field oriented research for testing of criteria and indicators of tropical forest plantations in Kerala.

[9] RDB: Regional Development Banks; BD: Bilateral Donors; EFI: European Forestry Institute. "F": Facilitator.
[10] Includes also ICRAF: International Centre for Research in Agroforestry; IBFRA: International Boreal Forest Research Association; and WCMC: World Conservation Monitoring Center.
[11] Includes also the World Conservation Union (IUCN) and World Wildlife Fund (WWF).

High-level Support (G8)

Examples of high-level support for sustainable forest management include the Denver Summit of the G8 countries (Canada, France, Germany, Italy, Japan, Russia, United Kingdom and USA) in June 1997, where it was proposed to establish a practical "Action Programme on Forests" that includes five categories of action:

- implementing national programmes and building capacities for sustainable forest management;
- establishing networks of protected areas;
- assessing the state of each nation's forests using agreed criteria and indicators;
- promoting private sector management of forests; and
- eliminating illegal logging.

The G8 countries met again at the Summit in Birmingham, England, (15 - 17 May 1998) and agreed on five categories of action including a commitment to continue work with partner countries to build national capacity to "improve scientific underpinning of the economic, social and environmental indicators of sustainable forest management."

Private Participants

Several bilateral donors, development banks and NGOs also play an important role in technology transfer and capacity building in sustainable forest management, including the development and implementation of criteria and indicators (Table 2). It is estimated that the role of the private sector in forestry financing has increased by 60 percent since 1991. Regional bodies and institutes, such as the IIFM, also can play an important role as collaborators towards the implementation of criteria and indicators for sustainable forest management.

DEALING WITH REGIONAL AND NATIONAL CAPACITIES TO IMPLEMENT CRITERIA AND INDICATORS

Definitions, Terminology and Data Collection

In order to report on advances at international level concerning sustainable forest management, it is necessary that countries and/or processes use terminology and concepts that have the same meaning universally. In this respect the FAO/ITTO Expert Consultation: Harmonization Meeting of Criteria and Indicators for Sustainable Forest Management (FAO/ITTO, 1995) reviewed the possibilities to ensure compatibility of ongoing work, including terminology. Besides agreeing on the need to exchange information, know-how and experience among ongoing initiatives to ensure comparability, the meeting also emphasized "the need to allow ongoing initiatives to pursue their aims unimpeded, reflecting the different environmental and socio-economic conditions from which they have sprung."

In an effort to make field data collection more meaningful and efficient, countries need to revise the suggested set of national-level criteria and indicators. It is useful in a national exercise, to prioritize and decide which indicators are relevant and meaningful to the country based on current environmental, ecological, social and economic conditions, and those indicators the country has the capacity to measure and monitor. Given that most countries, especially developing countries, have problems in measuring some of the indicators, FAO encourages countries to collect and report field data of at least those parameters which form part of national forest inventories and whose results countries regularly contribute to FAO's

Forest Resources Assessment Programme. In this respect the "Expert Consultation on Global Forest Resources Assessment 2000 (FRA 2000)" held in Kotka, Finland (June 1996) identified 15 indicators for sustainable forest management which could be assessed through the FRA 2000[12].

CONCLUSIONS AND RECOMMENDATIONS

The development, review and implementation of criteria and indicators are a continuing process. The success of the implementation can depend mainly on three conditions: (a) political endorsement principally from the respective national forestry authorities, as is the case of the Pan-European Forest Process, the Lepaterique Process of Central America and the Tarapoto Proposal, (b) processes should preferably operate within the framework of ongoing NFPs, and (c) indicators adopted should be based on countries' priorities according to prevailing environmental, social, economic and institutional conditions.

NFPs can be an excellent vehicle for countries to implement the relevant set of criteria and indicators. Implementation will be facilitated if the following key points are considered to hold true by national authorities: (a) criteria and indicators are not a constraint but a useful tool for monitoring and reporting on trends over time in sustainable forest management, (b) all indicators do not have to be implemented with immediate effect; but that can be done progressively, (c) even the most developed countries in the world have problems in measuring some of their indicators and (d) the periodicity, or time span between measurements that will reflect the periodic rate of change of the parameter, will depend on countries' technological and, even more, financial conditions and possibilities.

There continues to be an urgent need to arrive at common concepts and terminology, and to draw attention to continued and increased need for international dialogue to help facilitate common understanding and compatibility of action among countries and regions. Countries concerned need to ensure the compatibility of criteria and indicators implemented at national level and those being developed at the forest management unit level.

As suggested in a meeting of the Montreal Process during the XIth World Forestry Congress (Turkey, October 1997), countries whose implementation of their criteria and indicators is still at very early stages, should look for assistance from those ongoing initiatives or countries within initiatives which, over the years, have progressed rapidly. For example, the Pan-European Forest Process in collaboration with FAO helped countries start criteria and indicators processes in Dry Zone Africa, the Near East and Central America.

Countries have limitations, which in varying degrees constrain implementation of national criteria and indicators for sustainable forest management. Thus it is important that priorities are set as to which indicators are to be considered "core indicators," at least for the time being. The Forest Resources Assessment Programme of FAO recommends that for the purpose of the ongoing FRA 2000, the priority indicators to be used refer to the following: forest resources, biological diversity, forest health and vitality, production of wood and forest products, soil and water protection, and social and economic functions. However, qualitative and descriptive indicators related to policy, legal and institutional frameworks are also important and the inclusion of more of the "qualitative data" may be a desirable long-term aim.

[12] Include the following: area of forest, area of other wooded land, area of forest by naturalness, area of forest plantations, forest areas converted to other uses, total forest biomass above ground, total carbon stock in forests, total volume of growing stock, changes over time of total volume of growing stock, changes over time of total forest biomass, changes over time of total carbon stock, area of forest and other wooded land available for wood production, area of forest by ownership, area of forest in protected areas and area of forest in other wooded lands burned annually. (FAO, 1996c).

Preliminary results of the implementation of criteria and indicators indicate that even the more developed countries have problems in the measurement and assessment of some of the indicators identified by the processes. Unless this issue is addressed in a timely manner, it could hinder the implementation process.

Within the limits of available resources, FAO will to continue with its role to ensure the flow and dissemination of information, know-how and technologies among the international processes, thus facilitating comparability and compatibility among them as requested by the IPF. FAO will also, to the extent possible, help countries that request assistance in implementation.

ANNEX 1

NATIONAL-LEVEL CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT FOR THE NEAR EAST

(Adopted by the FAO/UNEP Expert Meeting; Cairo, Egypt; 15 - 17 October 1996)[13]

Criterion 1: EXTENT OF FOREST RESOURCES

1. Area and percentage of forests and "other wooded lands" (including plantations, agroforestry, shelterbelts) with their change over time (deforestation/reforestation/conversion)
2. Biomass/standing volume, growing stock, carbon stocks
3. Area and percentage of forests for which management plans are made
4. Area and percentage of forests and other wooded lands which have been demarcated

Criterion 2: CONSERVATION OF BIOLOGICAL DIVERSITY IN FOREST AREAS

2a. Ecosystem Indicators:
5. Distribution of forest ecosystems (area by type of vegetation, natural or man-made)
6. Areas of forest reserves and protected areas
7. Spatial fragmentation of forest resources
8. Excisions affecting rare ecosystems by area

2b. Species Indicators:
9. Number of forest dependent species (fauna, flora)
10. Area and number of species at risk in forest areas
11. Extent of mixed stands
12. Reliance on natural regeneration

2c. Genetic Indicators:
13. Existence of the number of seed provenance
14. Number of forest dependent species with reduced range
15. Population levels of key species across their range

Criterion 3: HEALTH, VITALITY AND INTEGRITY

3a. External influence indicators:
16. Areas and percentage of forest (plantations/natural forests) affected by:
    a) natural fires
    b) storms
    c) insects and diseases
    d) drought, wild animals (game)

3b. Forest vitality indicators:
17. Area of natural forests with healthy regeneration
18. Incidence of defoliation

3c. Anthropogenic influence indicators (site degradation):
19. Area of encroachment for farming, urban expansion and unplanned tourism
20. Average annual consumption of fuelwood per capita
21. Area and number of fires caused by people
22. Grazing damage by domestic animals
23. Competition from introduced plants
24. Trends in crop yields

[13] Later on endorsed by the 12th Session of the Near East Forestry Commission (Cairo, Egypt 21 - 24 October 1996).

Criterion 4: PRODUCTIVE CAPACITY AND FUNCTIONS

25. Percentage of forests and other wooded lands managed according to an integrated management plan[14]
26. Annual balance between wood increment and wood harvesting and trends
27. Wood production
28. Non-wood forest products outputs including among others aromatic and medicinal plants

Criterion 5: PROTECTIVE AND ENVIRONMENTAL FUNCTIONS

5a. Protective functions:
29. Extent of forests and other wooded lands managed for protection purposes
30. Size and percentage of wooded areas managed mainly for the protection of watersheds
31. Areas managed for scenic and amenity purposes
32. Areas managed for soil protection

5b. Combating land degradation:
33. Area of sand dunes annually stabilized through tree/shrub planting
34. Area of eroded hillsides annually rehabilitated through tree/shrub planting
35. Efficiency of trees/shrubs planted in stabilizing sand dunes or rehabilitating eroded hillsides
36. Effectiveness of plans formulated for managing trees/shrubs planted for desertification control
37. Extent of combating desertification

Criterion 6: MAINTENANCE AND DEVELOPMENT OF SOCIO-ECONOMIC FUNCTIONS AND CONDITIONS

6a. Indicators of economic conditions:
38. Value of wood products
39. Value of non-wood forest products
40. Value of recreation
41. Value of hunting
42. Share of forest sector in GNP/GDP
43. Value from secondary forest industries
44. Value from biomass energy
45. Forest trade balance
46. Level of investment in forest sector and forest products-based industries

6b. Indicators of the distribution of benefits:
47. Employment generation in forest sector
48. Forest dependent communities involvement (numbers of organized groups and women)
49. Contribution to agricultural development
50. Rate of improved livelihood of forest dependent communities
51. Share of benefits from forest areas in the family income of forest region communities
52. Contribution to food security

6c. Indicators of participation among stakeholders in forestry:
53. Grassroots participation and equity
54. Number and area of resettlement schemes for people living in the forest
55. Reduction in the number of forest offences
56. Interest and contributions of the rural communities, media, NGOs, politicians and the public in general for the conservation and development of forests and forestry

Criterion 7: THE LEGAL AND INSTITUTIONAL FRAMEWORKS

57. National forest policy, legislation and regulations
58. Institutional instruments and tools
59. Concrete implementation and capacity to monitor
60. Economic framework and financial instruments
61. Community consultation and information tools
62. Research and extension capacity
63. Valorization of local expertise, knowledge, and local technologies
64. Transfer and adaptation of appropriate technologies
65. Capacity to implement international instruments

[14] To what extent management plans address environmental, socio economical productivity aspects of sustainable forest management.

ANNEX 2[15]

NATIONAL-LEVEL CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT IN DRY ZONE AFRICA

(Adopted by the UNEP/FAO Expert Meeting, Nairobi, Kenya; 21 – 24 November 1995)[16]

Criterion 1: MAINTENANCE AND IMPROVEMENT OF FOREST RESOURCES INCLUDING THEIR CONTRIBUTION TO GLOBAL CARBON CYCLES

Indicator:

1. Total area of forests, plantations and other wooded lands (and their changes over time)
2. Biomass (and its changes over time)

Criterion 2: CONSERVATION AND ENHANCEMENT OF BIOLOGICAL DIVERSITY IN FOREST ECOSYSTEMS:

2a. Ecosystem indicators:

3. Areas by types of vegetation (natural and man-made)
4. Extent of protected areas
5. Fragmentation of forests
6. Area cleared annually of forest ecosystems containing endemic species

2b. Species indicators:

7. Number of forest-dependent species (and its change over time)
8. Number of forest dependent species at risk
9. Resources exploitation systems used

2c: Genetic indicators (fauna, flora):

10. Average number of provenances (and its change over time)
11. Number of forest dependent species with reduced range
12. Population levels of key species across their range
13. Management of genetic resources

Criterion 3: MAINTENANCE OF FOREST ECOSYSTEM HEALTH, VITALITY AND INTEGRITY

14. Areas and percentages of forest (natural and man-made) modified, with the indication of severity of damage by such agents as: fires (including frequency), storms (e.g. windthrow, flooded areas), insects and diseases, damage by wild and domesticated animals, competition from introduced plants, drought, damage by wind erosion)
15. Percentages of forest ecosystems with or without regeneration
16. Changes in nutrient balance and soil acidity
17. Bush encroachment
18. Trends in crop yields
19. Percentage of the population employed in crop and livestock farming

Criterion 4: MAINTENANCE AND ENHANCEMENT OF PRODUCTIVE FUNCTIONS OF FORESTS AND OTHER WOODED LANDS

20. Percentage of forests and other wooded lands managed according to a management plan
21. Growing stock
22. Annual balance between growth and removal of wood products (and its change over time)
23. Average annual consumption of wood for energy per capita
24. Managed and sustainable extraction of non-wood forest products (and its change over time), including fodder (grass layer and fodder from trees/shrubs), consumptive wildlife utilization, honey, gum, misc. fruits, roots, edible leaves, medicinal substances, fibers for handicrafts, etc.

[15] During the UNEP/FAO/SADC meeting (Lilongwe, Malawi, December 1998) the original set of criteria and indicators of the Dry Zone Africa Process was thoroughly re-reviewed and discussed by the National Coordinators. The end result of this exercise was a "new set" of national level criteria and indicators for sustainable forest management for SADC member countries with very minor changes. The only change introduced was the addition of another indicator: Criterion V; Indicator 28: Changes in water yield and quality. Thus, in practice it can be concluded that this "new set" with 48 indicators is very much the same as the original set of the Dry Zone Africa Process which has 47.

[16] Later on endorsed by the 10th Session of the African Forestry and Wildlife Commission, South Africa, 27 November - 1 December 1995.

Criterion 5: MAINTENANCE AND IMPROVEMENT OF PROTECTIVE FUNCTIONS IN FOREST MANAGEMENT

25. Areas and percentages of forests and other wooded lands managed mainly for the protection and/or rehabilitation of agricultural or range lands, and/or rehabilitation of degraded lands and relevant important infrastructure works
26. Areas and percentages of forests and other wooded areas managed mainly for the production of water, protection of watersheds, riverine zones and for flood control
27. Areas of forests and other wooded lands managed for scenic and amenity purposes

Criterion 6: MAINTENANCE AND ENHANCEMENT OF SOCIO-ECONOMIC BENEFITS

6a. Indicators for economic benefits:
28. Value of wood products
29. Value of non-wood forest products
30. Ecotourism (including hunting, recreation)
31. Share of forest sector in GNP
32. Value from primary and secondary industries
33. Value from biomass energy
34. Forest sector trade balance
35. Investment in forests and forest industries

6b. Indicators of the distribution of benefits:
36. Employment generation, notably in rural areas
37. Degree to which social, cultural and spiritual needs are met
38. Benefits accruing to local communities (with particular emphasis on women and youth)
39. Contributions to food security

Criterion 7: ADEQUACY OF LEGAL, INSTITUTIONAL AND POLICIES FRAMEWORKS FOR SUSTAINABLE FOREST MANAGEMENT

40. Existence of a national forest policy including the integration of forest management in rural land-use planning and development
41. Existence of a comprehensive legislative and regulatory framework providing for equitable access to resources, alternative forms of conflict resolution and consideration of land occupancy and cultural rights of local populations
42. Institutional, human and financial capacity to implement the national forestry policy, and relevant national and international laws, instruments and regulations
43. Research and development capacity
44. Existence of incentives for investments in the forestry sector
45. Valorization of local expertise, knowledge and technologies
46. Existence of measures to facilitate the transfer and adaptation of appropriate technologies
47. Existence of an administrative, policy and legal framework for the effective participation of local communities, NGOs and the private sector in forest policy formulation, implementation and monitoring

ANNEX 3

MOST RECENT ACTIVITIES OF OTHER INTERNATIONAL ONGOING INITIATIVES ON CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT

- **Pan-European Forest Process:** The activities of this process were recently reviewed at the Third Ministerial Conference on the Protection of Forests in Europe (Lisbon, Portugal, 2 - 4 June 1998). Ministers responsible for forestry adopted, endorsed and encouraged countries to vigorously pursue the implementation of the six national-level criteria developed by member countries and the European Union; at the same time they also endorsed the associated indicators. Furthermore, they endorsed the "Pan-European Operational Level Guidelines for Sustainable Forest Management." These operational guidelines can be used on a voluntary basis to further promote sustainable forest management at the field level. As a follow-up to the last round table discussions in Brussels, Belgium (November 1998), the First Expert Meeting in Follow-up of the Lisbon Conference was convened in Vienna, Austria (31 March – 1 April 1999). Again as a follow-up of the last event, the Pan-European Forest Process held another meeting in Vienna on 1 October 1999.

- **Montreal Process:** Discussions and consultations within its twelve member countries aimed at refining and expanding information contained in the "First Approximation Report on Implementation," published by its Technical Advisory Committee in 1997. The report provides an overview of the perceived relevance of the national-level criteria and indicators developed within this Process to the conditions, needs and priorities of individual participating countries; and reports on the availability of corresponding data. In its 13th and latest meeting (Moscow, October 1998), the Montreal Process requested its Technical Advisory Committee to review and propose possible elements for forest unit-level criteria and indicators. The issue was discussed and reviewed by the Technical Advisory Committee at a meeting in Montevideo, Uruguay (24 – 28 May 1999). The result of this meeting was a recommendation to the Working Group of the Montreal Process to be considered and likely to be approved in the coming meeting of the Group in Charleston, South Carolina, USA, from 28 November to 2 December 1999. Starting 1 July 1999, the Process made relevant information accessible to the world via its home page on the Internet in English, Spanish and French.

- **Tarapoto Proposal:** Seven "National Consultations for Validation" organized for Bolivia, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela were completed between December 1996 and April 1999. Through these consultations, each country analyzed and systematically evaluated the relevance of the criteria and the applicability of the indicators (at the regional, national and forest management unit levels) developed within the framework of the Tarapoto Proposal in the light of economic, ecological, social, political and institutional conditions and needs of the Amazon region. The Government of Finland has just recently approved funds for the validation of the criteria and indicators in Brazil which will be done separately in three regions starting early next year. Once these tasks are completed, the Proposal will likely consider a Tarapoto II for year 2000.

- **Near East Process:** A follow-up workshop was organized by FAO in Cairo in June - July 1997 and attended by the Arab Centre for Studies of Arid Zones and Dry Lands (ACSAD) and the Arab Organization for Agricultural Development (AOAD). During this workshop, national coordinators first reported on progress in the analysis of applicability and testing or implementation of the national-level criteria and indicators for sustainable forest management developed within the framework of the Near East Process. Secondly, they presented a consolidated proposal for coordinated future action, taking into consideration the results of a country-based survey of the availability, periodicity and reliability of data corresponding to the proposed common criteria and indicators and the capacity of countries to undertake the work required. An FAO/UNEP National Coordinators meeting was held in Damascus, Syria (2 – 4 December 1998) in which progress in implementation of criteria and indicators in the Near East was analyzed. Following one of the recommendations of this meeting, and financed by FAO and UNEP, the draft of the "practical guidelines for the assessment and measurement of criteria and indicators in the region" are being reviewed. Once approved in their final form, these should help countries speed up implementation effectively.

- **Dry Zone Africa Process:** A follow-up workshop organized by UNEP/FAO in November 1997 in which countries presented an analysis of the applicability of the proposed national-level criteria and indicators, actual or potential availability of data and national capacities for collection and analysis of data. A consolidated Plan of Action was prepared and agreed upon by countries present in the November meeting. A follow-up UNEP/FAO/SADC meeting of national coordinators for the implementation of criteria and indicators for sustainable forest management in the SADC countries, Dry Zone Africa, was held in Lilongwe, Malawi (15 – 18 December 1998). The main objective of this meeting was to review and analyze progress towards implementation of criteria and indicators in SADC member countries. Future plans for implementation were drafted. Following one of the recommendations of this meeting, the draft of the "practical guidelines for the assessment and measurement of criteria and indicators in the SADC region" has been written and is being reviewed. The "guidelines" should assist member countries speed up implementation once they are approved by member countries.

- **Lepaterique Process of Central America:** The Central American Commission on Environment and Development (CCAD), through its Technical Secretariat, the Central American Council on Forests and Protected Areas (CCAB-AP), reviewed and tested regional, national and forest management unit-level criteria and indicators proposed by the seven-member countries (CCAD/FAO/CCAB-AP, 1997). The regional Expert Meeting, organized within the framework of an FAO project in January 1997, was followed by two sub-regional workshops and seven national seminars supported by FAO and the CCAD. With some funding from FAO, the Lepaterique Process of Central America is currently doing a similar validation exercise as Tarapoto's.

- **International Tropical Timber Organization (ITTO):** ITTO is a major contributor and an important participant in sustainable tropical forest management. The assessment of forest management status and the transfer of environmentally sound technologies along with capacity building currently rank high in ITTO's agenda. Through an Expert Panel established in 1997 by the International Tropical Timber Council (ITTC), ITTO has revised the originally specified "ITTO Criteria for Sustainable Tropical Forest Management," with due attention to recent trends and international developments in the field (ITTO, 1992). A draft document, "Criteria and Indicators for the Measurement of Sustainable Management of Natural Tropical Forests," was discussed by the XXIII Session of the ITTO in Yokohama, Japan, 1 – 6 December 1997 (ITTO/ITTC, 1998). This document identifies 7 criteria and 66 indicators applicable both at the national and forest unit levels.

- **International Union of Forestry Research Organizations (IUFRO):** Its Inter-Divisional Task Force on Sustainable Forest Management, FAO and CIFOR organized an International Conference on Indicators for Sustainable Forest Management (Melbourne, Australia; 24 – 28 August 1998) in support of the process of implementation of criteria and indicators world-wide and to secure their scientific base and validity.

- **Center for International Forestry Research (CIFOR):** CIFOR continues to execute a multi-year research project (financed by the European Union, other donors and previously also by the GTZ) focusing on the identification and testing of criteria and indicators for sustainable forest management at this level. Efforts of the project have to date largely concentrated on criteria and related indicators dealing with biological diversity, with socio-economic and (to a lesser degree) with economic aspects. Field tests were carried in Brazil, Cameroon, Côte d'Ivoire and Indonesia. To complement this project, the Australian Council for International Agricultural Research (ACIAR) and CIFOR, in cooperation with the Kerala Forest Research Institute, India, are testing criteria and indicators for the sustainability of tropical forest plantation management in Kerala.

- **The African Timber Organization (ATO):** ATO continues to be active in identifying relevant "principles" and criteria and indicators for sustainable forest management through testing at the forest management unit level. Its main aim is the development of appropriate tools for classifying, qualifying and certifying forest management in its member nations.

ANNEX 4

BRIEF DESCRIPTIONS OF THE MAJOR INTERNATIONAL ONGOING PROCESSES ON CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT [17]

ITTO: The ITTO Process identifies 7 criteria and 66 indicators applicable both at the national and forest management unit levels in humid tropical forests of member tropical countries. (Date when the criteria and indicators were adopted: March 1992, Yokohama, Japan).
MEMBER COUNTRIES[18]: 53 countries. Australia, Austria, Belgium/Luxembourg, Bolivia, Brazil, Cambodia, Cameroon, Canada, Central African Republic, China, Colombia, Côte d'Ivoire, Democratic Republic of Congo, Denmark, Ecuador, Egypt, European Union, Fiji, Finland, France, Gabon, Germany, Ghana, Greece, Guyana, Honduras, India, Indonesia, Ireland, Italy, Japan, Liberia, Malaysia, Myanmar, Nepal, The Netherlands, New Zealand, Norway, Panama, Papua New Guinea, Peru, Philippines, Republic of Congo, Republic of Korea, Spain, Suriname, Sweden, Switzerland, Thailand, Togo, United Kingdom, Unites States of America and Venezuela.
The Dry Zone Africa Process on Criteria and Indicators for Sustainable Forest Management identified 7 criteria and 47 indicators for sustainable forest management at the national level (November 1995, Nairobi, Kenya).
MEMBER COUNTRIES: Dry Zone Africa Process: 28 countries CILSS[19] (9 countries): Burkina Faso, Cape Verde, Chad, Gambia, Guinea Bissau, Mali, Mauritania, Niger and Senegal. IGADD (7 countries): Djibouti, Eritrea, Ethiopia, Kenya, Somalia, Sudan, and Uganda. SADC (12 countries): Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe.
The "Pan-European Forest Process" focuses on the development of criteria and indicator for the sustainable management of forests in European. In principle, it includes boreal, temperate and Mediterranean-type forests. The European countries have agreed on 6 common criteria, 27 quantitative indicators and a number of descriptive indicators for sustainable forest management at the regional and national levels (June 1993, Helsinki, Finland).
MEMBER COUNTRIES (38): Albania, Austria, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Moldavia, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and United Kingdom.
The "Montreal Process" deals with criteria and indicators for sustainable forest management in temperate and boreal forests in 12 countries outside Europe. The 12 participating countries have agreed on a set of 7 non-legally binding, criteria and 67 indicators for sustainable forest management for national implementation. (February 1995, Santiago, Chile).
MEMBER COUNTRIES (12): Argentina, Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russian Federation, Uruguay and USA.
The "Tarapoto Proposal of Criteria and Indicators for Sustainability of the Amazon Forest" is sponsored by the Amazon Cooperation Treaty. The 8 participating countries proposed 1 criterion and 7 indicators at the global level. Furthermore, it identifies 7 criteria and 47 indicators for implementation at the national level. For the forest management unit level, the process recognizes 4 criteria and 22 indicators (February 1995, Tarapoto, Peru).
MEMBER COUNTRIES (8): Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela.
In the FAO/UNEP Expert Meeting on Criteria and Indicators for Sustainable Forest Management for the Near East, countries identified 7 criteria and 65 indicators for sustainable forest management at the regional and national levels (October 1996, Cairo, Egypt).
MEMBER COUNTRIES (30): Afghanistan, Algeria, Azerbeijan, Bahrain, Cyprus, Djibouti, Egypt, Islamic Republic of Iran, Iraq, Jordan, Kuwait, Kyrgyz Republic, Lebanon, Libya, Malta, Mauritania, Morocco, Oman, Pakistan, Qatar, Kingdom of Saudi Arabia, Somalia, Sudan, Syria, Tadjikistan, Tunisia, Turkey, Turkmenistan, United Arab Emirates and Yemen.
The "Lepaterique Process of Central America" on Criteria and Indicators for Sustainable Forest Management in the region identified 4 criteria and 40 indicators at the regional level and 8 criteria and 53 indicators at the national level (Tegucigalpa, Honduras 20 – 24 January 1997). This was the beginning of the Process which was later complemented by two FAO/CCAD-supported sub-regional meetings and 7 national seminars on country-level implementation and on the identification of criteria and indicators at the forest management unit level (January 1997, Tegucigalpa, Honduras).
MEMBER COUNTRIES (7): Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.
The African Timber Organization's main priority since 1994 has been to "promote the implementation of sustainable forest management in ATO member countries," and "in accordance with recommendations made at international level, specially by the Intergovernmental Panel on Forests," it has chosen to use for its work five principles, two "sub-principles," 26 criteria and 60 indicators at the regional and national levels (January 1993, Libreville, Gabon).
MEMBER COUNTRIES (13): Angola, Cameroon, Central African Republic, Congo, Côte d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Gabon, Ghana, Liberia, Nigeria, São Tomé et Príncipe and Tanzania.

[17] The description of the Dry Zone Africa Process can be found at the beginning of this paper.

[18] ITTO runs field tests on the implementation of criteria and indicators at the forest management unit level in tropical countries only. Some, if not all, of the non-tropical member countries in the list participate in other ongoing international and/or regional processes and are ITTO members as an organization only and not as part of the process on criteria and indicators for sustainable forest management.

[19] CILSS: Permanent Interstate Committee for Drought Control in the Sahel; IGADD: The Inter-Governmental Authority on Drought Control and Development; SADC: Southern Africa Development Community.

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ITTO'S ACTIVITIES AND EXPERIENCES IN THE DEVELOPMENT OF CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT

Efransjah, International Tropical Timber Organization

INTRODUCTION

ITTO is an intergovernmental organization comprising producer and consumer countries, which account for the bulk of tropical forests in the world and almost all international trade in tropical timber products. Its work and activities is governed by the International Tropical Timber Agreement 1994, (ITTA, 1994) being the only global convention now in existence on forests. ITTO seeks to achieve its long-term objective through a three-pronged approach:

- Firstly, the promotion of conservation and sustainable management of tropical forests including reforestation of degraded areas;
- Secondly, the promotion of sustainable forest industries and in particular further and increased processing of timber in producer countries so that they may enjoy the benefits of the exports of greater value added products; and
- Thirdly, the creation of transparency of the trade in tropical timber through the collection and dissemination of information which will lead to a better pricing structure of tropical timber.

ITTO is committed to strike a balance between conservation and utilization of tropical forests through international cooperation. To this end, ITTO is working closely with relevant conservation non-governmental organizations (NGOs) and timber trade associations. Indeed in all ITTO Expert Panels that examine important issues, both conservation and trade NGOs are invited and sponsored to participate. They are therefore very much partners in the consultative and deliberative process of the ITTO forum.

THE GENESIS OF ITTO CRITERIA AND INDICATORS

From the beginning, ITTO focused its policy work on the promotion of sustainable forest management. In 1988, the organization implemented a study to assess the extent to which tropical forests were being managed on a sustainable basis. This study was undertaken by the International Institute of Environment and Development (IIED) of London under the leadership of Professor Duncan Poore. The study eventually led to the publication of the well-known book "No Timber without Trees." It addressed what became one of the key issues for ITTO and showed the enormous magnitude of the problems related to the tropical forests worldwide, but it also pointed towards ways for improvement. The study identified conditions governing the administration of sustainably managed forests – stability of tenure, effective planning and implementation of yield control and harvesting, for example – and gave clues as to what had to be done. However, the methods for achieving these conditions were found to be quite specific to the countries in which sustainable management was found to be working, so they had to be incorporated into systems of general and practicable guidelines. This led to the development of the ITTO guidelines for the practice of sustainable forest management.

The *ITTO Guidelines for the Sustainable Management of Natural Tropical Forests* contains a set of principles which constitutes the international reference standard, established by ITTO, for the development of more specific national guidelines. The development, application and enforcement of national guidelines based on an internationally accepted standard are matters for national decision by individual timber producing countries. The adoption by ITTO and all

its member countries of the international guidelines was a significant step. This proved to be in the best interest of all producer and consumer countries concerned with the efficient and sustainable development of the tropical forest resources and forest-based industries.

By 1992, four sets of operational guidelines for achieving sustainable forest management had been developed and adopted by the International Tropical Timber Council (ITTC). The first, for the management of natural tropical forests and thus applying to the greater part of the resources, dates from 1989. It was followed by guidelines for tropical forest plantations and for the conservation of biodiversity in tropical production forests. The fourth set of guidelines on prevention and management of fire in tropical forests was completed early in 1997.

In 1991, ITTO followed up on the guidelines by the issuing of the "Criteria for the Measurement of Sustainable Tropical Forest Management." In this initiative, ITTO played a pioneering role. The text of the criteria begins by providing a working definition of sustainable forest management and proceeds, thereafter, to link general criteria for sustainability with their corresponding examples of operational indicators. The criteria are written in general concise terms. To become operational and field-oriented, these generalized criteria need to be adapted to suit the national and forest management unit levels. They are necessarily conceived as dynamic and subject to revision from time to time with new and evolving experiences. They also provide the basis for a standard reporting system to facilitate comparison and discussions for cooperation and assistance needed to achieve sustainability. ITTO has recently reviewed and updated its criteria and indicators, incorporating the experience gained earlier. An Expert Panel met in Yokohama in September 1997 and developed an updated set of relevant criteria and indicators required for the implementation of sustainable forest management, which was adopted by the Council Session in May 1998.

The ITTO Year 2000 was a major step in terms of forestry policy formulation towards sustainability and was welcomed by the entire international forestry community. Although originally designed to mainly focus on tropical forests, the ITTO Year 2000 Objective has become an agreed agenda for all types of forests. Similarly, in a statement attached to the ITTA 1994, ITTO consuming member countries also committed to achieve the sustainable management of their forests by year 2000.

CHARACTERISTICS OF THE ITTO CRITERIA AND INDICATORS (1992)

The 1992 set of ITTO criteria and indicators includes 7 criteria and 27 indicators at the national level, and 6 criteria and 23 indicators at the forest management unit level. One of the characteristics of this first set of criteria and indicators was its focus solely on natural forests, which appeared then to be the main concern in the international debate on forestry.

Another characteristic was the emphasis on timber production, while apparently less emphasis was given to biological diversity conservation and the involvement of local communities in forest management. Adjustments were pursued in 1993, with the publication of the *ITTO Guidelines for the Conservation of Biodiversity in Tropical Production Forests*, which became a supplement of the *ITTO Guidelines for the Sustainable Management of Natural Tropical Forests.*

On the other hand, an attempt was made to identify a limited number of criteria that could reflect sound forest management with clear but simple indicators, in order to assess and monitor the trend of forest change. This simplicity and flexibility was essential in order to take into consideration the varied situations among member countries, and the heterogeneity of forest types and ecosystems.

APPLICATION OF THE ITTO CRITERIA AND INDICATORS (1992)

The 1992 criteria and indicators have been used as a framework for reporting progress towards the achievement of the sustainable forest management in general, and the ITTO Year 2000 Objective in particular, by ITTO member countries. This reporting was one of the commitments made by member countries in Quito in 1991.

In order to facilitate reporting, in 1993, ITTO adopted a common format for reporting progress towards the Year 2000 Objective. This format generally took into account the set of criteria and indicators adopted in 1992 in order to encourage initial reporting, with the understanding that the format will be revised to include more information as additional data become available in member countries.

The reporting has not been easy for member countries. Among the major constraints are data deficiencies and outdated data, while institutional capacity for data collection and analysis is often inadequate. Some relevant measures have been initiated by ITTO to improve capacity, such as the regular organization of training workshops for the collection of forest statistics, and the development of a user friendly formats for data collection. Several pilot projects to improve the collection of forestry related data have also been implemented in member countries. Specific projects to promote, disseminate and to provide training on the application of criteria and indicators for sustainable tropical forest management have also been implemented.

ITTO SET OF CRITERIA AND INDICATORS (1998)

Although the criteria and indicators (1992) have not been fully implemented by members as a means of reporting progress towards the ITTO Year 2000 Objective for the reasons mentioned above, it was felt necessary to revise this set of criteria and indicators, for the following reasons:

- the need to give emphasis to certain areas, in particular in the field of biodiversity conservation, local communities' participation and environmental aspects;
- the criteria and indicators (1992) were developed before the Earth Summit took place in Rio de Janeiro in 1992. Its deliberations were considered as the most authoritative consensus for sustainable forestry. Therefore, such criteria and indicators should also take into account the Rio Declaration, the Forest Principles, Agenda 21, the Framework Convention on Climate Change and the Convention on Biological Diversity which were adopted during the Summit;
- as the follow-up of the Earth Summit, many other international and regional initiatives on criteria and indicators for sustainable forest management have emerged, some of them inspired by the pioneering ITTO criteria and indicators;
- relevant experiences had been gained by ITTO through project implementation in the field and lessons learnt from the collection of data; and
- significant results emanating from research on testing criteria and indicators in the field, conducted by the Center for International Forestry Research (CIFOR), are becoming available.

In this light, in November 1996, ITTO convened an Expert Panel comprising sixteen members: six representing producer countries, six from consumer countries, two representatives from the NGO community and two from trade/industry, to revise the 1992 set of criteria and indicators. The draft produced was reviewed by the ITTC during its Twenty-third and Twenty-fourth Sessions, and adopted in 1998 as the ITTO criteria and indicators (1998).

COMPARISON OF ITTO CRITERIA AND INDICATORS (1992) AND CRITERIA AND INDICATORS (1998)

The criteria and indicators (1998) retained certain characteristics of the criteria and indicators (1992). Both sets of criteria and indicators were developed through consultation among representatives from ITTO producing and consuming member countries, the NGO community, and the trade/industry organizations, which represent the main stakeholders of forestry development.

The criteria and indicators (1998) are still focused on natural tropical forests; planted forests were not included. This was deemed necessary to keep the criteria and indicators clear and easy for interpretation and assessment. It was also felt that fundamental differences exist between the management of plantations and the management of natural forests. Therefore, it seemed more appropriate to identify separate criteria and indicators for natural forests and for plantations, although both have to be managed on a sustainable basis in order to achieve sustainability.

Another characteristic that has been retained is that the criteria and indicators have been identified at two levels: the national level, and the forest management unit level, although many criteria and indicators apply at both levels. The rationale was to make these criteria and indicators as clear and specific as possible in order to facilitate monitoring and assessment.

Finally, both sets include a limited but meaningful number of criteria and indicators to facilitate reporting. The revised set includes 7 criteria and 66 indicators, compared to 13 criteria and 50 indicators for the previous set (1992).

The two sets of criteria and indicators differ to some extent, however. The criteria and indicators (1998) include clear definition of terms in order to avoid confusion and facilitate reporting. In this connection, it is noted that the title has changed from "*Criteria for the Measurement of Sustainable Tropical Forest Management*" in the 1992 set to "*Criteria and Indicators for Sustainable Management of Natural Tropical Forests*" in the 1998 set. The 1998 title is more compatible with the issue at stake, where criteria and indicators are tools to assess trends of forest conditions and forest management, over time.

The 1998 criteria and indicators are better organized and ensure greater coverage of the features and requirements associated with the sustainable management of tropical forests.

THE WAY AHEAD

The ITTO criteria and indicators (1998) have now been published, hence member countries have been provided with an improved tool for assessing changes and trends in forest conditions and management systems. This may be accomplished by measuring or describing the indicators at regular intervals. When the successive values of any indicator are placed in a time sequence, they provide information on the direction of change, either towards or away from sustainable forest management.

Based on past experience, requests for reporting of progress towards the Year 2000 Objective in particular, and sustainable forest management in general, has been characterized by insufficient response from member countries. One would therefore expect additional measures be taken by ITTO to improve reporting based on the new set of criteria and indicators. In 1998, upon request of ITTC, an Expert Panel was assigned to produce a manual on the methods that could be used to compile data on indicators at both national and forest management unit levels. The manual has been prepared to provide guidance to member countries for compiling data on the indicators set out in the *ITTO Criteria and Indicators for*

Sustainable Management of Natural Tropical Forests. It has been issued in two parts (Part A and Part B) which respectively embodied indicators at the national and forest management unit levels. Part A and Part B are very similar to one another, but with some differences. All the indicators apply at the national level and are included in Part A, while fewer indicators apply at the level of the forest management unit. For clarity, the numbering of indicators is identical in both Parts and follows exactly the sequence in the ITTO guidelines.

Many countries will have to take a focused and phased approach to implement the set of criteria and indicators. Information on some indicators is already available in some countries; other countries may require additional resources or even conduct specific research to confirm data at the field level. There will be obviously a need to refine the criteria and indicators further in light of experience gained from development of new forestry technologies, and a better understanding of the functioning of tropical forest ecosystems as a result of extensive research. The process is therefore a continuous one towards sustainable forest management, which all are striving to achieve however difficult. As the next step, ITTO will carry out limited field-testing and verification of the manual in specific countries and situations, to be followed by training sessions at the operator level.

SUSTAINABLE FOREST MANAGEMENT FOR DRY FORESTS OF SOUTH ASIA

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INTRODUCTION

The tropical dry forests of Asia occur in areas with rainfall ranging from of 500 to 1,000 mm/yr. These forests are relatively open. The people living in and around these forests depend heavily on them for livestock grazing as well as for fuelwood, building poles, bamboo and a range of other products and services. Many of these forests are fragile, and unsustainable harvests, even if light, can lead to severe degradation, weed infestation and increased susceptibility to fire and insect damage. Large areas have degenerated into grass and scrub land. Dry forests in these areas often merge into arid or even desert margin zones where the natural tree cover becomes increasingly spare. Currently, only 15 percent of the dry forest zone in Asia is forested (FAO, 1993).

Table 1: Deforestation in the Dry Zones of Asia

Region	Total Land Area of the Zone (million ha)	Total Forested Area in 1990		Annual Deforestation (1981 - 1990)	
		million ha	% of Zone	million ha	% of Zone
Asia	280.6	41.1	15	0.5	1.1
World Total	1,249.1	238.3	19	2.2	0.9

Source: FAO, 1993

The dry tropical forests pose management challenges very different from those of the moist tropics. Most of the native tree species are slow growing and drought tolerant. During hot dry spells, biological activity is reduced to a minimum as a means of survival. Fire is an important hazard.

The wood produced from dry forests is usually hard and durable and with few exceptions, is generally only commercially marketable on a local basis. Regeneration from seeds and coppice shoots is very common. Regeneration also relies on grazing animals eating the pods and excreting the seeds; otherwise, the seeds are able to survive for years in the soil. A high proportion of the tree species coppice, producing vigorous new growth when the main trunk is cut. Many of the species are fire resistant when larger than pole size. Wildlife is a significant element in the management of these areas. It is extremely important for generating local employment through eco-tourism.

Where rainfall is scarce but reliable, sustained yield management is technically feasible. This is usually based on replacement or enrichment planting. The drier the area or the more erratic the rainfall, the poorer the record of replacement planting tends to be. In some areas, studies have shown that the yield from exotic species may be less than that of the indigenous forest cleared to make way for them.

The management emphasis in the drier areas has consequently been shifting towards the regeneration and management of existing forests with indigenous and endemic species and the afforestation of degraded or even completely barren areas. In a number of countries,

demonstration plots in which cutting and grazing have been forbidden and fire has been excluded for a number of years have shown a remarkable ability to regenerate both from coppice and from seed that has lain dormant in the soil. A common example is a scheme called "Rehabilitation of Degraded Forests (RDF)" in India, which greatly relies on this phenomenon. This suggests a method of management capable of restoring and sustaining the productive capacities of large areas of forest in these areas, where the root stock is still intact (MoEF, 1999).

Important non-wood forest products (NWFPs) from the dry forests include gums (such as gum arabic), fodder, honey and grazing, whose production is included in the objectives of management of some forests. Other management objectives include maintenance of populations of wild animals as an important component of biodiversity conservation and support of eco-tourism.

The main problem in implementing forest management schemes in most of the dry forest areas is the intensity of existing land use. Even in badly degraded areas, people may rely completely on what is left of the forests for browse and fuel. Closing off areas for regeneration, even though it will produce long-term gains, can impose intolerable short-term burdens upon people. In cases of shared ownership of land, difficulties may also arise in arriving at satisfactory methods of dispersing the various benefits and costs involved.

Plantation forestry is a well-established form of intensive forest use. However, in tropical areas, plantation forestry needs much improvement in several aspects. There are numerous examples of plantations that have failed or of sites that have been degraded by ill chosen exotic species. A review of tropical plantations by Pandey (1992) observed that planning is generally poor, particularly in relation to vital issues such as the matching of species to the site. Plantation projects are often designed in haste, with scant attention paid to important issues because of time or financial constraints.

In the developing world, the main physical limitation to the future contribution of plantation forestry is the availability of land. With expanding farming populations using all the available non-forested land for food production, the areas available for plantations are becoming ever more restricted. The experience of the past two decades shows that degraded or "waste" lands may be the only resource available to poor people.

There are, however, large areas where the natural forest has been badly degraded or where the soil fertility has been lost due to unsustainable use, which could be used for plantations. Such schemes would provide a source of empowerment and long-term income, provided the needs of local people are recognized from the beginning. Large areas (150 million ha) of salt affected land in the developing countries can be brought into productive use by planting them with salt-tolerant trees. But even then, there could be competition from agriculture. Major efforts are being made in some areas to rehabilitate such lands or to use them for salt-tolerant crops. Other problematic sites include mined-out areas and their overburdened dumps, waterlogged areas along unlined canals, hard lateritic soils, and so on. All these areas can be brought under green cover through use of site-specific species and technology.

Considering the fragility of dry areas and recognizing that the "policing" approach of conservation and protection has not succeeded, greater emphasis has to be given to people's participation in forest management, decision-making and benefit sharing. Management of dry forests should, therefore, aim at the application of practices that are ecologically sound, economically viable, socially responsible and environmentally acceptable; and which do not reduce the potential of these resources to deliver multiple benefits (Hardcastle, 1999). Some of these broad principles hold great promise for sustainable forest management and development of dry forests of this region.

HISTORY OF FOREST MANAGEMENT IN THE REGION

India

Ancient Indian texts of the Mauryan period (4^{th} – 3^{rd} century BC) are a testimony to the fact that the concepts of forestry and forest management practices were well developed during those times. The primary document that highlights the scientific approach to the aspects of administration, forest policy and their enforcement is the "Arthashastra" of Kautilya, which is the treatise and Bible of Indian administration. There was a regular and independent Forest Department in the administration of Chandragupta Maurya. Kautilya, a great visionary as he was, sketched an ideal Indian State with forests as an important part. In "Arthashastr" he mentioned four types of forests (Rangrajan, 1987; Rawat, 1991):

- Pashuvan (Deer Forest)
- Mrigvan (Game Forest)
- Dravyavan (Productive Forest)
- Hastivan (Elephant Forest)

The Productive Forest was for commercial production of forest produce, the Elephant Forest for capturing wild elephants and nurturing them and the Game Forest for recreational use like hunting. The Vanaprasthas or forest recluses were also allotted parts of forest for their habitation, meditation and contemplation. The well-protected Leisure Forest, intended for the King's pleasure, had plantations bearing sweet fruits, thornless trees and pools of water. It was stocked with tame and harmless deer, elephants and other wild animals. Wildlife sanctuaries and wildlife protection also found a mention in "Arthashastra" (Rawat, 1991; Pandey, 1996, 1998; Prasad, 1999b).

Kautilya said whoever plants a large forest for exploiting the timber resources, near the border of his State, watered by a river and yielding material of high value, is said to outmaneuver others. A forest watered by a river is self-sustaining and provides shelter in times of calamities. Probably today's irrigated plantations along the canals resemble most what Kautilya described. Such examples may be compared with today's Indira Gandhi Canal Areas in Indian Thar Desert (Pandey, 1998).

British control and management of forests marked a break from the existing practices. The era of scientific management began in 1864 with the appointment of Dietrich Brandis, a German forester, as the Inspector General of Forests. This was followed by the creation of a separate forest service, and the promulgation of legal measures, notably the 1865 Forest Act which was revised in 1878 to confer powers to the newly constituted Forest Departments. It provided for the creation of separate "reserved" and "protected" categories of forests. Concepts of working plans and management units as Divisions and Circles emerged for the scientific management of State-owned forests during this time (Rao *et al.,* 1961).

Forest Management Scenario from 1900 - 1947

In British India in 1900, out of 788,156 sq. miles of total area, 42.56 percent was under cultivation, 44.38 percent was kept for common use of the community and only 13.06 percent of the area (1,02,942 sq. miles) was notified as reserved and protected. Most of the exploitable areas and important tree species were brought under working plans. All silvicultural systems were designed and implemented for commercial harvesting and regeneration of important timber species for resource generation without much consideration of the ground flora or non-commercial trees or the ecological consequences of such management practices (Rao *et al.,* 1961).

Forest Management in Post-Independent Period

Since Independence, progressive and effective steps have been taken by the Government of India and State governments for the protection and preservation of forests and wildlife in the country. The Constitution of India provides guidelines for the protection of forests and wildlife. The Directive Principles of State Policy assigns duties to the States and citizens through Articles 48-A and 51-A (g), which say, "*State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country; and the citizens are to protect and improve the natural environment including the forests, lakes, rivers and wildlife and to have compassion for the living creatures.*"

Prior to 1970s

Post Independence, the abolition of "Zamindari" system and the application of land ceiling laws brought large private forest areas under Indian Government's control. Notification and scientific management of these forest areas were the major tasks of the forest service in the early 1950s. In 1950-51, the recorded forest area was 40.48 million ha. It increased to 66.80 million ha in 1976-77 and to 76.52 million ha in 1996, i.e., an increase of 36.04 million ha (Gadgil and Guha, 1992).

The 1952 Forest Policy that was the first after Independence, laid down that one-third of the country's land area should be under forest cover for ensuring a balanced and complementary land-use system. It introduced the fundamental concept of self-sustenance for meeting local and national needs, advocated extension forestry, provided for the management and control of private forests, containment of shifting cultivation and creation of village forests. The policy also focussed on the need to protect wild animals through setting up of sanctuaries and national parks. However, it had a bias towards timber yield and revenue generation by replacement of inferior species with a valuable commercial species and did not highlight sustainable management of non-wood forest produce. It proposed administration of forests in financial terms, i.e., protected forests, forests for national use, village forests and treelands. Not much emphasis was laid on the involvement of people in forest management and protection, but in 1966, the Indian Forest Service was revived to ensure coordinated professional management of forests.

Post 1970

In 1970, a National Wildlife policy was adopted by the Indian Board of Wildlife, leading to the enactment of the Wildlife (Protection) Act of 1972, amended in 1991. In 1976, the subject of "forest" was transferred from the State List to the Concurrent List of the Constitution of India to ensure uniform policy and management. From commercial or production forestry that considered all non-teak forests to be inferior, management emphasis shifted to a broad spectrum of goods and services provided by forests. The Forest Conservation Act enacted in 1980 and later amended in 1988, provided that areas recorded as "forests" in government records cannot be transferred for non-forestry use without prior approval of the Government of India. This legislation brought a drastic reduction in forest loss from the average level of 0.143 million ha/year during the 30 years from 1950 to 1980, to the average of 25,000 ha/year during the 15 years from 1980 to 1995. This, reportedly, has further declined to about 20,000 ha/year between 1995 and 1999 (MoEF, 1999). Moreover, this conversion now requires "compensatory afforestation" on an equivalent area or double the area on degraded forestlands.

In view of the growing demand for and dwindling of forest resources, social forestry was introduced during this time to bring about a transformation in the relationship between the State Forest bureaucracies and the local people. In spite of the good intent and spirit behind

the social forestry programmes, many of them failed due to the "*we work and you participate*" attitude of the foresters who promoted these programmes.

A separate Ministry of Environment and Forest was created in the Union Government in 1985 and the forest wing from the Ministry of Agriculture was transferred to the new ministry.

The National Forest Policy of the country was revised in 1988 (MOEF, 1988) with the principal aim of maintaining environmental stability and ecological balance including atmospheric equilibrium by conserving the natural heritage of the country. The new policy gave priority to the conservation of forests and biodiversity. The derivation of direct economic benefit from forests has been subordinated to this principal aim.

The new Forest Policy (1988) gave special emphasis to conserving the natural heritage, preserving flora and fauna, meeting fuel, fodder, non-wood forest produce and small timber requirements of the rural and tribal population, and increasing forest area and productivity to meet local and national needs. This is to be achieved through a massive people's movement for afforestation and protection with the involvement, specially, of women and encouraging forest-based industries to develop direct linkages with the rural people for their raw material requirements. People living in or near forests have the first charge on forest produce. The national goal of the policy is to have a minimum of one third (two thirds in the hills) of the total land area of the country under forest or tree cover.

The Present Scenario

The 1988 Forest Policy has ushered in an era of interaction, co-operation and co-ordination between the foresters and the community. The Government of India issued on 1st June 1990, a guideline highlighting the need and the procedure to be adopted for the involvement of village committees and voluntary agencies in the protection and development of degraded forests. In the 1995 forest assessment, India had 3.50 million ha of forests with less than 70 percent crown density, 35.00 million ha with 40 - 70 percent crown density, 24.93 million ha with 10 - 40 percent crown cover and 6.08 million ha of scrub area. Thus, only 11.73 percent of land area had reasonably good forest cover of over 40 percent crown density against the 33 percent stipulated in the National Forest Policies of 1952 and 1988.

Participatory Forest Management

Joint Forest Management and other forms of Participatory Forest Management systems currently being developed by many State Departments and village communities hold a great promise and have created areas of new hope for regeneration and sustainable development of multiple-use forest areas all over the country.

Table 2: Forest Area Statistics of India

Forest Area	**million ha**
Legally recorded forest area	76.52
Actual area under forest cover (1995)* (Natural Forests) (Plantations)	65.00* (50.38) (14.62)
Actual area under forest cover (1997)	63.34

Sources: FSI, 1997; *FAO, 1997

The forestry sector in India has traditionally been one of the most organized sectors with more than a century-old tradition of scientific management. However, of late, it has been affected by a rapid increase in population, insufficient infrastructure and diversion of forest areas for developmental activities. In addition to these, there are several other problems like inadequate public awareness about the working plans of the forests, technological weakness, insufficient funds and facilities, and conflicting roles and functions of the public forest administration that are unique to forestry. These have necessitated the search for a workable framework for scientific and sustainable management of forest resources, which allows adoption of a multidisciplinary approach and inter-sectoral co-ordination in forest matters. This would help translate into action the national commitment to "Agenda 21" and the "Forest Principles" made at the Earth Summit (UNCED) in Rio de Janeiro, June 1992.

Sustainable Forest Management as an Issue and an Opportunity

The major task before the country is to rehabilitate the degraded forests and to enhance the area under forest/tree cover to 33 percent of total area as envisaged in the National Forest Policy 1988 (MoEF, 1988). Though continuous efforts are being made, the results are discouraging due to the ever increasing demand for forest products and limited financial resources (<10 percent of the total plan allocation). To reverse the process of degradation and to achieve the goal of the National Forest Policy 1988, the Indian Government, with input from the UNDP and FAO, has proposed the National Forestry Action Programmeme (NFAP) to address these issues (MoEF, 1999).

The objective of the NFAP is to evolve issue-based programmes in line with the National Forestry Policy (1988). It is a comprehensive strategic plan to address the key issues underlying the major problems of the forestry sector. Its programme structure is based on the proposals in the 26 State Forestry Action Programmes(25 from States and 1 from the Union Territory of Andaman and Nicobar Islands (MoEF, 1999)). Apart from forest conservation and development, the NFAP also stipulates substantially enhanced outlay for holistic forest management. To achieve these goals, NFAP envisages an investment of US$ 32 billion over the next 20 years.

The NFAP recognizes that a rational and balanced combination of different forest functions – production, protection conservation and provision of environmental amenities – is essential to help conserve the sustainability of forests. The concept and goal of sustainable forest management is holistic in this respect and the task ahead is multidisciplinary.

Pakistan

Pakistan is mainly a dry country. About 51 percent of the land area lies in the arid zone, where tree growth is extremely limited. Bushes and grasses grow in this region, but they are often devoured by large herds of livestock, the mainstay of the inhabitants. Approximately 37 percent of the country is semi-arid, where tree growth is possible. But this area is mainly utilized for rain-fed agriculture, since marginal farming gets preference over tree culture in a food-deficit country. Only 12 percent of Pakistan is sub-humid and, thus, well suited for tree culture. About 20 percent of this region is already under dense, productive natural coniferous forests (FAO, 1993).

The Situation Before 1947

Prior to 1947, Hazara, Malakand, Murree Hills and the northern areas had dense forests. The terrain in these areas was mountainous and the forests were, and still are, the main source of livelihood for the people. During the colonial rule, the tribesmen were given generous rights in the forests and adjoining land and the dependence of the local agro-pastoral economy on

grazing of livestock was recognized. The low population densities of livestock and humans posed no threat to the forests.

Forests were divided into two categories: "Reserve Forests" and "Guzara Forests". Guzara Forests were adjacent to the village settlements and the ownership of land and its trees was vested with the people, either individually or jointly as family ownership or as village "shamilaat" (common property). However, the legal claim to these forests lay with the British. Reserve Forests were well delineated and demarcated dense forests on the hills and distant from the settlements. All activities except those permitted through special notifications, were prohibited in these forests.

The Situation After 1947

When Pakistan was established in 1947, it inherited forest cover less than 2 percent of its territory. There was a meager forest resource in the Western half, but the country remained self-sufficient in wood and wood products until 1971. Efforts to increase the forest area since then have had limited success due to the arid climate in most parts of the country, the low priority assigned to forestry in the planning process and the consequent inadequate funding.

The Forestry Policy of 1955 recognized the scarcity of forest resources and emphasized forest development and production, with equal emphasis on non-tangible benefits of the forest produce. The 1962 policy further stressed the importance of production and regeneration of forests and of improvement in the processing techniques for better forest utilization. Guidelines for watershed management and rehabilitation programmes for proper soil conservation in forest areas were also established. Subsidies were given for terracing and higher taxes were levied on highly eroded areas. Co-operative groups for soil conservation, farm forestry and planting of fruit trees on private lands were encouraged, while grazing of goats in forest areas was progressively eliminated over a period of three years.

Forestry first received some priority in 1960, when the Indus Valley Project allowed large, newly irrigated areas of Punjab and Sindh Provinces to be colonized. Government policy earmarked 10 percent of the new barrage areas for raising trees in block plantations. In 1970, about 1 million ha of forest area was added to the official forest area of Pakistan taking it to 3 million ha, after four States merged in the North West Frontier Province. The control of 17,000 ha of roadside and canal-side strips was also transferred to the province for use as linear plantations for amenity purposes. Following the land reforms in 1960 and 1972, excess land which was mostly woodland and wildland, was surrendered by the big landowners as "Resumed Land" to the provincial Forest Department for management. Around 100,000 ha of Resumed Land was notified as Protected Forests under the Pakistan Forest Act (1927).

Under the World Food Programme's *Food for Work* scheme, planting of bare hills, terracing of fields, erosion prevention measures and slope consolidation activities were undertaken to protect the catchments. More than 200,000 ha of forests were raised in this manner. (FAO, 1993).

The Present Scenario

The Forestry Policy of 1980 placed a bigger thrust on the planting of fast-growing tree species in areas outside forests, incentive-based development of compact fuelwood plantations, scientific harvest of forest products, conservation of wildlands for recreation, wildlife and for the medicinal plants found therein. The need to integrate forestry with other sectors at provincial and national levels was also realized.

Pakistan National Forestry Policy (1991) was influenced by the country's social, economic and environmental needs. The country's mainstay is agriculture, which is dependent on canal

irrigation. Hence, sound management of watersheds constitutes the basic objective of the policy. At the same time, inadequate forest resources and the looming energy crisis require development of new plantations, efficient resource utilization and promotion of social forestry and agroforestry programmes. The 1991 policy also aims to increase the national forest area from 5.4 percent to 10 percent in the next 15 years. Conservation of biodiversity is also being emphasized through the conservation of natural forests and reforestation and wildlife habitat improvement programmes. Environmental degradation in the river catchments is to be contained in order to check soil erosion and accretion of silt in water reservoirs, to regulate water supply to increase the lifespan of multipurpose dams and to mitigate floods.

Anti-desertification measures are urgently required along with the rehabilitation of waterlogged, saline and degraded lands through vegetation treatment. It is important to generate income and employment opportunities for the rural populace and promote NGO/Voluntary Organizations' involvement in generating environmental awareness. Rangeland management and improvement programmes need to be initiated to boost fodder management.

The 1991 Forestry Policy recognizes that sustainable development requires a good base of natural resources, their uniform distribution and growth at or above the increase in population. The Forest Policy objectives revolve around the following issues.

- Conservation of forest, watershed, wildlife and range resources;
- Promotion of social forestry programmes to increase existing forest areas;
- Containment of environmental degradation; and
- Conservation of biodiversity.

For an effective implementation of the policy, changes are required with respect to the following:

- Reorganization of forest administrative structure;
- Adequate financing and funding support to the forestry sector;
- Effective legislation; and
- Dedicated implementation of forestry reforms.

Forestry has been low in the national programme priority rating of Pakistan. Public forests amount to a mere 2.023 million ha, i.e., just 3 percent of the total land; and yield only 1.7 percent of the total wood consumed in the country.

Pakistan's lowlands are fertile and extensive but unproductive because of their arid condition. As a remedy, the country developed one of the most extensive irrigation systems in the world running to about 62,300 km. With irrigation, the lowlands have been transformed into highly productive areas for both food and wood production.

The Forestry Master Plan of the country (FAO, 1993) envisages enlargement of agroforestry areas to about 175 million ha so that they can produce 13 million cum of wood by 2008. The forestry base is to be expanded by about 7 times, from 3 percent (2.02 million ha) to 20 percent (15.4 million ha) by 2018. The National Conservation Strategy of 1992 prescribes planting of 100 trees/ha along the farm boundaries. Block plantations in woodlots and linear planting are also to be undertaken (Ganguli, 1995).

Bangladesh

Bangladesh, a deltaic country has a land area of 143,998 km^2, consisting mainly of low, flat and fertile land. It is one of the most densely populated countries in the world with a density of 756 persons per km^2 and currently a population of 108.8 million, growing at a rate of 2.18 percent per year. The per capita cultivated land holding is only 0.08 ha, while agriculture is the mainstay of the Bangladesh economy. The total forest land in Bangladesh is 2.46 million ha, 16.85 percent of the land area of the country. Forests are separated into three groups: those managed by the Forest Department, unclassed State forests and village forests (FAO, 1993).

Hill, mangrove and sal forests constitute the major forest types managed by the Forest Department, covering an area of 1.46 million ha. Sal forests of the dry region and those found in the plains are also known as the moist and dry deciduous forests consisting of degraded sal (*Shorea robusta*) with other deciduous and few evergreen species. These species are used for posts, boat building, fuelwood and for other constructional purposes. Natural forests are unequally distributed and most lie in the eastern and southern parts of the country, with very little of forests in the north and northwest. The small forest area and the high incidence of encroachment and deforestation of the existing forest have resulted in the degradation of the soils and water resources of the whole area. Further deterioration of the vegetation will create serious environmental hazards and desertification in the north.

Unclassed State forests (USF) have been subjected to excessive overcutting and indiscriminate shifting cultivation, converting them into tree-cum-grass savannah. The USF hold great potential for tree growing but it is difficult to control the intensity and spread of fires lit by the local community practicing *shifting cultivation*. Attempts are being made to resettle these people and encourage them to adopt horticulture and permanent agriculture as a sustainable income source.

The dense population of Bangladesh exerts great pressure on the dwindling forest resources for fuelwood, construction timber, agricultural implements and also for agriculture and pastureland. It is essential to manage forests in a socially acceptable manner for the long-term benefit and well being of the people. The government has undertaken various activities for reducing the demand-supply gap where forest goods and services are concerned (Table 3).

Table 3: Forest Development Activities in Bangladesh

Year	Forest Development Activity	Programme Features
1966	Mangrove Afforestation Programme	115,000 ha of mangrove plantations established along the coast line with World Bank's support
1989	Revision of Forest Management Plans	Management Plans for hill and mangrove forests revised.
	Brick Burning Control Act	Use of fuelwood in brick kilns prohibited. Brick kilns consume about 23 percent of the fuelwood produced in the country.
Up till 1990-91	Afforestation on depleted hill forests	Afforestation on 69,500 ha forest area (including 52,000 ha of USF).
1990-91	Upazilla Afforestation and Nursery Project	Massive forest extension programme involving participation of the local people. 6,000 ha strip plantations, 8,500 ha fuelwood plantations, 1,000 ha agroforestry activities and 2,800 village afforestation projects undertaken, and 38 million seedlings distributed.

Source: FAO, 1993; Ganguli, 1995

Presently, threats to forests come from unsustainable harvesting, illegal felling, encroachment and forest denudation. Improvement, renewal and replacement of forest resources are crucial. There is a need to ensure the peoples' participation in forest protection and management.

Forestry Scenario in 1894

Earlier, the forest policy (1894) of the erstwhile eastern India, now Bangladesh, emphasized the maintenance of forests in the hilly areas for the preservation of climate and physical conditions so as to protect the cultivated land in the plains from floods, siltation and soil erosion. Little emphasis was placed on the sustainable management of forests. The policy then coming in the wake of Royal Commission on Agriculture gave preference to agriculture over forestry practices by proposing clearance to provide additional cultivable land.

Post-1947 Scenario

Bangladesh was deficient in forest resources by 1947. The forest policy was reoriented in 1955 to place more importance on improvement of forest areas by creating plantations, improving timber harvesting, managing all forests under management plans, training forest personnel, sound management of private forests and protection and conservation of wildlife.

A review of the forest policy in 1962 intensified management to make forestry a commercial concern. Apart from undertaking intensive plantations and a more efficient use of forest produce, soil conservation activities through watershed management also received a boost.

A more pragmatic and broad-based National Forest Policy was declared by the government of the newly established Bangladesh in 1979. The major thrust areas in the policy were:

- Preservation of climatic and physical conditions;
- Recognition of the role and importance of NWFPs;
- Soil conservation and regulation of stream flows, etc.;
- Use of modern technology for afforestation and forest management; and
- Establishment and maintenance of game sanctuaries and wildlife reserves.

The forest policies formulated prior to 1979 were in the interest of the rulers at that time and did not concern local people's needs, the overall environmental conditions or sustainable capacity of the forests. Though the forest policy of 1979 did address the needs of the local people, emphasized their involvement in forestry activities, stressed on environmental functions of the forest and also economic development based on forest and forest products, the environmental aspects has to be elaborated and further updated. There is an urgent need for a framework to manage forests sustainably for the multifarious goals of conservation of ecosystem, species and genetic diversity, forest-based income and employment generation, social welfare and equity, participation of people and the private sector and development of improved forest utilization technology.

The Present Scenario

Conservation of the present resource and restoration of the degraded and encroached lands need to be assigned a high priority. The dry sal forests of the plains are particularly heavily intersected and intermingled with the private and "khas" lands, resulting in the former's encroachment and illegal felling. Immediate steps should be taken to demarcate and delineate the Forest Department's lands on the ground and their participatory management under multiple land-use concepts for maximizing benefit to the local people. For proper management and particularly for protection of the existing forest areas, transport and communication facilities have to be improved.

Current management practices are deficient and defective. Except in the Sunderbans (mangrove forests), clear felling is practiced and regeneration is by planting of seedlings or by direct sowing. This system not only destroys the gene pool, but also causes depletion of land by erosion. USF have a great potential for expanding the forest area. Social forestry that also includes training and transfer of technology to the people will minimize shortage of wood, while involving women and benefiting the people. It will also impart a sense of ownership and security of the rights of use of the forests.

Siltation has become a major problem in the water supplies of the country. A policy on watershed/catchment management needs to be followed. Appropriate policy is also needed for the conservation and management of minor forest products (such as golpata, bamboo, rattan, medicinal plant species, honey, bees wax, fish, shrimp and shells).

An Environment Policy was adopted in 1992. It is complementary to the Forest Policy, and stresses conservation, expansion and development of forests, arrest of forest depletion, conservation of biodiversity, forestry research, development of wetlands and augmenting tree plantation.

Planned utilization and efficient management of water resources are keys to effective changes in agricultural production and productivity of other sectors. The massive damage caused by run off from monsoon rains is further aggravated by deforestation. The water catchment areas must be protected to prevent run off, to control the flow of silt into the rivers, to reestablish the water table and improve water storage.

Over 85 percent of the population lives in villages and depends on timber derived from village and State-owned forests. Widespread deforestation has increased flooding, erosion, siltation and desertification in the northern parts of the country. There is a need to undertake afforestation programmes in the USF, homestead and marginal lands.

Most rural people are poor and remain unemployed for several months of the year. This leads to forest encroachment and illegal felling. There is a need to generate productive employment through participatory forest management programmes. Proper institutional framework is the key to optimal programme implementation for economic development.

Low impact logging, extraction and transportation can be achieved by new methods, and by education and training of the Forest Department, public and private sector employees. A reform in the structure and size of forest administration is also required to translate the directives of the forest policy into reality. Proper legislation, co-ordination and control of forestry activities and an audit and review of the results are all important instruments for effective implementation of the policy.

Sri Lanka

Historical Pattern of Forest Management and Utilization

The historical pattern of forest management among the developing countries, particularly those that were colonized and have heavy population pressure, is commonly characterized by an early exploitation stage. This is typically followed by a forest management system based on timber harvesting, a peak and then a decline of timber harvesting, and finally consolidation.

Early Exploitation Stage (Up to 1880s)

Sri Lanka was originally very well forested. This wealth attracted and led to the colonization by the Portuguese, the Dutch and the British. Industrial revolution and increase in population accelerated the opening of forests for timber and land. Heavy felling and export of timber like calamander, satinwood and ebony increased the fear of timber famine. This led to the promulgation of Forest Ordinance Number 12 and gazettement of the forests from 1850 onwards. It was then that forest management actually started in Sri Lanka (FAO, 1993; FSMP, 1995).

Forest Management Based on Timber Harvesting (1880s to mid-1950s)

Organized forest management based on scientific directions, delineation of management units and preparation of Working Plans started at this time. Yield control was introduced in 1882. Plantations of teak, mahogany and eucalypts were established to produce wood for tea chests and railway sleepers. The first Forest Policy was drawn up in 1929. It emphasized the protection of forests for conservation purposes as well as the need of the country to export timber.

Peak and Decline of Timber Harvesting (mid-1950s to early 1980s)

Preoccupation of forestry in the country continued to be with the preparation and implementation of Working Plans for timber harvesting, the development of plantations and protection of the conservation forests. A resource assessment in 1965-67 concluded that with correct management, the country could sustain an adequate supply of timber and protective environment of forest cover for all time. Hence, forest industries were established. However, by early 1980s, it became clear that forest management based on the commercial selection system could not be continued. Forest cover had dropped from 44 percent of the total land area in 1956 to only about 30.8 percent by 1992 (Table 4). Most of the deforestation had occurred in the Dry Zone, mainly as a result of planned and unplanned agricultural expansion.

Consolidation and Quest for a Better System (From mid-1980s)

The Forest Resources Development Project was launched in 1983. The first Forestry Master Plan (1986) resulted from this project. The plan invited considerable criticism for its recommendations on the harvesting of natural forest and the inadequate attention paid to conservation issues. Environmental awareness was at its peak and environment-related priorities became the driving force of forestry development. Logging operations in the natural forest were suspended. An Environment Management Division was created in the Forest Department with national conservation review as its main agenda. A strategic management plan for the Dry Zone commenced in 1995.

More than 50 percent of the forests in Sri Lanka is dry monsoon forests that is largely concentrated in the Northern, Eastern, North-Central and Uva Provinces of the country. Common tree species in these forests are teak (*Tectona grandis*), ebony (*Diospyros quaesita*), satinwood (*Chloroxylon swietenia*), milla (*Vitex pinnata*) and velan (*Pterospermum canescens*).

Table 4: Area Under Dry Natural Forest Cover in Sri Lanka in 1992

Forest	Area ('000 ha)	% of Forest	% of Land
Total	2,046.5	100.0	30.8
Dry Monsoon Forest	1,094.3	53.5	16.5
Dry Zone Riverine Forest	22.4	1.1	0.3

Source: FSMP, 1995

The nation-wide rapid forest assessment and inventory in 1992-94 revealed that the dry monsoon forests have an average of about 123 stems/ha of at least 10 cm dbh. However, according to the 1982-85 inventory, there was a higher stocking, of about 700 stems/ha of at least 5 cm dbh. There has also been a drop in the standing volume since 1980's inventory.

Previous logging (both legal and illegal) extracted volumes of timber that proved to be far in excess of the sustainable yield. The result is a degraded forest structure, which has persisted because regeneration has failed. It is not possible to meet a significant proportion of local timber demand from sustainable commercial logging in natural forests allocated for this purpose. Active silvicultural intervention is necessary for the rehabilitation and regeneration of the forest. Ecological understanding of the regeneration potential of the residual stands needs to be improved to develop appropriate silvicultural interventions. Regeneration of degraded forests will be very costly. Hence, a more feasible alternative would be to release seriously degraded forests for other land uses or convert them into forest plantations. Priority should be biodiversity conservation and watershed protection. It is essential that forests important for adjacent communities be managed for multiple use.

An environmental component was added to the investment plans prepared under the Forestry Sector Master Plan of Sri Lanka in 1995 (FSMP, 1995). A new comprehensive plan was required because of the following reasons:

- Acute wood scarcity;
- Need to consider the complexity of problems underlying forest degradation and their inter-sectoral linkages; and
- Need to give due emphasis to conservation and meeting people's wood-related requirements from sustainable sources.

At this time, the term "Forestry Master Plan" was changed to "Forestry Sector Master Plan" because it was realized that forestry is not only about timber. It also covers biophysical, environmental and socio-economic components. The Forestry Sector Master Plan (1995-2020) was prepared on the basis of a participatory planning process that itself lasted for about two years. There was continuous dialogue with various stakeholders during this time. The new National Forestry Policy of 1995 was based on the principles of conservation as set out in the World Conservation Strategy of 1980, prepared by the IUCN. The eight main categories in this policy were:

- Role of forest in the environment;
- Forest land tenure;
- Forestry and land use;
- Sustainable development;
- Conservation of forest ecosystems;
- Recognition of research and education as priority needs in forestry;
- Inter-institutional links; and
- People and forest.

The 1995 Master Plan addresses the following important issues that past policy statements failed to address:

- Conservation of biodiversity;
- Forest-based industrial development and marketing;
- Private tree growing and NGO involvement;
- Research and development;
- Trees on non farm areas (NFAs);
- Development of institutions;
- Inter-sectoral concerns;
- Nature-based tourism; and
- Property rights, land and tree tenure.

It has been realized that people's broad forestry-related values should be taken into account in the planning process. These include their economic, environmental, cultural and spiritual needs as well as the national need for self-sufficiency with respect to forest products.

An ADB/UNDP/FAO-assisted community forestry project, implemented in the 1980s, was not as successful as hoped. This was followed by the ADB-assisted Participatory Forestry Project, which relied on incentive-based involvement of local people in forestry. The freedom of choice of approach or methodology, objectives and strategy was not complete. Hence, there is a need to test other types of participatory approaches to multiple-use management of natural forests. The long-term goal of these initiatives would be emergence of private or people's forestry complemented by State forestry.

The forestry Sector Master Plan aims at the following:

- Productive multiple-use forest managed jointly with the rural people and yielding a sustained flow of forest products and services that they and the rest of the society need;
- Increased forest–based income;
- Involvement of State agencies, Local Government Units (LGUs) and NGOs along with local people, to ensure that no further degradation or deforestation occurs; and
- Development of appropriate legal and institutional framework.

Stress needs to be placed on sustainability, integrated and appropriate land use, wetland conservation, maintenance of ecological processes and preservation of genetic diversity with due emphasis on research and social forestry to establish a firm relationship with the people. There is also a need to develop inter-sectoral linkages at several levels like research, development, extension and training.

THE CONCEPT OF SUSTAINABLE DEVELOPMENT AND SUSTAINABLE FOREST MANAGEMENT

The Concept of Sustainable Development

In the early 1970s, "sustainable development" became a common theme as concerns grew over the burgeoning world population and increasingly polluted environment. One of the turning points was the United Nation's Conference on the Human Environment in Stockholm in 1972. It drew attention towards the need to protect and conserve the global environment and also emphasized a shift in attitudes from pure utilization towards an ecological orientation.

The Brundtland Report (1987) of the World Commission on Environment and Development characterized sustainable development as "*development that meets the needs of the present without compromising the ability of the future generation to meet their own needs.*" The term "sustainable development" was further popularized by the Rio Summit on Environment and Development in 1992, which approved the action programme, Agenda 21, under which world governments agreed to promote sustainable development nationally and in international co-operation.

At an operational level, four inter-linked dimensions of sustainable development can be recognized – economic, environmental, social and cultural. For development to be sustainable in the long-term, there needs to be a balance between these four dimensions. In its original meaning, the concept of sustainable development emphasizes intergenerational solidarity, which is the diachronic meaning of sustainability. Yet, it is being argued that sustainable development can only be achieved at the worldwide level if the foundations for an intra-generational synchronic solidarity are established between the rich and the poor, among countries and within any given country (DeCastri, 1995). Also, it should be realized that sustainable development is an extremely scale-dependent process, which should, therefore, be understood and applied within both changing and open societies. All these four components of development should be equitably taken into consideration. For this, all the different economic sectors, i.e. agriculture, forestry, industry, etc. should be intimately intermingled for rational land use at the regional, national and global levels. Discussions on sustainable development have a working rationale only when the four dimensions of development are discussed altogether and in all their interactions. Real steps towards a more sustainable use of natural resources call for a new stage of human development, a new "Renaissance" with a much closer interaction between science and arts, between nature and culture.

The Evolving Concept of Sustainable Forest Management

Sustainability is a moving target and sustainable forest management does not attempt to freeze the concept as it is. There is no prospect of an early end to the pressures causing the clearing of forests. The challenge is not, therefore, to prevent these activities, but to manage them. The aim must be to ensure that wood and other forest products are harvested sustainably, that forests are harvested only in a planned and controlled manner and that the subsequent land uses are productive and sustainable.

The concept of sustainability has deep historical roots in forestry. Early forestry concerned itself with the preservation of forests and wildlife reserves for hunting by kings and nobles. Later came the concept of managing forests for the sustainable yield of timber. Management of the forest to provide a sustained timber yield is still what many foresters have in mind when they talk of sustainable forest management. This definition focuses on the production of wood and does not address the wider issues of ecological and social functions of the forests, with which timber production may only incidentally be compatible or may even be in conflict.

Management of forests solely for wood production, over the last four to five decades, has led to a steadily growing concern about the loss of other benefits. The concept of sustainable forest management has, therefore, evolved to encompass these wider issues and values. It is now seen as the multipurpose management of the forest so that its overall capacity to provide products and services is not diminished. A forest managed in this way will provide timber on a sustainable basis and will also continue to provide fuelwood, food, fodder and other products and services to those living in and around it. Its role in the preservation of genetic resources and biological diversity and in the protection of the environment will also be maintained.

Sustainable forest management is not to be confined to areas where a sustained yield of forest products and services is, at least in principle, achievable. It also calls attention to huge areas of degraded and disappearing forests. It is precisely in these areas that the need for managing the remaining forest is the greatest.

The approach to achieve sustainable forest management must be a holistic one, encompassing land-use planning and wider questions of rural development. Within this framework, it becomes a broad-based and multi-faceted activity. Management for sustainability will, therefore, first be concerned with securing an improved livelihood for the present generation, while maintaining the potential of the forest heritage for future generations. Second, forest potential must be seen within the wider context of rural development, in which the allocation of land to different uses is part of a dynamic process, where a balance is maintained between forests and other forms of land use in which trees have a role. Third, the responsibilities for forest management must be clearly identified and competing interests must be reconciled through dialogue and partnership. Finally, forestry activities have to compete for scarce financial resources and both the production and the environmental functions must be shown to be worthwhile to both users and financiers.

In 1795, a German forester, Georg Hartig, came up with the concept of sustainable yield by which he meant that in order for wood supply to be continuous over generations, harvests should not exceed growth. This idea formed the backbone of modern forestry in Europe and in North America (ISCI, 1996).

Traditional sustained yield management focused primarily on the production of commodities, but has proven inadequate to meet the requirements of the present day society for various products and services and other non-material benefits. In the 1970s, the concept of sustainable yield was broadened from basic wood production to the multiple uses of forests such as the production of forest products (timber and non-timber forest products), provision of recreational opportunities, protection of the environment, etc. Consequently, the traditional concept of sustainable yield has been revised and concepts such as sustainable forestry and sustainable forest management have been developed. But, the economic aspect has not been neglected. Rather, the objective of ensuring a continuous supply of forest products (wood and non-wood) remains a central theme in many forest policies.

ITTO

Sustainable forest management is the process of managing permanent forest land to achieve one or more clearly specified objectives of forest management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment.

For the national-level, a forest policy aiming at sustainability is a policy that guarantees the sustainability of all ecological forest types of a country in a balanced way and divided over a reasonably sized permanent forest estate. For the FMU-level, management of a certain forest is considered to be sustainable when it guarantees the continuity of all recognized principal functions of a particular forest without undue effects on the other functions.

(International Tropical Timber Council, 1992)

The general concept of sustainable forest management was considered as an important element of sustainable development in the UNCED in 1992. According to the "Forest Principles", forest resources and lands should be managed sustainably to meet the social, economic, ecological, cultural and spiritual functions, and the maintenance and enhancement of biological diversity. Health and vitality of the forests are widely recognized elements of forest policies and management. They are emphasized in many efforts

through which countries and organizations seek both political understanding and practical means and ways to sustainably manage all types of forests. These efforts include, among other things, the development and implementation of guidelines, criteria and indicators of sustainable forest management.

Though, there is a common understanding of what constitutes the fundamental elements of sustainable forest management, descriptions of the concept vary due to differences in perspectives of various stakeholders (government, forest dwellers, NGOs, industry, etc.), different economic, social, ecological and cultural environments and conditions and the progress in global and regional forestry dialogue.

The Council of the International Tropical Timber Organization (ITTC) was the first to adopt a definition and criteria and indicators of sustainable forest management as a basis for testing and demonstrating sustainable tropical forest management in its XIIth Session in May 1992. The International Tropical Timber Organization (ITTO) definition, which predated the UNCED, emphasizes the productive functions of the forests.

At the second Ministerial Conference for the Protection of Forests in Europe, in June 1993, the term sustainable forest management was defined in an international political context. This definition emphasizes the potential of the forests to fulfil, now and in future, relevant ecological, economic and social functions of the forests. The most salient difference as compared to the ITTO definition is the maintenance of biological diversity of forests.

Pan-European Forest Process

Sustainable forest management means the stewardship and use of forests and forest lands in a way, and at a rate, that maintains the biological diversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in future, relevant economic, ecological and social functions, at local, national and global levels, and that does not cause damage to other ecosystems.

(Ministerial Conference on the Protection of European Forest, 1993, Resolution H1)

The other initiatives (Montreal, Tarapoto and Dry Zone Africa) did not go on to explicitly define sustainable forest management. However, criteria and indicators are intended to implicitly provide a common understanding of what is meant by sustainable forest management, in all these initiatives.

While providing a general policy direction and a long-term goal, sustainable forest management through its criteria and indicators also provides a common framework for describing, assessing and evaluating a country's progress towards sustainability at the national level. This improves the understanding of what sustainable forest management actually means to facilitate international deliberations on this aspect and also provides a means to translate policy-level changes into field-level actions.

INTERNATIONAL AND REGIONAL INITIATIVES FOR FORMULATION OF CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT

So far, criteria and indicators for sustainable forest management at the national level have been developed within five ongoing regional and international initiatives: the ITTO, the Pan-European Forest, Montreal, Dry Zone Africa Processes and the Tarapoto Proposal (CSCE, 1994; FAO/ITTO, 1995; FAO/AFWC, 1995; ISCI, 1996).

Within the last few years, considerable efforts have been made towards the development and implementation of sustainable forest management in forest management. The concept of

sustaining the yield of timber has been known for decades. But the emphasis has only recently been shifted from sustainable yield to sustainable forest management, which comprises in a holistic way, the environmental and socio-economic functions of forests instead of merely their timber production functions. However, the steps towards sustainable forest management taken so far, whether in the form of developing criteria and indicators for sustainable forest management, or developing and implementing better management practices, vary considerably from one region to another.

Pre-UNCED Initiatives

ITTO in 1990 developed the Guidelines for the Sustainable Management of Natural Tropical Forests, prior to the UNCED in Rio de Janeiro, 1992. It further went on to demonstrate its commitment to achieve sustainable management of tropical forests by developing criteria and examples of indicators in 1992. The Indian Forest Policy (1988) and subsequent government resolution on June 1, 1990 on the Joint Forest Management (MoEF, 1990) have emphasized the ecological, socio-cultural, and economic dimensions of sustainable forest management.

ITTO Criteria for Sustainable Forest Management

The process of developing the ITTO criteria involved representatives from producer and consumer countries, timber trade, and intergovernmental and NGOs. Sets of 5 national-level criteria and 27 indicators, as well as 6 forest management unit level criteria with 23 indicators were developed in 1991. Biological diversity was not defined by ITTO in terms of criteria and indicators.

UNCED

The UNCED in Rio de Janeiro (1992) approved an action programme, Agenda 21, under which world governments agreed to promote sustainable development nationally and in international co-operation. The major outcomes with implications on forests were:

- Chapter 11 of Agenda 21, on Combating Deforestation;
- Non-legally binding Forest Principles;
- Convention on Biological Diversity;
- Framework Convention on Climatic Change; and
- Post-Rio Convention to Combat Desertification.

The first three recognized the need and utility of internationally agreed upon criteria and indicators that demonstrate and characterize the management, conservation and sustainable development of all types of forests. The other two agreements also contain forest-related elements.

In Chapter 11 of Agenda 21 (section 11.23b), governments agreed to undertake, in co-operation with special interest groups, the formulation of scientifically sound criteria and guidelines for the management, conservation and sustainable development of all types of forests.

Post-UNCED Initiatives

The above agreements constituted major catalysts for the development of criteria and indicators for sustainable forest management. Since UNCED, several international meetings elaborating this issue have taken place. Four post-UNCED initiatives on developing criteria and indicators for sustainable forest management at the international level are continuing at present: the Pan-European Forest Process, the Montreal Process, the Tarapoto Proposal and the UNEP/FAO Dry Zone African Initiative.

a) A year after the UNCED, in June 1993, the Second Ministerial Conference on Protection of Forests in Europe was held in Helsinki, Finland. This Conference was attended by over 200 policy makers and scientists from 37 countries and the European community, as well as a number of international, intergovernmental organizations and NGOs. As a result of the follow-up work of this Conference, known as the Pan-European Forest Process, a set of 6 criteria and 27 indicators were agreed upon. Each participating country was urged to develop national indicators to supplement the Pan-European ones (ISCI, 1996).

   In January 1995, some 100 examples of supplementary descriptive indicators were introduced covering the policy instruments used for each criterion in order to enhance the sustainable management of forests. Each country may design the descriptive indicators for its own conditions when creating their national criteria and indicators.

b) In 1993, under the auspices of the Conference on Security and Co-operation in Europe (CSCE), more than 150 scientists and forestry experts from 40 CSCE States and 13 international NGOs held a Conference in Montreal, Canada, which came to be known as the Montreal Process (CSCE, 1994). This is the non-European Working Group on criteria and indicators for the conservation and sustainable management of temperate and boreal forests.

   In order to ensure an effective follow-up, Canada hosted a small meeting at its embassy in Washington DC in December 1993. At that time, both Canada and the US were interested in bringing the European (Helsinki) and the post-Montreal criteria and indicators processes together. They were surprised when the representatives from the governments of France, Germany and the UK expressed their preference to remain primarily with the Pan-European Forest Process. From that point forward, the Montreal and the Pan-European Forest Processes developed in parallel, but with observers invited from governments in each group to attend each other's meetings.

   The Montreal Process currently involves Argentina, Australia, Canada, Chile, China, Japan, and Republic of Korea, Mexico, New Zealand, Russian Federation, USA and Uruguay. A consensus, called the Santiago Declaration, has been reached on 7 national-level criteria and 67 indicators for non-European temperate and boreal forests.

c) The Tarapoto Proposal was elaborated at the Regional Workshop on the Definition of Criteria and Indicators for the Sustainability of Amazonian Forests. ITTO and the Tarapoto initiatives have both developed criteria and indicators applicable at the forest management unit level, besides those at the national level.

d) The UNEP/FAO Dry-Zone Africa Process started from an Expert Meeting on Criteria and Indicators for Sustainable Forest Management in Dry Zone Africa organized jointly by FAO and UNEP in November 1995. This was the first step in developing national-level criteria and indicators for countries in the Sub-Saharan Dry Zone Africa (FAO/AFWC, 1995).

e) The Inter-governmental Panel on Forests (IPF) was established in 1995 under the aegis of the Commission on Sustainable Development (CSD) following the latter's Third Session, as an "open ended, ad hoc inter-governmental Panel to pursue consensus in formulation of coordinated proposals for action in an open, transparent and participatory manner." One of its priorities deals with the criteria and indicators for sustainable forest management.

In the second session of the IPF, which was held in Geneva from 11 to 22 March 1996, the issue of criteria and indicators was initially discussed. Countries and groups presented a range of views on the comparability and compatibility of criteria and indicators, the relationship between criteria and indicators, and partly related to this, the level at which criteria and indicators should be developed and implemented. Apart from these, specific points were also raised relating to the nature and scope of criteria and indicators and the process of their development and testing at the national and regional levels, the implications of proliferation of criteria and indicators development initiatives and their impact on certification of forest products and ongoing global trade.

f) **Indian Initiatives: Bhopal-India Process**

India has always been committed to the conservation of forests and biodiversity, with sustainability as the central theme of its Forest Policy (1988). However, in the absence of an implementable framework for sustainable forest management in India, there was no mechanism to provide feedback on the direction of changes taking place after the implementation of the forest policy (Prasad, 1999a). The Indian Institute of Forest Management (IIFM), a premier autonomous institution under the Ministry of Environment and Forests, Government of India, took a timely initiative in 1998 to generate a pool of knowledge for infusing the idea of sustainable forest management in the country. This Indian national initiative has been named as the Bhopal-India Process. Bhopal was chosen as the locus of sustainable forest management activity in India not only for its central geographic location, but also for being on an imaginary *genetic superhighway* connecting the two biodiversity hotspots – the Western Ghats and the eastern Himalayas. This initiative found support of a specially constituted Technical Group on sustainable forest management and the Government of Madhya Pradesh. A three-day workshop was organized from 21 to 23 January 1999, by IIFM in collaboration with the Madhya Pradesh State Forest Department and Government of India. The workshop aimed at generating a base set of national-level criteria and indicators to reliably assess sustainable forest management in India. It was decided to adopt a three-tier hierarchical structure for India, involving principles, criteria and indicators, for defining sustainable forest management (Prasad *et al.*, 1999b).

The deliberation at this technical meeting of the Bhopal-India Process led to the identification of 8 national-level criteria and 51 related draft indicators. This set of criteria and indicators is relevant not only for the four major forest types of India, but also for the dry forests of Sri Lanka, Pakistan and Bangladesh.

The Bhopal-India Process Criteria and Indicators

Criterion 1: Extent of Forest and Tree Cover

1.1 Area and type of natural and man-made forests
1.2 Forest area under fragile ecosystems
1.3 Area of dense and degraded forest
1.4 Forest in non-forest area
1.5 Area rich in NWFP species
1.6 Forest area diverted for non-forestry use
1.7 Community managed forest areas

Criterion 2: Ecosystem Function and Vitality

2.1 Status of natural regeneration
2.2 Status of natural succession
2.3 Status of secondary forests
2.4 Weed, pest, disease, grazing, fire, etc.
2.5 Maintenance of food chain

Criterion 3: Biodiversity Conservation

3.1 Area of protected and fragmented ecosystems
3.2 Number of rare, endangered, threatened and endemic species including tiger population
3.3 Level of species richness and diversity
3.4 Canopy cover
3.5 Medicinal and aromatic plants and other NWFPs
3.6 Level of non-destructive harvest

Criterion 4: Soil and Water Conservation

4.1 Soil moisture
4.2 Soil compaction
4.3 Status of erosion
4.4 Run-off (water yield)
4.5 Soil pH
4.6 Soil organic carbon
4.7 Nutrient status of the soil
4.8 Soil flora, fauna and microbes
4.9 Level of water table
4.10 Sediment load

Criterion 5: Forest Resource Productivity

5.1 Growing stock of wood and non-wood forest products
5.2 Natural regeneration status
5.3 Increment of wood and non-wood products
5.4 Area of afforestation and new plantations
5.5 Level of material and technological inputs
5.6 Extent of protection measures
5.7 Level of tangible benefits

Criterion 6: Forest Resource Utilization

6.1 Aggregate and per capita wood and non-wood consumption
6.2 Import and export of wood and non-wood forest products
6.3 Recorded and unrecorded removals of wood and non-wood forest products
6.4 Direct employment in forestry and forest industries
6.5 Contribution of forest to the income of forest dependent people

Criterion 7: Social, Cultural and Spiritual Needs

7.1 Well-being in terms of livelihood, recreation, cultural and aesthetic needs
7.2 Degree of economic, social, gender and participatory equity
7.3 Conflict management mechanisms
7.4 Traditional (Indigenous) Knowledge application

Criterion 8: Policy, Legal and Institutional Framework

8.1 Existing policy and legal framework
8.2 Extent of community, NGO and private sector participation
8.3 Investment in research and development
8.4 Human resource capacity building efforts
8.5 Forest resource accounting
8.6 Monitoring and evaluation mechanisms
8.7 Status of information dissemination and utilization

Various international and national NGOs are also actively involved in working for the development of approaches to sustainable forest management and its measurement by formulating their own principles, and/or criteria and indicators. While participating in the meetings of the international, regional and national initiatives in this direction, these NGOs bring their special interests and points of views to the discussion of forest-related matters.

The key features of all the above initiatives are consensus and dialogue. Formulation of criteria and indicators has necessitated international consensus building. Nevertheless, these criteria and indicators need to be adjusted and implemented for specific national conditions. National and international dialogues have been fuelled at each step of criteria and indicators elaboration, leading to significant advancements towards sustainable management of global forests and ultimately to the cause of sustainable development.

Currently over 100 countries are involved in developing national-level criteria and indicators. In 1989, the ITTO established a process to develop criteria and indicators for sustainable forest management (ITTO, 1992, 1997). After UNCED in 1992, interest in criteria and indicators developed faster all over the world. Some international initiatives share a common objective to develop indicators and to describe, monitor, evaluate and report progress towards sustainable forest management at the national level. In many initiatives, countries are urged to develop additional national indicators and, furthermore, to develop indicators at the sub-national and forest management unit levels.

EVOLVING NATIONAL-LEVEL CRITERIA AND INDICATORS FOR SUSTAINABLE MANAGEMENT OF DRY FORESTS IN SOUTH ASIA

Sustainable forest management has very high positive externalities. If all costs and benefits, direct and indirect, private and social, are taken into consideration, sustainable forest management is the most efficient, effective and least-cost option for management of forest resources. The components of sustainable forest management depend on ecological, social and economic conditions. Sustainable forest management covers all aspects of forestry in an appropriately balanced manner. In addition, it incorporates natural forests, large plantations, animals, microflora and fauna, water and soil, as well as traditional knowledge and heritage. Sustainable forest management is specific and practical for translating the concept of sustainability into reality in forestry.

Sustainable forest management in the dry zones of South Asia would involve:

- Producing wood and non-wood forest products, first for meeting subsistence needs with the surplus for commercial purposes;
- Protecting or setting aside areas to be managed as plantation or wildlife reserves for recreational and environmental purposes;
- Regulating the conversion of forest lands for non-forestry uses; and
- Regenerating wastelands and degraded forests.

The current level of forest utilization in the region is unsustainable. In order to control and reverse this trend, it is necessary to work at different fronts (Chandrasekharan, 1999). Various approaches to achieve sustainable forest management would, thus, include:

- Inventory of resources and bio-prospecting (flora and fauna) to assess the quality and extent of the resource base;
- Functional and land capability classification of forests and land-use planning to ensure healthy and sustainable land use (production, protection, conservation), systems within acceptable safe minimum standards;
- Protection of adequate extent of natural forest for their long-term contributions, including conservation of biodiversity, wetland values and other externalities, and controlling deforestation;
- Management and utilization of forest resources (wood and non-wood products, and environmental and recreational services) for maximizing their sustainable contribution and value addition towards improved welfare of society. Creation of new, or expansion and enhancement of existing, forest resources, and their intensive and scientific management to meet industrial and commercial needs, particularly through raising plantations (providing wood and non-wood products), and including waste-free and sustainable harvesting and efficient use;
- Promotion of efforts for producing forest goods and services outside forest areas (e.g., agroforestry plantations, home gardens) and development of potential substitutes for wood from non-forest sources (e.g., rubber wood, coconut wood);
- Waste reduction and waste recycling programmes;
- Feasible mediums for encouraging participation of people and the private sector;
- A proper and realistic system for costs, values and benefits attributable to forestry, to ensure a strong ecology-economy interface; and
- Appropriate institutional arrangements and support for ensuring efficiency.

Forest management is no longer seen as a timber-oriented activity, yet total protection of natural forests in practical terms, for conservation purposes alone, is impossible in the region.

The natural forests in most developing countries are inadequately managed. The Forest Resources Assessment 1990 (FAO, 1995) further indicates that the growing stock per ha has increased steadily in almost all developed countries. In developing countries, however, apart from a net loss of forest area and associated stock, there has been a reduction in the quality of growing stock and biomass per unit area of the remaining forest. Instead of measures to address the causes of forest depletion, a restriction has been imposed on extraction of timber from natural forests. Without means and proper instruments to implement this decision, the result in several cases has only been a stoppage of investment and scientific management practices. This will lead to the deterioration of forests, especially when unrecorded removals are continuing.

The major issues in the dry forests of the region are elaborated below. The following section will also help suggest a set of criteria and indicators for sustainable management of the dry forests of India, Pakistan, Sri Lanka and Bangladesh.

Extent of Forest and Tree Cover

Forest resource expansion is possible through plantations. Forest plantations have been initiated to create and expand the forest resource base, especially to fulfil the needs of the people and as a reliable source of industrial raw material. Forest plantations established under a system of clear felling followed by artificial regeneration, or by afforestation of bare lands, wastelands, grasslands and other degraded lands, are common in the region.

Plantations can also be seen as a means to conserve natural forests, because of several advantages:

- Plantations supplement production from natural forests, thus, reducing the pressure on the latter;
- They allow choice of species of desired characteristics for an area;
- Homogeneity of production is ensured through plantations;
- Harvesting is less expensive in case of carefully planned plantations; and
- Vegetation growth and yield can be manipulated using appropriate inputs.

However, plantation forestry involves much larger investments than natural forest management and needs continuous protection and upkeep. Yet, plantations can provide a solution to the resource scarcity faced by the dry forests of South Asia. The same land may be claimed for many other purposes, as land scarcity is also a major issue here. To make sufficient land available for plantations in this region, the following potential areas are suggested:

- village common lands;
- degraded private lands;
- margins of roads, railways, canals and tanks; and
- vacant lands belonging to schools, offices and hospitals.

By appropriate selection of species and system (mixture of species, rotation, input levels, method of planting and maintenance), it will be possible to raise need-oriented plantations or mixed tree crops in the dry areas through social forestry programmes.

Tree cover can also be improved by rehabilitating and enriching tree growth in marginal and degraded forestlands, promoting tree plantations in farming systems, expanding and intensifying agroforestry and homestead forestry, and planting trees in the periphery of urban centers. Expansion of State forests is constrained by lack of resources, land and financial

allocation. However, private participation (community, individuals and corporate) in sustainable forest development could be a reliable strategy. These efforts could be invigorated by offering different incentives (e.g., legal and policy, institutional, financial marketing etc.).

Desertification is becoming a serious threat in the region, and controlling its spread has become a Herculean task. Restrictions should be imposed on harvesting trees from protected forests, from areas falling above a specific degree of slope and other fragile areas like river banks, margins of reservoirs, wetland, fragile watersheds, etc. The objective of natural resource conservation and protection of biodiversity can be served at least partially by cultivation of NWFP species and through development of NWFPs in agroforestry to diversify the resource and economic base.

Forest Health and Vitality

The various factors causing damage to the dry forests, and against which protection is required, include pests and diseases and natural causes such as drought and flood. Forest fire, overgrazing and other extractive activities like pilferage, deforestation, encroachment, and shifting cultivation are all anthropogenic factors that negatively affect the region's forests. Insects, pests and diseases assume epidemic proportions when the health and vitality of ecosystems are in poor condition. The epidemic proportions of sal heartwood borer, teak skeletonizer and defoliator are some of the common examples of manifestations of reduced vigor of trees in the degraded forest areas of central India (Prasad, 1998). Stability of the resource base is very important for sustainable production, especially in the dry region. Improved forest health and vitality can be achieved through rehabilitation and enhancement of degraded lands, and through measures to remove or control factors that cause degradation.

Forest Resource Productivity

Sustainability and productivity are intricately linked. Productivity has aspects of both quantity and quality (physical scale). There is an urgent need to improve and sustain productivity of the dry forests of the region. These forests have high biological potential, but their present growth and productivity are far below the demand for various reasons. Productivity of forests has to be increased in terms of volume of wood and non-wood products and services. This increase, however, should be consistent with the environment, as sound basis for long-term development.

A sustainable increase in forest productivity can be achieved by upgrading technology, appropriate silvicultural manipulation of species, rotation and tending schedules and stand improvement operations along with infrastructure development. Each forest management unit needs to be managed to achieve its highest level of efficiency and sustainability in accordance with the main function assigned to it.

Dedicated efforts are required to replant the existing, poor quality plantations and to increase quality and productivity. Insufficient land availability may, however, necessitate intensive and integrated land use and development to optimize benefits. Considering the increasing population and the consequent heavy pressure on land in the Asian region, there seems no other alternative feasible except intensive forestry, as we can no longer afford to keep productive lands under low levels of production. The management prescriptions also need to be reviewed continuously and improved on the basis of research and new information to increase the level of sustainable yield from the existing and newly created resource base.

Proper management planning necessary for sustained productivity should address all relevant issues like halting forest degradation and waste-free utilization of forest resources. Natural

forests need to be managed so that they continue to provide direct and indirect benefits sustainably. Today, sustainable yield management means ensuring that a continuous flow of timber and non-wood products is available, while supporting biodiversity conservation and other ecological services. Introduction of the quality aspect to productivity yields a different scale of productivity compared to that based on physical measures only (Prasad, 1999a).

Forest Resource Conservation

Forest resources are heterogeneous, encompassing soil and water, ecosystems, trees, shrubs, herbs, microflora and wildlife, biodiversity, knowledge about flora and fauna and intellectual property. Hence, conservation extends beyond sustaining productivity, since it highlights the need for air, soil and water conservation, maintaining essential ecological process and life support systems, control of global warming, affording protection of flora and fauna, conserving biodiversity, management of parks and wildlife and much more. The concept of safe minimum standards for resource conservation provides a socially determined demarcation between imperatives to preserve and enhance natural resource systems, and the free play of resource tradeoffs.

Soil and Water Conservation

Soil and water resources in several parts of the region, particularly in mountain watersheds, river valleys, arid areas and ravines, have undergone considerable degradation. Deforestation has not only resulted in a decline in forest resource stocks, but has also affected the environment negatively in various ways. This includes soil degradation, declining agricultural productivity, damage to relatively fragile ecosystems, impoverishment of fish and wildlife populations, negative impacts on the quantity and quality of water resources, and deterioration of the micro-climate and other environmental services of forests. Forest depletion and consequent soil erosion in the mountainous regions has resulted in the siltation of water reservoirs and in the reduction of their storage capacity and hydroelectric generation potential.

Millions of hectares of land in the region are situated in ecologically fragile areas of mountain ranges, valleys and ghats. Soil and water conservation assumes great importance in these areas. Apart from the economic and industrial plantations, there is a need to promote a massive programme of tree planting on a voluntary basis for environmental amelioration and use of watershed management technology for land rehabilitation and soil conservation.

Rehabilitation of degraded lands for soil and water conservation would necessitate the following actions:

- Control of deforestation;
- Protective afforestation and soil conservation;
- Improvement of marginal lands through tree planting;
- Rejuvenation of soil through supplements and nitrogen-fixing trees;
- Rehabilitation of saline environment through the introduction of halophytic shrubs;
- Protection of fields from wind through properly-designed wind breaks, shelter belts and row planting; and
- Promotion of farm forestry and agroforestry.

Biodiversity Conservation

It is very difficult to probe beneath the static descriptions of any ecosystem and assess its long-term "health". Biodiversity conservation is important to ensure that the underlying components of living resources i.e. habitat, species and genetic diversity are maintained.

Loss of genetic resources accentuated by forest degradation poses a grave threat to food security in the region. Destroying a "keystone species" triggers a deadly "domino effect" where other species and genes, along with entire ecosystems, crumble into extinction. These losses close off various little-understood options for future generations. Once genetic resources and their variability are lost, the promises of biotechnology will be aborted. Protection of these resources is an investment for continued life on earth (Umali, 1991).

At the national level, it will be difficult to separate the issues of environmental degradation and poverty alleviation. Poor people – faced with marginal environmental conditions – will have no choice but to seek immediate economic benefits at the expense of the long-run sustainability of their livelihoods. Creation and management of protected areas of all representative ecotypes in the region are of special significance. Protected areas and nearby natural and planted forests should be connected.

In the context of NWFPs, development, conservation of natural forests and their species richness is very important. Many of the plants providing NWFPs are found only in the primary forests of the dry regions. Some of them can only thrive within natural habitats and do not lend themselves to domestication. Their growth and cultivation in plantations depend heavily on regular infusion of germplasm from the wild gene reservoirs. Only the continued existence of species variability in the wild will allow plant breeders to have a chance to create new, disease-resistant and high-yielding varieties for the future. Thus, the genetic wealth and variability are also crucial for the development of NWFPs (FAO, 1996).

Forest Resource Utilization

Forest harvesting systems in the region should be improved and wastage reduced. Income generation through non-destructive uses of forests should be promoted. Rational development of NWFPs through integrated forest management and agroforestry systems carried out in a flexible and socio-economically acceptable manner, can considerably contribute to the welfare of the indigenous communities. Forestry-based small-scale enterprises have considerable potential for improving the welfare of such communities.

It is essential to view forest harvesting as a part of a renewal operation and a necessary part of managing resources, and not as deforestation. Some degree of production orientation to harvesting can also promote an integrated and waste-free utilization of the resource. Careful planning is, however, needed at the operational level. Prescriptions for post-harvest operations are important to ensure the sustainability of the resource.

Forest-based processing industries need to have strong backward and forward linkages and should be capable of addressing the problems of underdevelopment. There may be a need to restructure existing enterprises and to develop new ones to use forest resources as an important means for development. Innovation, residue control, plantation research, and transfer of technology are important for improving efficiency of forest-based industries. There may be a need to phase out obsolete mills and non-performing establishments, and to establish new processing units as growth centers. Research and development and meaningful involvement of local communities, supported by appropriate incentive packages are important.

Harvesting of NWFPs (from both wild and cultivated sources) is different from timber harvesting in terms of the tools and equipment used, technology, pre-harvest preparation and post-harvest treatments and requirements of immediate processing. Harvesting is a particularly weak link in the utilization of NWFPs, due to the variety of tools, techniques and situations involved. Sustainable management and utilization of NWFPs as a renewable resource, essential for meeting human needs, demand scientific knowledge, technology, skills and research support. Efficiency in production implies improving productivity, reducing wastes and indirect costs and registering an increase in the economic rate of return through processing and value addition. A code of practice for sustainable forest harvest needs to be developed and waste-free, low-impact logging and harvest should be promoted. Research, demonstration and promotion are needed to enhance understanding and to support and encourage efficiency in forest harvesting and processing.

Generation of Income and Employment in Forestry

As the pressure on forests in the dry zones of South Asia will further increase, it may become necessary to commercialize all forest products and services and to develop intensive management at the forest/farm interfaces for increasing production of both agricultural and forests goods. Even in cases where forest areas can be set aside and managed and by local communities, each forest area must at least break even on costs.

Socio-economic contributions of forests should aim at making the lives of communities living in and near forest areas increasingly comfortable. A socio-economic environment needs to be created that provides attractive conditions for the communities including diversity and flexibility in their economic activities. Forestry has tremendous potential to alleviate poverty through the creation of both on-farm and off-farm employment and income (Prasad, 1999a).

Income can be earned as wages in forest plantations. Forest-based growth centers can be created and developed to solve the problems of backward and underdeveloped regions. People can be involved and employed in a chain of activities of seed collection, nursery operations, seeding, sales, plantation and maintenance of trees and plantations, tending operations, infrastructure development, logging and transportation, etc. Harvesting of NWFPs, primary and downstream processing of varying scales and sophistication, and so on, also offer immense employment potential for local people. Simple value adding activities for NWFPs carried out at the primary collector's level enhances the income of gatherers and ensures sustainable harvesting practices (Prasad *et al*., 1999a).

Forestry activities can be specially planned and organized to benefit rural women and the landless. On-farm income, for example, can be generated through tree growing and agroforestry enterprises; and off–farm through forest-based, small-scale and cottage-level enterprises, developed particularly for NWFPs, bamboo, canes and small timber.

Development of forest-related enterprises requires increases of wood and non-wood forest resources. Increased resources also multiply employment opportunities, incentives, downstream activities and welfare. This will support further expansions of the forestry resource base.

Supplying woodfuels to urban centers also provides year-round employment to landless laborers and marginal farmers. In the absence of other gainful rural employment opportunities, fuelwood headloading offers sustained employment. In many cases, such practices are said to be the main factor leading to forest degradation. This unnecessary pressure on natural forests can be minimized by improving biomass supply through agroforestry and its variants (Prasad, 1999a).

Forest Policy, Legislation and Institutional Framework

Earlier forest polices in the region tended to consider timber production as the primary contribution of forests. During the second half of the twentieth century; however, there was considerable influx of ideas and information that guided a change in policies in South Asia. This has been partly due to development of technology and changes in socio-economic concepts and values. There has been increased acceptance of concepts such as decentralized people's participation, involvement of the private sector, development roles of NGOs, sustainable development, economic efficiency, social equity and environmental conservation.

The forests in the region are largely owned and managed by the government with people's involvement in forestry being essentially restricted to homesteads, common land plantations, agroforestry and farm forestry. Forest policy development and implementation are the responsibility of the government. A formal mechanism should exist for regular revision of the policy in the light of new circumstances or availability of new information. While the whole process of policy development and revision calls for strong and continued political will and commitment, leadership to guide and facilitate the process is equally crucial. It is important to involve in discussion, all those who are and will be affected by the policy and to obtain their views and opinions and to provide them with clarification and elaboration. Policies should be based on the philosophy of people-based development and forest management should be designed to facilitate and benefit from people's participation. The policy imperatives for the region should reflect the goals of environmental conservation, economic development and social progress. Hence, their major and interrelated imperatives are sustainability, efficiency and people's participation.

Policy priorities should be decided in a holistic and balanced manner, within the overall context of environment and development. Periodic monitoring of policy measures should be institutionalized. The legitimate range of interests should be allowed, including those of local inhabitants, and efforts should be made to bring about their effective participation in all stages of policy formulation and implementation.

Forest laws, rules and regulations should be reviewed and revised to be in tune with the new forest policies, such that they will act as an instrument to facilitate forestry sector development. Forest laws need to be consolidated and updated and made uniform all over a country. Also, the process of development of forest laws, rules and regulations should be kept simple.

The changing scenario calls for several new roles for forestry agencies. The forest departments in South Asia need to undergo fundamental changes. For this, it is necessary that organizational structures, linkages, orientation, inter-institutional relationships and missions are suitably tuned.

As emphasized in the World Bank's Forest Policy Paper, the frontier of development in forestry sector is not technology, but institutions and their human capital. Admittedly, technology and technological progress are important, but the desired links of technological changes will not take place without an adequate and supportive institutional environment, opportunities for private and public sectors to play important roles, and community participation in development.

Substantial restructuring may be necessary to allow for active participation of the private sector, cooperatives, small-scale farmers and NGOs in forest development. There is also a need to create an appropriate business environment in the sector for attracting investment.

The forestry sector should co-ordinate with other major national economic sectors to avoid conflicts and to ensure mutually beneficial development. A form of institutionalized

participation in operational units should be promoted by giving long-term leases or rights to people, to enable them to become partners. Enterprise development in the forestry sector should be organized under a system of autonomous and self-financed enterprises, which will promote the participation of the private sector, cooperatives, NGOs and individuals in the functioning of the system.

There is a need to strengthen existing forestry education and training by providing trained teaching staff, improved course content and curriculum. There is a need to establish facilities for training trainers and enhancing research capabilities. It is essential to deploy adequately trained people for all technical jobs in the field, such as nursery operations, wildlife conservation, forest plantations, and agroforestry. Also those with skills in other areas and dimensions should be employed in forestry to enhance overall inter-sectoral abilities. Education and training facilities and resources should be reviewed, rationalized and upgraded periodically to cater to the changing needs of the forestry sector.

Private Sector Participation

Homestead forestry and agroforestry have developed largely as family or private initiatives. Community organizations have a comparative advantage over the government agencies in managing such centers, producing planting materials, establishing forest plantations and undertaking consultancies (Chandrasekharan, 1999).

However, a number of government regulations act as disincentives and barriers to afforestation of wastelands. These include restrictions on species that can be felled from private lands, timber transit rules, etc. Such restrictions need to be reduced to the bare minimum. Appropriate incentives, like provision of improved planting materials and technical information and support could motivate farmers to expand farm forestry. Tree growing is still not a lucrative land-use option. The role of trees grown on private lands needs to be viewed from their contribution to ameliorating climate extremes, in carbon sequestration, regulation of run-off and preventing soil wash, and in increasing the supply of tree products to the market. Apart from legal and policy facilitation for tree growing and harvest, financial, infrastructure, and marketing incentives also need to be provided to motivate private participation in sustainable forestry development.

There is a greater need to involve women, disadvantaged groups, tribal communities, local people, private organizations and NGOs in the planning and operation of forestry development programmes.

Role of Forestry Research and Technology Development

Technological innovation and development is a strategically important dimension of forestry development and it is to be made possible by research. Forestry in the region critically needs research support to improve productivity, reduce losses and wastage, maximize utilization, to improve quality and value of plantations, for sustainable management of forest resources, improved conservation of genetic resources and wildlife, development of NWFPs and diversification of plantations. Research support is also essential for carrying out basic surveys and studies (e.g. on biodiversity, land sustainability, inventory and bio-prospecting), for providing basic technical data (e.g. growth and yield under different management intensities) and for documenting and validating indigenous knowledge. Further, resource inputs are essential for producing and supplying improved and certified seeds, for *in situ* and *ex situ* conservation of genetic resources and for the transfer of technology to end-users.

Research inputs are especially vital for the following areas: homestead forestry and agroforestry, watershed management, protective and restrictive afforestation, high-yield plantations, sustainable NWFP management, wildlife conservation and management, multipurpose forest management, genetic resource conservation and forestry interactions at interfaces with other sectors. Forest policy, forest economics and management are other important areas requiring research support.

Public Awareness, Information and Technology Dissemination/Extension

Public awareness and forestry extension are closely related aspects aimed at mobilizing support and co-operation from the people and for fostering better understanding. Media, exhibitions, fairs, carnivals and other public activities, annual tree planting festivals, and incorporating forestry subjects in curriculum of schools and colleges are all important for sustaining forest management.

Forestry extension can act as an outreach programme for dissemination of research results and technological innovations at the rural level. Feedback from the rural recipients of extension and technology aids research institutions in developing and providing them with improved technology. Effective extension support is needed to improve people's tree and conservation consciousness, and improve rural income and employment through forestry-related activities. Ultimately, this will increase awareness and efforts to promote the sustainable management of forest resources.

In view of the above discussion on the major forest management issues calling for action in the dry forests of the region, the criteria and indicators evolved during the Bhopal-India Process appear to be relevant as a base upon which to work and deliberate. The eight criteria for the sustainable management of dry forests of South Asia can be:

- Increase in the extent of forest and tree cover;
- Maintenance, conservation and enhancement of biodiversity;
- Conservation and maintenance of soil and water resources;
- Maintenance and enhancement of ecosystem function and vitality;
- Maintenance and enhancement of forest productivity;
- Optimization of forest resource utilization;
- Maintenance and enhancement of social, cultural and spiritual benefits; and
- Adequacy of policy, legal and institutional framework.

PROPOSED SET OF CRITERIA AND INDICATORS FOR DRY FORESTS OF SOUTH ASIA

The complete base set of 8 criteria and 51 associated indicators for sustainable management proposed for the sub-region is provided below.

Criteria and Indicators for Sustainable Forest Management of Dry Forests of South Asia (Draft Set)

Criterion 1: Increase in the Extent of Forest and Tree Cover

1.1. Area and type of natural and man-made forests
1.2. Forest area under fragile ecosystems
1.3. Area of dense and degraded forest
1.4. Trees in non-forest areas
1.5. Areas rich in NWFP species
1.6. Forest area diverted for non-forestry use
1.7. Community managed forest areas

Criterion 2: Maintenance, Conservation and Enhancement of Biodiversity

2.1. Area of protected and fragmented ecosystems
2.2. Numbers of rare, endangered, threatened and endemic species, including tiger population
2.3. Level of species richness and diversity
2.4. Canopy cover
2.5. Medicinal and aromatic plants and other NWFPs
2.6. Level of non-destructive harvest

Criterion 3: Conservation and Maintenance of Soil and Water Resources

3.1. Soil moisture
3.2. Soil compaction
3.3. Status of erosion
3.4. Run-off (water yield)
3.5. Soil pH
3.6. Soil organic carbon
3.7. Nutrient status of the soil
3.8. Soil flora, fauna and microbes
3.9. Level of water table
3.10. Sediment load

Criterion 4: Maintenance and Enhancement of Ecosystem Function and Vitality

4.1. Status of natural regeneration
4.2. Status of natural succession
4.3. Status of secondary forests
4.4. Weeds, pests, diseases, grazing, fire, etc.
4.5. Maintenance of food chain

Criterion 5: Maintenance and Enhancement of Forest Productivity

5.1. Growing stock of wood and non-wood forest products
5.2. Natural regeneration status
5.3. Increment of wood and non-wood products
5.4. Area of afforestation and new plantations
5.5. Level of material and technological inputs
5.6. Extent of protection measures
5.7. Level of tangible benefits

Criterion 6: Optimization of Forest Resource Utilization

6.1 Aggregate and per capita wood and non-wood consumption
6.2 Import and export of wood and non-wood forest products
6.3 Recorded and unrecorded removals of wood and non-wood forest products
6.4 Direct employment in forestry and forest industries
6.5 Contribution of forest to the income of forest dependent people

Criterion 7: Maintenance and Enhancement of Social, Cultural and Spiritual Benefits

7.1 Well-being in terms of livelihood, recreation, cultural and aesthetic needs
7.2 Degree of economic, social, gender and participatory equity
7.3 Conflict management mechanisms
7.4 Traditional (indigenous) knowledge application

Criterion 8: Adequacy of Policy, Legal and Institutional Framework

8.1. Existing policy and legal framework
8.2. Extent of community, NGO and private sector participation
8.3. Investment in research and development
8.4. Human resource capacity building efforts
8.5. Forest resource accounting
8.6. Monitoring and evaluation mechanisms
8.7. Status of information dissemination and utilization

COMPARABILITY OF CRITERIA AND INDICATORS OF ITTO, DRY ZONE AFRICA AND BHOPAL-INDIA

Comparability of criteria and indicators has been stressed, among other things, in the FAO/ITTO (1995) Expert Consultation on the Harmonization of Criteria and Indicators for Sustainable Forest Management, as well as in the Programme Framework of the IPF. The guiding framework for the Bhopal-India Process criteria and indicators was borrowed from ITTO's framework and guidelines, which are more field oriented and aim at focusing on current weaknesses in forest management, and, thus, help to identify improvements in management practices. Hence, a comparison of ITTO's criteria and indicators, those of the Dry Zone African Initiative, and the base national set derived from the Bhopal-India Process, is presented in Table 5.

Table 5: A Comparison of ITTO and Dry Zone Africa's Criteria and Indicators with those Proposed for the Dry Forests of South Asia

Comparison of Criteria

ITTO	Dry Zone Africa	Dry Zone South Asia
Criterion 1: Enabling conditions for sustainable forest management	**Criterion 7:** Adequacy of legal, institutional and policies framework for sustainable forest management	**Criterion 8:** Adequacy of policy, legal and institutional framework
Criterion 2: Forest resource security	**Criterion 1:** Maintenance and improvement of forest resources, including their contribution to global carbon cycles	**Criterion 1:** Increase in the extent of forest and tree cover
Criterion 3: Forest ecosystem health and condition	**Criterion 3:** Maintenance of forest ecosystem health, vitality and integrity	**Criterion 4:** Maintenance and enhancement of ecosystem function and vitality
Criterion 4: Flow of forest products	**Criterion 4:** Maintenance and enhancement of production functions of forests and other wooded lands	**Criterion 6:** Optimization of forest resource utilization
Criterion 5: Biological diversity	**Criterion 2:** Conservation and enhancement of biological diversity in forest ecosystems	**Criterion 2:** Maintenance, conservation and enhancement of biodiversity
Criterion 6: Soil and water conservation	**Criterion 5:** Maintenance and improvement of protective functions in forest management	**Criterion 3:** Conservation and maintenance of soil and water resources
Criterion 7: Economic, social and cultural aspects	**Criterion 6:** Maintenance and enhancement of socio-economic benefits	**Criterion 7:** Maintenance and enhancement of social, cultural and spiritual benefits

Extent of Forest Resources

ITTO	Dry Zone Africa	Dry Zone South Asia
Criterion 2: Forest resource security	**Criterion 1:** Maintenance and improvement of forest resources, including their contribution to global carbon cycles **Criterion 4:** Maintenance and enhancement of production functions of forests and other wooded lands	**Criterion 1:** Increase in the extent of forest and tree cover
- Present area of the permanent forest estate in relation to national goals and targets - Plantation establishment targets, present age class distribution, and annual planting regimes	**1.1** Total areas of forests, plantations and other wooded lands (and their changes over time)	**1.1** Area and type of natural and man-made forests **1.4** Forest in non-forest area **1.5** Forest area rich in NWFP species
	4.2 Growing stock	
	1.3 Biomass (and its changes over time)	

Health and Vitality

ITTO	Dry Zone Africa	Dry Zone South Asia
Criterion 3: Forest ecosystem health and condition	**Criterion 3:** Maintenance of forest ecosystem health, vitality and integrity	**Criterion 4:** Maintenance and enhancement of ecosystem function and vitality
- Addressed in the management unit level indicators: The extent of vegetation disturbance after logging		**4.3** Status of secondary forest
	3.1 Areas and percentage of forest (natural and man-made), modified, with the indication of the severity of damage, by such processes as: fires, storms, insects and diseases, damage by wild animals, damage by domestic animals, competition from introduced plants, drought, damage by wind erosion	**4.4** Area and percentage of forest affected by weeds, pests, diseases, grazing, fire, etc.
	3.2 Percentage of forest ecosystems without regeneration **3.3** Changes in nutrient balance and soil acidity **3.4** Bush encroachment **3.5** Trends in crop yields **3.6** Percentage of population employed in crop and livestock farming	**4.1** Status of natural regeneration **4.5** Maintenance of food chain **4.2** Status of natural succession

Productive Functions

ITTO	Dry Zone Africa	Dry Zone South Asia
Criterion 4: Flow of forest products	**Criterion 4:** Maintenance and enhancement of production functions of forests and other wooded lands	**Criterion 6:** Optimization of forest resource utilization
- Regulation of subsequent harvesting in relation to increment data and net area of production - Regulation of initial harvesting rates in relation to defined cutting cycles and net area of production forest	**4.3** Annual balance between growth and removals of wood products (and its change over time) **4.4** Average annual consumption of wood for energy per capita	**6.3** Recorded and unrecorded removals of wood and non-wood forest products **6.1** Aggregate and per capita wood and non-wood consumption
- Comprehensive land-use planning and provision for the permanent estate - Wood production targets over time from various sources	**3.2** Percentage of forest area managed according to a management plan or management guidelines	
	4.5 Extraction of NWFPs (and its changes over time) of fodder, consumptive wildlife utilization, honey, gum, misc. fruits, roots and edible leaves, medicinal substances, fibers for handicrafts and other uses	

Biological Diversity

ITTO	Dry Zone Africa	Dry Zone South Asia
Criterion 5: Biological diversity	**Criterion 2:** Conservation and enhancement of biological diversity in forest ecosystems	**Criterion 2:** Maintenance, conservation and enhancement of biodiversity
- Areas of protection forests and production forests within the permanent forest estate	*Ecosystem Indicators* **2.1** Areas by types of vegetation (natural and man-made)	See indicator **1.1**
- The representativeness of the protected areas network at the current or planned reservation programme	**2.2** Extent of protected areas	**2.1** Area of protected and fragmented ecosystems
	2.3 Fragmentation of forests	See **2.1** in the cell above.
	2.4 Areas cleared annually of forest ecosystems containing endemic species	See indicator **1.2**
	2.8 Average number of provenances **2.2** Number of forest dependent species with reduced range **2.10** Population levels of key species across their range **2.11** Management of genetic resources **7.6** Number of forest dependent spp. **7.7** Number of forest dependent species at risk **7.8** Resource exploitation systems	**2.2** Number of rare, endangered, threatened and endemic species, including tiger population **2.3** Level of species richness and density **2.4** Canopy cover **2.5** Medicinal and aromatic plants and other NWFPs **2.6** Level of non-destructive harvest

Protective and Environmental Functions

ITTO	Dry Zone Africa	Dry Zone South Asia
Criterion 6: Soil and water conservation	**Criterion 5:** Maintenance and improvement of protective functions in forest management	**Criterion 3:** Conservation and maintenance of soil and water resources
• Under forest management unit level criterion - The availability of engineering, watershed protection and other environmental management prescriptions of production forests	**5.1** Areas and percentage of forest and other wooded land managed mainly for protection and/or rehabilitation of degraded lands and relevant other infrastructural works **5.3** Areas of forests and other wooded lands managed for scenic and amenity purposes	See indicator **1.2** See also indicator **1.1**
		3.1 Soil moisture **3.2** Soil compaction **3.3** Status of soil erosion **3.4** Run off (water yield) **3.5** Soil pH **3.6** Soil organic carbon **3.7** Nutrient status of soil **3.8** Soil flora, fauna and microbes **3.9** Level of water table **3.10** Sediment load

Developmental and Social Needs

ITTO	Dry Zone Africa	Dry Zone South Asia
Criterion 7: Economic, social and cultural aspects	**Criterion 6:** Maintenance and enhancement of socio-economic benefits	**Criterion 7:** Maintenance and enhancement of social, cultural and spiritual benefits
- National revenue and expenditure budgets for forest management	*Indicators of economic benefits:* **6.1** Value of wood products **6.2** Value of non-wood products **6.4** Share of forest sector in GNP **6.5** Value of primary and secondary industries **6.6** Value from biomass energy	**6.2** Import and export of wood and non-wood forest products
	6.3 Ecotourism (including hunting and recreation) **6.10** Degree to which social, cultural and spiritual needs are met	**7.1** Well being in terms of livelihood, recreation, cultural and aesthetic needs **7.3** Conflict resolution mechanism **7.4** Traditional (Indigenous) Knowledge application
	Indicators of the distribution of benefits: **6.9** Employment generation, notably in rural areas **6.11** Benefits accruing to local communities **6.12** Contributions to food security	**6.4** Direct employment in forestry and forest industries **6.5** Contribution of forest to the income of forest dependent people **6.6** Degree of economic, social, gender and participatory equity

Legal, Policy and Institutional Frameworks

ITTO	Dry Zone Africa	Dry Zone South Asia
Criterion 1: Enabling conditions for sustainable forest management - Many legal, policy and institutional indicators appear under several criteria and also, under forest management unit criteria. Hence, the ITTO indicators related to Policy issues have not been specified here.	**Criterion 7:** Adequacy of legal, institutional and policies framework for sustainable forest management	**Criterion 8:** An enabling policy, legal and institutional framework
	7.2 Existence of a comprehensive legislative and regulatory framework providing for access to resources, alternative forms of conflict resolution and consideration of land occupancy and cultural rights of local population	**7.1** Existing policy and legal framework See also indicator **8.3**
	7.1 Existence of national forest policy including the integration of forest management in rural land-use planning and development	See indicator **7.1** in the cell above
	7.6 Valorization of local expertise, knowledge and technologies	See indicator **8.4** **5.7** Community managed forest areas

	7.8 Existence of an administrative, policy and legal framework for the effective participation of local communities, NGOs and the private sector in forest policy formulation, implementation and monitoring	**7.2** Extent of community, NGO and private sector participation **7.6** Monitoring and evaluation mechanisms **7.7** Status of information dissemination and utilization
	7.5 Existence of incentives for investments in the forestry sector **7.4** Research and development capacity	**7.3** Investment in research and development **7.5** Forest resource accounting
	7.3 Institutional, human and financial capacity to implement the national forest policy and relevant national and international laws, instruments and regulations	**7.4** Human resource capacity building efforts
	7.7 Existence of measures to facilitate the transfer and adaptation of appropriate technology	See indicator **7.4** above.

The above review and comparison indicate that the criteria in all the three initiatives include the following seven elements:

a) Extent of forest resources;
b) Biological diversity;
c) Protective and environmental functions;
d) Health and vitality;
e) Productive functions;
f) Development and social needs; and
g) Legal, policy and institutional framework.

In spite of this similarity among the various criteria evolved under the processes and those suggested for the dry forests of South Asia, their structure and wordings vary. The similarities will become fewer and fewer as the indicators are compared. Hence, direct comparison of (criteria and) indicators is not feasible in all cases, especially when the criteria and indicators have been developed for:

- different geographic and/or ecological zones;
- different economic, ecological, social and cultural conditions; and
- different levels and purposes.

Conceptually, however, all the initiatives of evolving criteria and indicators for sustainable forest management are somewhat similar.

STRATEGY FOR PROMOTING, DEVELOPING AND IMPLEMENTING NATIONAL AND FOREST MANAGEMENT UNIT LEVEL CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT IN SOUTH ASIA

The preceding discussion related to an overview of the ongoing international initiatives for sustainable forest management and suggestions on possible criteria and indicators for the dry forests of South Asia. This background document would be incomplete without suggesting a suitable strategy and timeframe for the promotion of action at regional, national and local levels in the testing and adaptation of these common criteria and regionally applicable

indicators. Lessons can be drawn from the attempts made in these lines, on national and local bases, within India (see Box on the following page).

Need for a Sub-Regional Strategy

Commitments made by countries at UNCED to implement the "Forest Principles" were not legally binding. Yet, interest in the development, testing and implementation of criteria and indicators for sustainable forest management has steadily grown. Currently, some 150 countries are developing and implementing criteria and indicators within the framework of a number of presently ongoing regional and eco-regional initiatives.

There is a need to harmonize the ongoing initiatives through exchange of information, knowledge and experiences among ongoing initiatives in order to ensure compatibility and to avoid needless duplication of efforts. At the same time, sub-regional and national peculiarities with respect to forest condition, and socio-economic and institutional parameters, need to be fully appreciated to prevent their dilution in the criteria and indicators framework derived for the sub-region. For example, apart from the seven globally agreed elements of criteria, as duly exemplified by ITTO's set of criteria and indicators, another (eighth) criterion pertaining to optimization of forest resource utilization has been considered important for the countries of the dry zone of Asia, due to the increasing role that forests play in their national economies. This criterion will address the need to balance forest-related livelihood needs and ecological concerns in the Asian region. Thus, there is a need to devise sub-regional and national strategies and action plans for promoting sustainable forest management.

Decisions in individual countries of this sub-region relating to the final set of national-level criteria and indicators will definitely vary. However, these decisions and activities should complement each other, leading to overall, positive trends towards sub-regional and further on, towards regional-level sustainability. The Sub-Regional Strategy should encourage and assist involved countries to join the sustainable forest management activities and incorporate a review of criteria and indicators developed by ongoing processes. This will help avoid duplication of efforts and wasteful overlaps.

The framework developed as part of the Sub-Regional Strategy will ensure that the national criteria and indicators are mutually compatible and contribute towards a common understanding of issues. It is also necessary to arrive at common concepts and terminology and to draw attention to the increasing need for international dialogue to help facilitate better understanding and compatible actions among countries and regions.

Finally, a Sub-Regional Strategy will help initiate coordinated action for promoting, developing and implementing national and forest management unit level criteria and indicators in the South Asian countries. The countries in the sub-region will also be able to discuss the process of monitoring progress towards sustainable forest management and report needs at national and sub-regional levels. The strategy will help the countries to devise a time-scale for step-by-step follow-up action to the Indian Workshop (November - December 1999), at national and forest management unit levels. The strategy will assure continuity of involvement and contacts among the countries of the sub-region. Along with the Action Plan, it will guide and motivate these countries to devote time and resources to implement the criteria and indicators and commit themselves to achieve this goal through the active participation of all stakeholders in the process.

Indian Initiatives for the Adoption of Criteria and Indicators for Sustainable Forest Management

It was the National Technical Workshop on "*Evolving Criteria and Indicators for SFM in India*", organized by IIFM, Bhopal in January 1999, that set the ball rolling for SFM-related attempts in the country. This national-level initiative brought to light the need for a monitoring framework for the sustainable management of the country's forests, for the benefit of the foresters, researchers and NGOs working in the field of forestry in India. The Workshop recommendations were forwarded to the Ministry of Environment and Forests, Government of India, which set up a National Task Force, with IIFM as the nodal agency, for galvanizing action in the field of SFM, on a countrywide basis. Two more Sub-National-level Workshops, one each at Dehradun and Bangalore, were planned as an offshoot of the first one, to carry the Bhopal-India Process of SFM further. The other objectives of these Workshops include:

- *Ratification of the criteria and indicators for SFM, evolved during the Bhopal-India Process;*
- *Awareness Generation regarding criteria and indicators of SFM, their application and implementation in field situation; and*
- *Identifying the Research Needs and their Prioritization for collection and analysis of data related to the testing and adaptation of criteria and indicators for SFM in the country.*

One of these Workshops was organized at Dehradun – the *Mecca* of forestry research and education in India, recently in November 1999. This event attracted researchers, foresters from prominent forestry and allied institutions of the country, like Indira Gandhi National Forest Academy (IGNFA), Wildlife Institute of India (WII), Forest Survey of India (FSI), Indian Council of Forestry Research and Education (ICFRE) and representatives from various NGOs having interest in sustainable management of India's forests. The Workshop deliberations which focused on the ratification of previously evolved criteria and indicators for SFM in India and sensitization of the delegates on SFM-related aspect, generated much enthusiasm, interest and ideas about furthering the cause of SFM in the country.

Another, similar workshop has been planned for Bangalore, to tap and sensitize the forestry academia and professionals in the southern part of the country. Since, legislative support is indispensable for the success of any nationwide initiative, a National-level Workshop has also been planned for the Capital city of Delhi. This Workshop is likely to be attended by government representatives from the Ministry of Environment and Forests (MoEF) and other related Ministries of the Indian Government, State Forest Department officials as well as other stakeholders in the SFM process who need to be updated in the field of SFM and their support elicited for smooth implementation of criteria and indicators at the field-level or the FMU-level. Representatives from various national and international funding organizations will also be invited to this Delhi Workshop; to garner financial and technical support for activities related to countrywide criteria and indicators testing.

It is expected that the following SFM-related activities will be accomplished by year 2000 – end, in India:

- *Determination of Training Needs for data generation, compilation and analysis;*
- *Research Prioritization – both short-term and long-term;*
- *Assessment of Funding Requirements for countrywide criteria and indicators testing and adoption; and*
- *Initiation of Fieldwork for Testing of Bhopal-India Process's criteria and indicators for SFM in India: at National and FMU/Forest Divisional levels.*

The entire process of SFM-related field data collection, compilation and analysis to develop an implementable framework for monitoring progress towards sustainable management of the country's forests will require at least 2 years (year 2000 - 2002). This timeframe is justified, keeping in view the vastness and cultural as well as ecological diversity of a country like India. Another three years will then be required to operationalize and implement this framework in all the Forest Divisions (where 1 Forest Division = 1 FMU), of the country. Hence, by year 2005, it is expected that all forest in the country will be under sustainable management regime.

Strategy for Testing and Adaptation of Criteria and Indicators for Sustainable Forest Management in the Dry Forests

Drawing from India's tentative national plan for implementation of sustainable forest management through the Bhopal-India Process, the following initial strategy and timeframe can be suggested. Each country should identify a nodal agency or institution (like IIFM in India), that will plan and coordinate sustainable forest management related activities at identified places or institutions in the country and provide regular feedback to national and provincial or state forest departments. The nodal agency will also identify potential donor agencies for funding various sustainable forest management activities in their respective countries. These preliminary activities related to the sensitization of various stakeholders in forest management and ratification of the common criteria and indicators developed during the November – December 1999 Workshop in India should be accomplished by the end of year 2001. In the next five years (2001 – 2005), an implementable framework of criteria and indicators for sustainable forest management will be developed, tested and operationalized.

A detailed activity chart for the preliminary activities is provided below. It is expected that these steps will pave the way for further activities related to the successful testing and adaptation of common criteria and regionally applicable indicators for sustainable management of the dry forests of South Asia.

STRATEGY AND ACTION PLAN FOR PROMOTING SUSTAINABLE FOREST MANAGEMENT RELATED ACTION AT REGIONAL AND NATIONAL LEVELS

Preliminary Activities

Objective	Strategy	Action	Time Frame
➢ *Evolving national-level criteria and indicators for sustainable forest management of dry forests in Asia.*	Sub-regional initiative and brainstorming for evolving a draft set of criteria and indicators for sustainable forest management of dry forests in Asia.	Sub-Regional Workshop, Bhopal, India	30 Nov – 03 Dec. 1999
➢ *Eliciting national support and generating awareness about criteria and indicators and the sustainable forest management process in the country*	♦ Sensitization of academia, government and forestry professionals about sustainable forest management and criteria and indicators framework. ♦ Awareness generation about the draft set of criteria and indicators evolved for the dry forests in the workshop held in India.	National-level Workshop on Criteria and Indicators for Sustainable Forest Management of Dry Forests	
➢ *Adoption of the criteria and indicators evolved during the regional workshop and the country's own national workshop* ➢ *Determination of training needs and research priorities to guide data collection for testing criteria and indicators for sustainable forest management.* ➢ *Assessment of funding needs for testing and operationalizing criteria and indicators for sustainable forest management in the country.*		Two (at least) sub-national workshops in the respective countries.	By end of 2001
➢ *Reporting sustainable forest management related activities on a country basis.* ➢ *Setting sub-regional priorities and goals for sustainable management of dry forests.*	♦ Monitor and guide the progress of sustainable forest management related activities in the region. ♦ Draw lessons from initiatives taken by other countries in the sub-region, and discuss common problems and challenges.		End of 2001

Potential Sources of Outside Assistance

Implementation of criteria and indicators for sustainable forest management in South Asia will require a considerable work, as the concept of this monitoring framework for forest management activities is new to the region. There is a need for systematic technology transfer related to criteria and indicators. This encompasses techniques as well as methods, technical knowledge and information sharing. Apart from regular technical guidance, financial assistance will be necessary, keeping in view the developing economies and the diversity and extent of forest resources in the South Asian countries.

One of the major constraints that the countries in the sub-region may face in the implementation of criteria and indicators at the national level is a lack of technical knowledge and financial resources. UNEP, FAO, ITTO and other international organizations can support this process in allocating the necessary means to achieve the implementation of criteria and indicators at the national levels. These organizations can be called upon to assist governments of the dry zone of Asia, in the identification of national technical needs, transfer of technology, and development of human and financial resources required for national-level implementation of the criteria and indicators.

It is suggested that FAO provide continuous technical guidance for the sustainable forest management related endeavors of the South Asian countries. Other organizations like the UNEP and CIFOR can also provide support. FAO, in its capacity as UN focal point for action in the forestry sector, continues to closely follow all the ongoing international processes, supports efforts by countries and regions, help disseminate information and knowledge among the processes. These activities are partially facilitated as they are carried out through "national coordinators" who have been identified for each country and/or region, e.g., for the Near East and Dry Zone Africa Processes. Possible activities that FAO can undertake in the Asia region include research and scientific information, technical collaboration and extension. Since FAO's work and involvement have largely concentrated on assistance to countries at the regional and national levels, it should support and encourage countries to revise the suggested set of national-level criteria and indicators and, in national exercises, to prioritize and decide which criteria and indicators are relevant to the country.

Financial support will be required for the initial activities to sensitize government personnel, foresters, NGOs and other stakeholders regarding sustainable forest management and criteria and indicators, and also for fieldwork and other implementation work. There are a number of international funding agencies already funding forestry-related projects in South Asia, and these should be approached for support in developing criteria and indicators for dry forests. The nodal agency or organization identified by each country of South Asia will aid and monitor the allotment and effective utilization of such funds.

It can be estimated that around US$ 100,000 for larger countries like India and China and US$ 50,000 for each of the remaining South Asian countries, will be required on average, to carry out the preliminary activities (like sensitization in criteria and indicators and the ratification process) between 1999 and 2001. The later stages of data collection, field-testing and implementation for a period of five years (Year 2001 - 2005) will require around US$ 5 million each in the larger countries like India and China, and US$ 2 million each in the other smaller South Asian countries. Overall, the entire process of development, testing, adaptation and implementation of criteria and indicators for the sustainable management of the forests in 10 countries of the South Asian region will require around US$ 26.6 million. It will be essential for the South Asian countries to tap all potential sources of outside funding and explore other innovative fund-raising options for successful implementation of criteria and indicators by 2005.

It should be remembered that sufficient investment in sustainable forest management would be required through both national governments and the private sector. Initially, these funds may not be forthcoming. Hence, individual countries will need to design improved strategies for the implementation of sustainable forest management, including taking steps to establish strong partnerships among the government institutions, the private sector, bilateral and multilateral development agencies, research organizations, local governments and NGOs.

CONCLUSIONS

Forests cover one-third of the Earth's land surface. They are a valuable natural resource as a source of timber, fuel and land, as a carbon repository, as the most critical link in photosynthesis and as ecosystems of immense diversity. Some benefits like carbon absorption derive from the fact that forests grow; while others accrue from forests being cut down for timber, fuel and competing land uses. Forests are one of the most crucial life support systems available to all life forms on earth, including human beings. Over the years, this dependence has not diminished in extent, but has changed in form. As the forests are becoming scarce, the urgency of the situation and the magnitude of this dependence and the role of forests are becoming clearer.

Traditionally, forests were a local, or at most, a national asset, which were often used without global or long-term considerations. Developing countries with forest resources typically view forests as national economic assets whose exploitation is important to their development – a matter of national sovereignty. Developed countries view the same forests as global resources important primarily as global commons to serve as sinks for greenhouse gases or reservoirs of biodiversity. Yet, forests are one of the few, truly renewable resources if managed efficiently. To treat the world's forests as an asset that needs to be developed in order to increase the income they generate, they should be carefully managed for sustainable development – both in the developing and industrialized countries. Differing and conflicting views need to be considered and assimilated, and here lies the challenge in meeting the goal of sustainable forest management, as envisioned at Rio in 1992.

The increasing demand for forest products to supply the needs of a growing world population is causing stress on the world's forests. State forests of South Asia have been intensely sought by development projects, rural people and logging industries. Forest depletion is mainly due to increased population and from placing unjustified demands on the resource. Forest mismanagement is due to deep-seated differences between the local people and the government about who should control the resource and how the forests should be managed. Unsustainable and destructive forest-use practices are also leading to the ultimate destruction of the forests of the region. Whether at the hands of the local communities, or loggers or foresters, the practice of sustainable utilization and development of forest resources has suffered mainly due to lack of incentives and limited monitoring capacity. As the forests are destroyed, so are the genetic resources that evolved over millions of years. Tropical forests play important and only partially understood roles in shaping our climate and atmosphere. Forest clearing, accelerating since 1860, is now considered a major cause of the global warming trend.

The rate of deforestation in developing countries that house nearly three-quarters of the world's forests has accelerated during the last 20 - 25 years. Between 1990 and 1995, the total area of forests decreased by 56.3 million ha – the result of a loss of 65.1 million ha in developing countries and an increase of 8.8 million ha in developed countries (FAO, 1999). Though human clearing of forest land is an old process, tropical forest clearing has accelerated at an alarming rate. The primary forces driving deforestation in the region are inappropriate and uncontrolled logging and unsustainable forest use. The ongoing process of

extinction has also now increased significantly, with species disappearing at rates as high as 100,000 per year. Ultimately, tropical deforestation threatens human survival.

There is a need to slow the destruction of one of the Earth's most valuable natural resource. Forest communities are part of the solution to deforestation, rather than only part of the problem. Forest communities in different countries of the region have also shown the willingness to take on forest management responsibilities, if given the chance. Indigenous communities have a wealth of experience and knowledge of forest ecology and sustainable use practices.

Local forest management problems are characterized by the diverse and complex social forces changing the land in each locale. Therefore, there is a need to enable foresters to respond to varying local conditions and needs. Countries in the South Asian region have experienced insurgency movements since independence, aggravated by the discontent of forest communities. As pressures on these lands intensify, the potential for violence grows. Governments are slow to recognize local management capacity and rights; yet, the management ability of tens of thousands of forest communities is apparent in the great diversity of productive, ecologically viable agroforestry systems found throughout the tropics. Policies and procedures are needed as they would smoothen the transition to the decentralized management of local forest lands. Changes leading to increased local forest management in Asia in general, and in drier parts of South Asia in particular, include:

- a proliferation of new mechanisms for the partnership of local communities in forest management administration and benefit sharing (e.g., Joint Forest Management and participatory forest management);
- increased recognition of indigenous knowledge (i.e. ethno-forestry) of the local peoples; and
- restoration of the lands (including forests) of dispossessed communities and individuals.

South Asia's forests require new and more effective management systems – whose effectiveness needs to be monitored continuously. There is an urgent need for a framework that would guide and evaluate progress towards sustainable forest management. This rationalized monitoring and evaluation framework is provided by criteria and indicators. More than 100 countries across the globe are participating in some major regional or sub-regional processes that embrace the concept of sustainable forest management. For India, being one of the founder members of ITTO, its set of criteria and indicators are very relevant. The Sub-Saharan Dry Zone African criteria and indicators also deserve careful examination. The Bhopal-India Process has benefited from considerations, and lessons learnt from the development of the ITTO criteria and indicators and the Dry Zone African Process. It is time to examine these and others for their applicability to the dry forests of South Asia.

The "Workshop on National-level Criteria and Indicators for Sustainable Management of Dry Forests in Asia" highlights the commitment of Asian countries to formulate scientifically sound criteria and guidelines for the management, conservation and sustainable development of all types of forests. The set of criteria and indicators evolved and formulated during the workshop deliberations should apply at both regional and national levels, though, in the latter case their application will be dependent on the environmental and developmental policies of each country. At the local or forest management unit level, there may be variations in indicators that can be qualitative, quantitative, or descriptive attributes of the criterion to be assessed and monitored by the country. It will also be possible to assign different weights to these indicators according to the level on which they are applied.

Sustainable forest management has to be assessed at various levels of planning and implementation – from the local forest level (i.e. the forest management unit level) to the national level. Systematic, periodic assessment or measurement of indicators provides the basis for monitoring changes and trends in the levels of those indicators and, ultimately, progress in sustaining the various functions of the forest recognized in the "Forest Principles".

At the national level, the agreed set of criteria and indicators will provide:

- a tool to assess implementation of the "Forest Principles" and/or of any possible successor or international forest agreement; and
- a commonly agreed upon definition for sustainable forest management in the South Asian Region.

The workshop process will allow representatives from different countries to identify and mutually agree on a basic set of indicators and to track performance against established management objectives. Each group of forest users has its own views and priorities. Sustainable forest management, through it's the use of criteria and indicators, will serve as a platform to synchronize these views and to develop alternative management systems responsive to diverse and sometimes conflicting national and local priorities. It will help provide ways to simultaneously meet diverse needs of those who depend on forests for their living and cultures, respecting the forest's central roles as a vital part of the biosphere, a carbon sink, and as a supporter of millions of species.

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CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT IN BHUTAN, MONGOLIA, NEPAL AND CHINA

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INTERNATIONAL INITIATIVES OF CRITERIA AND INDICATORS

Sustainable forest management as a key component of global sustainable development has become a common international concern since the United Nations Conference on Environment and Sustainable Development (UNCED) in June 1992. The Forest Principles and Chapter 11 of Agenda 21 called for the identification of criteria and indicators to evaluate progress in countries' efforts in practicing sustainable forest management. This has resulted in a number of national, regional and international initiatives. Altogether, eight international processes are working to develop and implement criteria and indicators for sustainable forest management. More than 150 countries are involved in one or more of these ongoing initiatives at the regional, national and forest management unit levels.

The ITTO Process

The International Tropical Timber Organization (ITTO) was the first organization to formally develop criteria and indicators for sustainable forest management resulting in the "*Criteria for the Measurement of Sustainable Tropical Forest Management*" in March 1992. This pioneering work provided the foundation for international initiatives to develop criteria and indicators since the UNCED. ITTO's criteria and indicators focused primarily on sustainable tropical forest management for the *production of timber*. It included 5 criteria and 27 indicators applicable at the national level, and 6 criteria and 23 indicators at the forest management unit level.

In order to make the criteria and indicators more operational and useful, ITTO updated its criteria and indicators in 1998 to cover the full range of forest products and services (Table 1). This set of criteria and indicators is more similar to other sets of criteria and indicators later developed by the different initiatives.

Table 1: ITTO Criteria (Updated in July 1998)

ITTO Criteria	No. of Indicators at the National Level	No. of Indicators at the Forest Management Unit Level
1: Enabling conditions for sustainable forest management	9	9
2: Forest resource security	5	5
3: Forest ecosystem health and condition	5	5
4: Flow of forest produce	12	12
5: Biological diversity	8	8
6: Soil and water	9	9
7: Economic, social and cultural aspects	18	18
Total	**66**	**66**

The Pan-European Forest Process

The Pan-European Forest Process focuses on the development and implementation of criteria and indicators for sustainable forest management in Pan-European countries. Six criteria and 27 quantitative indicators were adopted in 1994, and later descriptive indicators at the Second Expert Level Follow-up Meeting of the Helsinki Conference in 1995. The Third Ministerial Conference on the Protection of Forests in Europe in June 1998 adopted the "*Pan-European Operational Level Guidelines for Sustainable Forest Management*" and endorsed associated indicators as a basis for international reporting and development of national indicators. The criteria and indicators are summarized in Table 2.

Table 2: Pan-European Forest Process Criteria and Number of Indicators

Pan-European Forest Process Criteria	No. of Quantitative Indicators	No. of Descriptive Indicators
Criterion 1: Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles	5	16
Criterion 2: Maintenance of forest ecosystems health and vitality	7	4
Criterion 3: Maintenance and encouragement of productive functions of forests (wood and non-wood)	3	8
Criterion 4: Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems.	7	16
Criterion 5: Maintenance and appropriate enhancement of protective functions in forest management (notably soil and water)	2	12
Criterion 6: Maintenance of other socio-economic functions and conditions	3	28
Total	**27**	**84**

The Montreal Process

In September 1993, the Conference on Security and Cooperation in Europe (CSCE) sponsored an international seminar in Montreal, Canada, on the sustainable development of temperate and boreal forests, with a focus on developing indicators for these forests. Canada took the lead in helping to launch an initiative to develop criteria and indicators among countries with temperate and boreal forests outside of Europe, thus resulting in the "Montreal Process". In February 1995, the Montreal Process countries met in Santiago, Chile, and endorsed the Santiago Declaration, a comprehensive set of 7 national-level criteria and 67 indicators (Table 3).

A report compiled from members' national reports provided baseline information and highlighted gaps in the available data for each indicator. Technical Notes were also prepared by a Technical Advisory Committee (TAC) to suggest techniques on measurements, data collection and interpretation for national-level criteria and indicators that have been endorsed by the Montreal Process. The Technical Notes also became a means for sharing experiences and expediting capacity building among member countries.

Table 3: Montreal Process Criteria and Number of Indicators

Montreal Process Criteria	No. of Indicators
1: Conservation of biological diversity	9
2: Maintenance of the 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
Total	**67**

The Tarapoto Proposal

The countries of the Amazon made a major effort to identify and determine criteria and indicators, which pay attention to the special nature of the region's forest ecosystems and other social and economic factors. In February 1995, eight countries of the Amazonian Cooperation Treaty adopted the Tarapoto Proposal on Criteria and Indicators for Sustainability of Amazonian Forests that identified 7 national-level criteria and 47 indicators, as well as others applicable at the forest management unit and global levels (Table 4).

Table 4: Tarapoto Proposal Criteria and Number of Indicators

Tarapoto Process Criteria at the National Level	No. of Indicators
1: Socio-economic benefits	16
2: Policies and legal and institutional framework for the sustainable development of forests	4
3: Sustainable forest production	5
4: Conservation of forest cover and biological diversity	8
5: Conservation and integral management of soil and water resources	4
6: Science and technology for the sustainable development of forests	6
7: Institutional capacity for promoting sustainable development in Amazonian	4
Sub-total at the national level	*47*
Tarapoto Process Criteria at the Management Unit Level	
8: Legal and institutional framework	3
9: Sustainable forest production	5
10: Conservation of forest ecosystem	6
11: Local socio-economic benefits	9
Sub-total at management unit level	*23*
Tarapoto Process Criteria at the Global Level	
12: Economic, social and environmental services of the Amazonian forest	7
Total	**77**

The Dry Zone Africa Process

UNEP and FAO jointly organized an Expert Meeting on Criteria and Indicators for Sustainable Forest Management in Dry Zone Africa in Nairobi, Kenya –in November 1995. The meeting proposed 7 criteria and 47 indicators at the regional level for Sub-Saharan Dry Zone Africa. As a follow-up, UNEP and FAO also organized a workshop in November 1997 to further develop the criteria and indicators identified at the Expert Meeting, and a Meeting

on National Level Criteria and Indicators in the Southern Africa Development Community (SADC) countries in December 1998. After detailed reviews, the set of SADC Initiative on Criteria and Indicators for Sustainable Forest Management in the Framework of the Dry Zone Africa Process was developed and consists of 7 criteria and 48 indicators (Table 5).

Table 5: Dry Zone Africa Process Criteria and Number of Indicators (Updated in 1998)

Dry-Zone Africa Process Criteria	No. of Indicators
1: Development, maintenance and improvement of forest resources, including their contribution to global carbon cycles	2
2: Conservation and enhancement of biological diversity in forest ecosystem	11
3: Maintenance and enhancement of forest ecosystem health and vitality	6
4: Maintenance and enhancement of productive functions of forests and other woodlands	5
5: Conservation and improvement of environmental and conservation functions of forests and other wood lands and combating desertification	4
6: Maintenance and enhancement of socio-economic benefits of forests and other wood lands	12
7: Adequacy and effectiveness of legal, institutional and policies frameworks for sustainable forest management	8
Total	**48**

The Near East Process

FAO and UNEP hosted a similar Expert Meeting in Cairo, Egypt in October 1996 to develop criteria and indicators for the Near East region. At this meeting, 7 national-level criteria and 65 indicators were endorsed for further development at the sub-regional and national levels at the 12th Session of the Near East Forestry Commission. The follow-up Meeting of National Coordinators on Criteria and Indicators for Sustainable Forest Management in the Near East was held in Damascus in 1998. Most countries represented reported on important steps taken towards the implementation of criteria and indicators at the national level.

Table 6: Near East Process Criteria and Number of Indicators

Near East Process Criteria	No. of Indicators
1: Extent of forest resources	4
2: Conservation of biological diversity in forest area	11
3: Health, vitality and integrity	9
4: Productive capacity and functions	4
5: Protective and environmental functions	9
6: Maintenance and development of socio-economic functions and conditions	19
7: The legal and institutional frameworks	9
Total	**65**

The Central American Process

In January 1997, FAO, in collaboration with the Central American Commission for Environment and Development, held an Expert Meeting to develop criteria and indicators for the seven countries in the commission. The meeting proposed 8 criteria and 53 indicators (Table 7) for application at the national level, as well as others applicable at the regional level in the "Lepaterique Process of Central America Process".

Table 7: Central American Process Criteria and Number of Indicators

Central American Process Criteria	No. of Indicators at the Regional Level
1: The existence of a legal, political, institutional, technical, economic and social framework which guarantees and promotes the sustainable management and conservation of forests	11
2: Forest cover	NA*
3: Forest health and vitality	NA
4: The contribution of forest ecosystem to environmental services	13
5: Biological diversity in forest systems	NA
6: Productive functions of forest ecosystems	4
7: Scientific and technological capacity for the development of forest resources	NA
8: Maintenance and improvement of the multiple social, economic and cultural benefits of forest ecosystems for dealing with the needs of different human groups	12
Total	**40**

*NA-Not applicable at the regional level.

Note: The total number of indicators at the national level is 53.

The African Timber Organization Process

The African Timber Organization (ATO), comprising 13 tropical timber producing African countries, initiated the development of criteria and indicators in close collaboration with the Center for International Forestry Research (CIFOR) in response to European threats to boycott tropical timber imports. The ATO process started at the forest management unit level, rather than the national level, and involves a number of field-level evaluations of criteria and indicators. The initial set of criteria and indicators was adopted by the ATO member countries in 1995. It identifies 5 principles relating to forest policy and management. Each principle is supported by a set of criteria and associated indicators (Table 8).

Table 8: ATO Principles, Criteria and Indicators

ATO Principles and Sub-principles	No. of Criteria	No. of Indicators
Principle 1: Sustainability of the forest and its multiple function is a high political priority	4	7
Principle 2: Areas devoted to forestry activities or the permanent forest estate are not declining	3	7
Principle 3: Forest are adequately managed and developed irrespective of their role	2	4
Sub-Principle 3a: Sustainable timber production (in quantity and quality) is guaranteed	4	17
Sub-Principle 3b: Sustainable production of non-timber forest products ensures biological diversity in forest systems	4	0
Principle 4: The main ecological functions of the forest are maintained	3	14
Principle 5: The right and duties of stakeholders should be clearly defined perceived and accepted by all	6	11
Total	**26**	**60**

Table 9 provides an overview of the eight initiatives. Four (i.e. ITTO Process, the Tarapoto Proposal, Lepaterique Process of Central America Process and the African Timber Organization Process) focus mainly on tropical forests. The Pan-European Forest and Montreal Processes deal mainly with temperate and boreal forests, while the Dry Zone Africa and the Near East Processes are developed for dry forests.

Most of these initiatives are led by international organizations except for the intergovernmental Pan-European Forest and Montreal Processes. They are political processes advancing a common understanding of sustainable forest management. The criteria and indicators generated by these processes are similar in expanding the traditional timber focus of forest management to include biodiversity, ecological services, and other socio-economic values. The 1992 ITTO criteria, being the first and developed before the UNCED, do not reflect the commitment to biodiversity and forest ecological services that is evident in the post-UNCED processes (including the updated set of criteria and indicators of ITTO in 1998). Although distinct in their structures, the criteria of all eight initiatives cover the following aspects:

- Extent of forest resources;
- Biological diversity;
- Forest productive functions;
- Forest protective and environmental functions;
- Forest ecosystem health and vitality;
- Multiple social, economic benefits and conditions; and
- Legal, institutional and economic framework, capacity to implement sustainable forest management.

In response to the increasing concern about global climate change, many initiatives – Pan-European Forest, Montreal, Dry Zone Africa and ATO Processes – have included this component in their criteria. Furthermore, the Dry Zone and Near East Processes covered desertification within the criterion on protective and environmental functions of the forests, thus illustrating the specific regional interest.

Except for the ATO Process, most of the international initiatives focus on national-level criteria and indicators. The Tarapoto Proposal is unique in covering all levels from forest management unit, to the national and global levels. ITTO addresses both the forest management unit and national levels and the Near East Process includes national and global levels.

The development of criteria and indicators has gained political acceptance and momentum before being technically understood. It has been internationally recognized that criteria and indicators are tools for assessing national trends in forest conditions and forest management. They also provide a common framework for describing, monitoring and evaluating progress towards sustainable forest management over time and an implicit definition of what it means, conceptually and on the ground.

However, it has been more than seven years since UNCED. No significant progress toward practicing sustainable forest management on the ground is evident. The problem is the usual "top-down" approach in the development of criteria and indicators and the absence of strong linkages to the current forest management practices. Among the unresolved issues in implementing criteria and indicators at the national and forest management unit levels are the questions of appropriate temporal and spatial scale. Another problematic area is the

application of criteria and indicators at higher hierarchical levels to take account of regional and global sustainability.

Table 9: Summary of Ongoing International Initiatives on Criteria and Indicators

INITIATIVE	ITTO	PAN-EUROPEAN FOREST	MONTREAL	TARAPOTO	DRY ZONE AFRICA	NEAR EAST	CENTRAL AMERICAN	ATO
GENERAL FEATURES								
Start time	1992	1993	1993	1994	1995	1996	1997	-
Eco-region	Tropical forests	Temperate and boreal forests	Temperate and boreal forests [a]	Tropical forests	Dry zone forests	Dry zone forests	All types of forests	Tropical forests
No. of countries [b]	25	38	12	8	27	30	7	13
Forest area(million ha) [c]	1305.046	904.577	1500.000	540.000	278.021	69.895	19.631	162.690
No. of criteria [d]	7 (1998)	6	7	7	7	7	8	28
No. of indicators [d]	117 (1998)	27	67	47	47	65	53	60
LEVELS								
Forest management unit	yes	no	no	yes	no	no	no	yes
National	yes	yes	yes	yes	yes	yes	yes	no
Global	no	no	no	yes	no	yes	no	no
FOREST RESOURCES								
Extent of forest resources	yes	yes	- [e]	- [f]	yes	yes	yes	yes
Global carbon cycles	no	yes	yes	no	- [g]	no	no	yes
Forest ecosystem health and vitality	no	yes	yes	-	yes	yes	yes	-
Biological diversity	yes	yes	yes	yes	yes	yes	yes	-
FOREST FUNCTIONS								
Productive functions	yes	yes	yes	yes	yes	yes	yes	yes
Protective and environmental functions	yes	yes	yes	yes	yes	yes	yes	yes
DEVELOPMENT AND SOCIAL NEEDS								
Socio-economic functions and conditions	yes	yes	yes	yes	yes	yes	yes	yes
INSTITUTIONAL FRAMEWORK								
Policy and legal framework; capacity to implement sustainable forest management	yes	yes	yes	yes	yes	yes	yes	yes

[a] Mexico, China, Australia and United States of America also have some tropical forests.
[b] Some countries participate in more than one process. The total number of the countries has some overlap among processes, such ITTO with Tarapoto Proposal and Central American Process.
[c] Some countries are represented in more than one initiative, notably Russia (forest area of 739,729,000 ha), which is included in both the Pan-European Forest and Montreal Processes.
[d] All the number of criteria and indicators are at the national level except for ATO which is at the forest management unit level.
[e] In the Montreal Process, the forest resource is not considered a separate criterion, but an indicator for two other criteria: (i) conservation of biological diversity; and (ii) maintenance of the productive capacity of forest ecosystem.
[f] In the Tarapoto Proposal, the criteria 'Extent of forest resources' and 'Biological diversity' are merged into one single criterion 'Conservation of forest cover and of biological diversity'.
[g] In the Dry Zone Africa Proposal, the criteria 'Global carbon cycle' and 'Extent of forest resources' are merged into one single criterion.

A further crucial issue is how to simplify criteria and indicators and directly relate them to practical forest management. Criteria and indicators only provide a framework for collecting and reporting data and information for further analyses. It is difficult to judge the sustainability of forest ecosystems based only on the reporting of criteria and indicators. There are clear demands for further developing and refining the current methodologies to analyze and evaluate the indicators for assessing the sustainability of the forest management.

FOREST MANAGEMENT AND DEVELOPMENT OF CRITERIA AND INDICATORS IN THE REGION

The general information on Bhutan, China, Mongolia and Nepal are summarized in Table 10.

Table 10: Country Data of Bhutan, China, Mongolia and Nepal*

Country Data	Bhutan	China	Mongolia	Nepal
Total land area (thousand ha)	4,700	932,641	156,650	13,680
Total forest area (thousand ha)	2,756	133,323	9,406	4,822
Forest cover (%)	58.6	14.3	6.0	35.2
Natural forest (thousand ha)	2,748	99,523	9,406	4,766
Total change in forest cover1990-95 (thousand ha)	-47	-433	0	-274
Annual change in forest cover 1990-95 (%)	-0.3	-0.1		-1.1
Population (million)	1.6	1,221.5	2.4	21.9
Population growth,1990-95 (%)	1.2	1.1	2.0	2.6
Rural population (%)	93.6	69.8	39.1	86.3
GNP per person in US$	170	490	400	160

* Source: FAO- State of the World's Forests 1997

Bhutan

The Kingdom of Bhutan, with an area of about 4.7 million ha, is a landlocked country in the eastern Himalayas, with some of the most rugged and mountainous terrain in the world, climbing from about 200 m in elevation in the South to over 7,550 m in the North. Bhutan is heavily forested, with 58.6 percent of forest cover and a variety of natural forest types including fir, mixed coniferous, chir pine (*Pinus roxburghii*), and broadleaf forests. Nature parks and reserves cover 26 percent of the country's land area with a relatively high proportion of protected forests. Even accessible forests remain relatively undisturbed. Bhutan's potential for producing non-wood forest products, such as fodder, bamboo, medicinal plants, natural dyes, pine resin, lemon grass and forest foods, is considerable. National fuelwood requirements are high due to the absence of alternative energy sources. Fuelwood production meets 83 percent of the total energy demand. The arable land is limited. Most rural households own livestock, which graze in the forests and pastures.

Government policy specifies that 60 percent of the country's land area should remain under forest. Bhutan has progressed through a National Forestry Programme since the early 1990s. It focuses on land-use planning, natural conservation, watershed management, forest management, integrated forestry development, human resource development and institutional strengthening. The 8th Fiscal Year Plan in 1996 went further to include sustainable forest management, nature conservation and protected area development, and social forestry and extension. The Government of Bhutan also recognizes that shortage of qualified human resources, lack of forest inventory data and forest management plans, inappropriate land-use

planning, unsound forest industrial structure and policy, are major constraints to sustainable forest management.

Mongolia

Less than 10 percent of Mongolia's land area is covered by forests. They are mainly located in the northern parts of the country, along the Russian border, forming a transition zone between the Siberian taiga and the Central Asian steppe zones. The taiga belt forests comprise mainly larch (*Larix sibirica*) and cedar (*Pinus cembra*) species, with *Pinus silvestris* and *Betula spp*. also being relatively common. Significant areas of arid forest and shrub land are located in the southern and southwestern parts of the country, mainly saxaul (*Haloxylon ammodendron*) forest. All forests and land in Mongolia are state-owned. A network of 40 protected areas covers large parts of the country. Fires destroy significant areas of forest and steppes woodland each year.

Nepal

Around 35 percent of Nepal's land area is covered by forest, some of which is heavily degraded. The wide range of topographic conditions in the country allows for a large variety of forest types. The distribution of natural forests generally follows altitudinal zones. The most common, below 1,000 m, is tropical forest, predominantly of *Shorea robusta*. Sub-tropical forests occur between 1,000 - 2,000 m, and are coniferous or broadleaved. The principal coniferous species is chir pine (*Pinus roxburghii*). The broadleaf forest is a mix of mainly chestnuts, alders and chilaune (*Schima wallichii*). Temperate forests, between 2,000 - 3,000 m, include a mix of oak, pine and rhododendron. Sub-alpine forests are found from around 3,000 m up to 4,200 m with a mix of firs, beech, rhododendron and juniper. Nepal has a modest area of plantation forest. Almost 15 percent of the country's land area is designated as national parks, wildlife reserves or conservation areas.

China

China possesses only 3 - 4 percent of the world's forest area and cannot meet the needs of the population. Its forest cover is 133.7 million ha, amounting to only 13.92 percent of the total land area with a total growing stock of 11,785 million m^3. About 45.3 percent of the total forest cover is state-owned and administrated by the State Forestry Administration, and 54.7 belongs to the communes monitored by the State Forestry Administration. However, the growing stock of the collective-owned forest resources is only 32.2 million m^3 or 30 percent of the total growing stock in China.

The largest forests lie in the northeast and inner Mongolian provinces, the ten southern provinces, and Sichuan and Yunnan provinces. The southern forests are mainly lowland rain and monsoonal forests. China has around 870 nature reserves covering more than six percent of the country. It also has the world's most extensive plantation estates, in excess of 20 million ha.

The result of over-utilization is a shift from high value mature forest to degraded and young forest. This is contributing to a severe imbalance in the age-class structure and the quality of the forest stands. It is estimated that more than 80 percentage of all forests in China is now in immature age classes. The country is facing a worsening imbalance between supply and demand for wood products, particularly for wood of commercial value, driven in part by the Government's economic development policies. A national survey of wood supply and consumption patterns indicated that by 2010 consumption would reach 180 million m^3 for

commercial logs and 80 million m^3 for fuelwood, leading to a large wood deficit. The gap between demand and domestic supply of wood, excluding fuelwood, is expected to increase to about 60 million m^3 over the next decade.

Forest Management in the Dry Zone of China

The arid and semi-arid areas of China are mainly found in mid- and warm temperate zones of the northwest, including most parts of Xinjiang Autonomous Region, Qinghai Province, Ningxia Autonomous Region and Gansu Province; parts of Shanxi Province, Shaanxi Province, Inner Mongolia Autonomous Region, Hebei Province and Liaoning Province.

Forests in these dry areas cover only 15.3 million ha. The growing stock accounts for only 7.7 percent of the national total volume. The extent of plantations, however, is higher than the national average – 34.7 percent compared to 26.7 percent respectively. A summary of the area and stock volume is shown in Table 11.

Table 11: Area and Stock of Plantations and Woodland in the Three North Shelterbelt Programme (thousand ha; thousand m^3)

Ownership	Forest Stand		Open Forests	
	Area	Volume	Area	Volume
State-owned	1,450	49,811	216	2,539
Collective-owned	2,727	82,088	548	5,258
Total	4,177	131,899	764	7,797

The natural forests are located above 1,000 m in elevation, and mainly on Tianshan Mountain and Aertai Mountain of Xinjiang, Qilian Mountain of Gansu and Yinshan Mountain of Inner Mongolia. The forests on Aertai Mountain are populated with *Larix sibirica* and *Picea sibirica*, the northern slope of Tianshan Mountain with *Picea schrenkiana*, the northern slope of Qilian Mountain with *Picea crassifolia* and the southern slope with *Sabina przewalskii* respectively. The forests in Yinshan Mountain are mainly deciduous, with *Populus tremula* and *Betula spp*., accompanied by shrub species such as *Vaccinium vitisidaea, Vaccinium myrtillus, Rosa acicularis, Lonicera* and *Sorbus.*

The forests were harvested for timber in the past, thus leading to several problems such as depletion of forest resources, reduced water levels, soil erosion and desertification. To counter insufficient wood supplies and environmental problems, China is implementing a number of large-scale forestry ecological programmes in its arid and semi-arid areas within the Three North Shelterbelt Development Programme, the National Programme to Combat Desertification and the Taihang Mountain Afforestation Programme. Through great efforts over the past 20 years, large areas of *Populus* and *Sophora* plantations have been established. To promote local economic development, commercial plantations have also been established in this region, mainly with *Prunus, Malus, Ziziphus, Vitis, Juglans* and *Quercus*.

Through these various programmes, environmental conditions have improved to some extent. The plantations have met timber demands for construction and local fuelwood. Income and agricultural production have been raised and living conditions have improved. Forest coverage has increased from 5 percentage in 1975 to 9 percent in 1997. In total, 1.1 million ha of farmland in this area have been protected by shelterbelt networks. Production has increased by about 10 to 30 percent. By 1998, 7 million ha were rehabilitated through implementation

of the National Programme to Combat Desertification, although some problems still need to be resolved, including:

- Conflicts between forestry and grazing;
- Conflicts between forestry and agricultural development;
- Mono-culture plantations;
- Lack of human resource development and capacity;
- Lack of capital resources and investments; and
- Low level of capability in science and technology.

Criteria and Indicators for Sustainable Forest Management at the National Level in China

China, as one of the 12 member countries of the Montreal Process, has been participating in other international initiatives on criteria and indicators. Most recently, the Chinese Government has taken a series of significant measures to promote sustainable forest management. Important activities include the formulation and implementation of a series of key programmes and policies, such as the Forestry Action Plan for China's Agenda 21, the Outline of China's Ecological Development Programmeme, the Action Plan of Protection of Biodiversity in China, and other research, capacity building and extension activities.

To effectively implement sustainable forest management in China, a research group was formed to develop criteria and indicators for sustainable forest management. Under the leadership of the State Forestry Administration, formulation of criteria and indicators was put into effect by the Sustainable Forestry Research Centre (Chinese Academy of Forestry). Research on demonstration regions has been initiated to further test and improve the criteria and indicators until they can be implemented in line with criteria and indicators from international initiatives, especially the Montreal Process.

The development of criteria and indicators is an important step in implementing the *Forestry Action Plan for China's Agenda 21*, a blueprint for China's forestry in the 21st Century. Experts from various fields tested and reviewed a provisional *Framework of Criteria and Indicators for Sustainable Forest Management in China*, with 8 criteria and 80 indicators. Eleven of the indicators can be implemented, 55 require further investigation, and 9 need long-term research and development, and 5 remain uncertain (Table 12).

Table 12: Framework of National-level Criteria and Indicators for Sustainable Forest Management in China

	CHINA'S FRAMEWORK		Montreal Process
Ref.	**Criteria and Indicators**	**Types**	**Ref.**
1	**Conservation of Biological Diversity**		**1**
1.1	Ecosystem diversity		1.1
1.1.1	*Extent of area by forest types relative to total forest area*	*A*	*1.1.a*
1.1.2	*Extent of area by forest type and by age class or successional stage*	*B*	*1.1.b*
1.1.3	*Area and percentage of plantation by broadleaved species and coniferous species*	*B*	*NA*
1.1.4	*Extent of area by forest type in protected area categories as defined by IUCN or other classification systems*	*B*	*1.1.c*
1.1.5	*Extent of area by forest type in protected area categories and by age class or successional stage*	*D*	*NA*
1.1.6	*Fragmentation of forest types*	*C*	*1.1.d*
1.2	Species diversity		
1.2.1	*The number of forest dependent species*	*B*	*1.2.a*
1.2.2	*The status of forest dependent species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment*	*A*	*1.2.b*
1.3	Genetic diversity		1.3
1.3.1	*Number of forest dependent species that occupy a small portion of their former range*	*B*	*1.3.a*
1.3.2	*Population levels of representative species from diverse habitats monitored across their range*	*C*	*1.3.b*
2	**Maintenance of the Productive Capacity of Forest Ecosystems**		**2**
2.1	Area of forest land and net area of forest land available for timber production	A	2.a
2.2	Area and total growing stock of different forest type	B	NA
2.3	Ratio of different types of forest land in the total forest land	A	NA
2.4	Total growing stock of forests for timber	B	2.b
2.5	Area and growing stock of plantations	B	2.c
2.6	Distribution of area and stock of forest for wood production by age-class	B	NA
2.7	Annual cutting of forest for timber should not exceed the annual growth of forests	A	cf. 2.d
NA	Annual removal of wood products compared to the volume determined to be sustainable	NA	2.d
2.8	Annual removal of non-timber forest products (fur-bearers, berries, mushroom, game), compared to the levels determined to be sustainable	B	2.e
3	**Maintenance of Forest Ecosystem Health and Vitality**		**3**
3.1	Area and percentage of forest affected by process or agents beyond the range of historic variation	B	3.a
3.2	Area and percentage of forest land subject to levels of specific air pollutants	A	cf. 3.b
NA	Area and percentage of forest land subject to levels of specific air pollutants or ultraviolet B that may cause negative impacts on the forest ecosystem	NA	3.b
3.3	Area and percentage of forest land with diminished biological components indicative of changes in fundamental ecological process and/or ecological continuity	B	3.c

Table 12 contd.

4	**Conservation and Maintenance of Soil and Water Resources**		**4**
4.1	Area and percentage of forest land with significant soil erosion	B	4.a
4.2	Area and percentage of cultivated land on slope over 25 degrees which have been turned back into forest land	B	NA
4.3	Area and percentage of forest land for soil and water conservation in those important regions	B	cf. 4.b
NA	Area and percentage of forest land managed primarily for protective functions	NA	4.b
4.4	Percentage of stream kilometers in forested catchment in which stream flow and timing has significantly deviated from the historic range of variation	C	4.c
4.5	Range of changes in physical and chemical properties of stream in forested catchment	C	cf. 4.f & 4.g
NA	Percentage of water bodies in forest areas with significant variance of biological diversity from historic range of variability	NA	4.f
NA	Percentage of water bodies in forest areas with significant variance from historic range of variability in pH, dissolved oxygen, levels of chemical, sedimentation or temperate change	NA	4.g
4.6	Controlled area and control percentage of areas with soil and water losses, intensity of which is over light	B	NA
4.7	Controlled area and control percentage of areas with soil and water losses, intensity of which is light	B	NA
4.8	Area and percentage of cultivated land on slope on which maintenance and conservation of soil and water resources have been taken into account according to regulations of the government	B	NA
4.9	Area and percentage of man-made forest which has a serious degrading of site index	C	cf. 4.d & 4.e
NA	Area and percentage of forest land with significantly diminished soil organic matter and /or changes in other soil chemical properties	NA	4.d
NA	Area and percentage of forest land with significant compaction or changes in soil physical properties resulting from human activities	NA	4.e
4.10	Area and percentage of broadleaf forest in man-made forests	A	NA
4.11	Area and percentage of different tree species	A	NA
4.12	Area and percentage of replanted man-made forests	D	NA
4.13	Area and percentage of land on slope on which maintenance and conservation of soil and water resources have been taken into account in silviculture according to regulations of the government	B	NA
4.14	Intensity, area and percentage of protection of forest ground vegetation	B	NA
NA	Area and percentage of forest land experiencing an accumulation of persistent toxic substances	NA	4.h
5	**Conservation of Forest Contribution to Global Carbon Cycles**		**5**
5.1	Area of forests	A	NA
5.2	Total forest ecosystem biomass and carbon pool, and if appropriate, by forest types, age class, and successional stages	B	5.a
5.3	Area and consumption of forests for energy resources and its contribution	C	NA
5.4	Production and consumption of forest products and its contribution	C	5.c
5.5	Area of cutting and its contribution	B	NA
5.6	Absorption of carbon by forest	D	cf. 5.b
5.7	Carbon emission by soil	D	cf. 5.b
NA	Contribution of forest ecosystems to the total global carbon budget, including absorption and release of carbon	NA	5.b
5.8	Release of CO_2 and CH_4 by peat	D	NA

Table 12 contd.

6	**Maintenance and Strengthening of Long-term Multiple Benefits of Forests**		**6**
6.1	Growing and consumption, including employment		6.1+6.5
6.1.1	*Population rate and economic rate*	*A*	*NA*
6.1.2	*Supply and consumption of wood and wood products, including consumption per capita*	*B*	*6.1.c*
6.1.3	*Upper limitation for annual removal of wood, and the area and location of forests available for timber production and its changes by year*	*B*	*NA*
6.1.4	*Supply and demand of wood and non-wood products, including their export and import*	*C*	*NA*
NA	Supply and consumption/use of non-wood products	NA	6.1.f
6.1.5	*Value and volume of wood and wood/non-wood product production, including value added through downstream processing, and value of wood and non-wood product production as percentage of GDP*	*B*	*6.1.a+ 6.1.b+ 6.1.d*
NA	Degree of recycling of forest products	NA	6.1.e
6.1.6	*Direct and indirect employment in the forest sector and forest sector employment as a proportion of total employment*	*B*	*6.5.a*
6.1.7	*Production efficiency rate, average wage rates and injury rates in major employment categories within the forest sector*	*B*	*cf.6.5.b*
NA	Average wage rates and injury rates in major employment categories within the forest sector	NA	6.5.b
NA	Viability and adaptability to changing economic conditions, of forest dependent communities, including indigenous communities	NA	6.5.c
NA	Area and percentage of forest land used for subsistence purpose	NA	6.5.d
6.2	Investment of forestry		6.3
6.2.1	*Value of investment, including investment in forest growing, forest health and management, planted forests, wood processing, recreation and tourism*	*B*	*6.3.a*
6.2.2	*Level of expenditure on research and development, education, and extension and use of new and improved technologies*	*B*	*6.3.b+ 6.3.c*
6.2.3	*Rates of return on investment*	*B*	*6.3.d*
6.3	Forest recreation and tourism, demands and assessment of culture, social and spirits		6.2+ 6.4
6.3.1	*Value, area and percentage of forest land managed for general recreation and tourism, in relation to the total area of forest land. Number and type of facilities available for general recreation and tourism, and number of visitor days attributed to recreation and tourism, in relation to population and forest area*	*B*	*6.2.a+ 6.2.b+ 6.2.c*
6.3.2	*Area and percentage of forest land managed in relation to the total area of forest land to protect the range of culture, social and spiritual needs and values*	*B*	*6.4.a*
NA	Non-consumptive use forest value	NA	6.4.b

Table 12 contd.

7	**Legal and Policy Protection Systems**		**7.1-7.3**
7.1	Legislation		7.1
7.1.1	*Forest resource ownership*	*B*	*7.1.a*
7.1.2	*Institution for management of forest resources*	*B*	*7.1.b+7.1.e 7.2.b*
NA	Forest management to conserve special environmental, cultural, social and /or scientific values	NA	7.1.e
7.1.3	*Encouraging best practice codes for forest management*	*B*	*7.1.d*
7.1.4	*Adopting institution of document management in managing forest resources*	*B*	*NA*
7.1.5	*Strengthening administrative regulations in forest management*	*B*	*cf. 7.1.b*
NA	Providing opportunities for public participation in public policy and decision-making related to forest and public access to information	NA	7.1.c
7.2	Policy		7.2
7.2.1	*For public participation in forestry*	*B*	*7.2.a+ 7.1.c*
NA	Undertaking and implementing periodic forest-related planning, assessment, and policy review including cross-sectoral planning and coordination	NA	7.2.b
7.2.2	*Developing and maintaining human resource skills*	*B*	*7.2.c*
7.2.3	*Adjusting the structure of forestry industry*	*B*	*NA*
7.2.4	*Developing and maintaining efficient physical infrastructure*	*B*	*7.2.d*
NA	Enforcing laws, regulations and guidelines	NA	7.2.e
7.3	Economic framework		7.3
NA	Investment and taxation policies and a regulatory environment in order to meet long-term demands for forest products and services	NA	7.3.a
7.3.1	*Favorable policy on forestry investment and taxation*	*B*	*cf. 7.3.a*
7.3.2	*Adopt policy collecting silviculture expenditure*	*B*	*cf. 7.3.a*
7.3.3	*Establish forest ecological compensation system*	*C*	*cf. 7.3.a*
7.3.4	*Strengthen institution of forest funds*	*B*	*cf. 7.3.a*
7.3.5	*Expand fund channel for forestry construction*	*B*	*cf. 7.3.a*
7.3.6	*Absorb and exploitation of oversees funds to seed up major project construction in forestry*	*B*	*cf. 7.3.a*
7.3.7	*Speed up construction of institute for modern forestry enterprise*	*B*	*cf. 7.3.a*
7.3.8	*Establish fair trading on forest products gradually*	*B*	*7.3.b*
8	**Information and Technological Supporting Systems**		**7.4-7.5**
8.1	Measurement and monitoring		7.4
8.1.1	*Availability and extent of up-to-date data, statistics and other information important to measuring or describing indicators associated with criteria 1-7*	*A*	*7.4.a*
8.1.2	*Scope, frequency and statistical reliability of forest inventories, assessments, monitoring and other relevant information*	*B*	*7.4.b*
8.1.3	*Compatibility with other countries in measuring, monitoring and reporting on indicators*	*B*	*7.4.c*
8.2	Research and development		7.5
8.2.1	*Development of scientific understanding of forest ecosystem characteristics and function*	*B*	*7.5.a*
8.2.2	*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*	*B*	*7.5.b*
8.2.3	*Evaluation of the contribution of science and technology*	*B*	*cf.7.5.c*
8.2.4	*Enhancement of ability to predict impacts of human intervention on forests*	*B*	*7.5.d*
8.2.5	*Ability to predict impacts on forests of possible climate change*	*B*	*7.5.e*

NA-Not applicable

*Indicator type: A-implementation now; B-requiring some R&D; C-requiring long-term R&D; D-uncertain

Criteria and Indicators for Sustainable Forest Management at the Sub-national Level in China

China has developed its criteria and indicators at two sub-national levels, i.e. the regional and forest management unit levels. The criteria and indicators at the sub-national levels should be more specific to the local conditions within the national framework. Indicators that are not measurable at the sub-national levels should be omitted, although they might be important at the national level. Furthermore, to effectively evaluate at the national level, it is necessary to weigh each indicator at sub-national levels in accordance to the local objectives of the forest management unit.

Since 1997, funded by the UNDP, identification and testing of criteria and indicators at the regional level have been conducted in Yichun in Heilongjiang Province, Fenyi in Jiangxi Province, Zhangye in Gansu Province, and representative sites of the Northeast State-owned Forest Zone, South Collective-owned Forest Zone, and Northwest Dry Land Forest Zone, respectively. The draft sets of regional-level criteria and indicators, each with 8 criteria similar to the national level, were developed for these three zones (Table 13). In total, the 77 indicators for Yichun focus more on the maintenance of forest productivity, while the 70 indicators for Zhangye concentrated more on environmental and social issues (water resource, conservation forest, shelterbelt, and cash tree plantations). The 60 indicators for Fenyi are related more to forest ownership, plantations, and commercial plantations.

Table 13: Indicators at the Regional Level in China

Criteria and Indicators	National level	Sub-national level		
		Yichun, Heilong-jiang	Fenyi, Jiangxi	Zhangye, Gansu
1. Biodiversity	10	9	11	14
Ecosystem	6	4	6	10
Species	2	2	3	2
Genetics	2	3	2	2
2. Productivity	8	12	9	8
3. Health & Vitality	3	3	3	8
4. Soil & Water	14	8	11	8
5. Carbon cycles	8	5	3	4
6. Multiple benefits	12	14	9	12
6.1. Growing & Consumption	7	9	4	9
6.2. Investment of Forestry	3	3	4	2
6.3. Recreation, culture, social, etc.	2	2	1	1
7. Legal & Policy	17	18	10	10
7.1. Legislation	5	8	3	3
7.2. Policy	4	6	3	3
7.3. Economic framework	8	4	4	4
8. Information & Technology	8	8	5	8
8.1. Measurement & Monitoring	3	3	1	3
8.2. Research & Development	5	5	2	5
Total	**80**	**77**	**60**	**72**

The criteria and indicators are being developed and tested at the forest management unit level in the three representative sites, including selection of the indicators, feasibility studies for data collection and the processing for the reporting of criteria and indicators. Most of the forest management unit-level indicators are developed from Criteria 1-4 (Table 14).

Table 14: Criteria and Number of Possible Indicators at the Forest Management Unit Level in Three Representative Forest Zones of China

Criterion	1	2	3	4	5	6	7	8	Total
Dagangshan, Fenyi, Jiangxi	10	5	4	8	3	8	9	4	51
Xishui, Zhangye, Gansu	11	5	4	7	4	6	10	0	47
Fenlin, Yichun, Heilongjiang	8	10	1	4	1	7	7	0	38

China faces many constrains in implementing criteria and indicators, such as limited forest resources, ecological and environmental degradation, increasing population, and economic growth. Economic development potential in the mountains is limited, exacerbating poverty and environmental degradation. Science and technology also require greater environmental awareness and wider public understanding. Therefore, strengthening education and training, and increasing public awareness among foresters are crucial in promoting sustainable forest management. At the same time, implementation of criteria and indicators also requires supporting relevant policies and regulations.

SUGGESTED CRITERIA AND INDICATORS FOR THE REGION

The international initiatives of defining and testing criteria and indicators for sustainable forest management aim to provide a common framework for promoting the participation, monitoring and evaluation of the progress toward sustainable forest management worldwide. The development of criteria and indicators is a dynamic and collaborative process, which requires the participation of all stakeholders. Therefore, it is important to encourage countries to be evolved in the international initiatives and to build their capacity. Despite differences in the criteria and indicators of the various international initiatives, the core elements are similar. New initiatives should seek consistency with the existing processes to facilitate future convergence. The following suggestions for criteria and indicators for the Dry Zones in Bhutan, China, Mongolia and Nepal are one step in that direction (Table 15).

Table 15: Proposed Criteria and Indicators for Sustainable Forest Management in the Region (Bhutan, China, Mongolia and Nepal)

Criteria and Indicators	
1	**Extent of forest resources and the conditions**
1.1	Area and percentage of forests and other wooded (including plantations, agroforestry, shelterbelts) lands to the total land area
1.2	Biomass, standing volume, growing stock and carbon storage of forests and other wood lands
2	**Conservation and enhancement of biological diversity**
2.1	Ecosystem diversity
2.1.1	*Distribution of forest ecosystems (area and percentage of the forest types and other land types)*
2.1.2	*Areas of forest reserves and protected areas*
2.1.3	*Area lost annually of forest ecosystem containing endemic species*
2.2	Species diversity
2.2.1	*Number of forest dependent species*
2.2.2	*The status (rare, endangered, threatened or extinct) of forest dependent species and the change population size of species at risk*
2.3	Genetic diversity
2.3.1	*Number of forest species reduced distinctly in distribution range*
2.3.2	*Stand amount and area of tree seed orchard and seed reserve for conserving or improving forest genetic resources*
2.3.3	*Area and percentage of stand by plantations of exotic species*
3	**Maintenance and enhancement of productive functions of forest and other wooded land**
3.1	Percentage of forest and other wooded lands managed according to an integrated management plan
3.2	Total area of forest land and net area for timber production
3.3	Area, standing volume and its annual increment of major forest types
3.4	Periodical balance between growth and removal of wood products
3.5	Managed and sustainable extraction of non-wood forest products (e.g. fodder, seed, fruits, fern, medicinal materials, consumptive wildlife utilization, etc.)
4	**Maintenance and enhancement of forest ecosystem health and vitality**
4.1	Area and percentage of forest types affected by diseases, pests, wild and domesticated animals, competition from introduced species
4.2	Area and percentage of forest types affected by fire, storm, flood, drought, and wind erosion
4.3	Area and percentage of forest types affected by human activities
5	**Maintenance and enhancement of forest protective and environmental functions**
5.1	Area and percentage of forests and other wooded lands managed mainly for protection purposes (e.g. for protection and/or rehabilitation of agricultural or range lands, and/or rehabilitation of degraded lands and/or areas prone to desertification and relevant important infrastructure works)
5.2	Areas and percentage of forest and other wooded areas managed mainly for the water source conservation, protection of watersheds, river zones and flood control
5.3	Area and percentage of forest land with significant soil erosion (different degree)
5.4	Area and percentage of farmland above 25 degrees slope converted to forests
5.5	Percentage and kilometers of stream in forest watershed in which stream flow and timing has significantly deviated from the historic of variation
5.6	Sedimentation for the streams with significant variation from the historic range
5.7	Area of sand dunes annually stabilized through tree/shrub planting
5.8	Areas and efficiency of trees/shrubs planted in stabilizing sand dunes or rehabilitating eroded hillsides
5.9	Effective of plan formulated for managing trees/shrubs planted for desertification control

Table 15 contd.

6	**Maintenance and enhancement of long-term multiple socio-economic benefits**
6.1	Indicators for economic benefits
6.1.1	*Value of wood products*
6.1.2	*Value of non-wood forest products*
6.1.3	*Ecotourism (incl. hunting, recreation)*
6.1.4	*The output and value from the processing for wood products and non-wood products*
6.1.5	*Share of forest sector in GNP*
6.1.6	*Value from biomass energy*
6.1.7	*Forest sector trade balance*
6.1.8	*Investment in forests and forestry industries, incl. natural forest conservation, forest recreation and ecotourism*
6.1.9	*Investment in forest education, research and extension*
6.1.10	*Degree of recycling of forest products*
6.2	Indicators of social benefits
6.2.1	*Direct and indirect employment in the forestry sector and forestry sector employment as a proportion of total employment*
6.2.2	*Degree to which social, cultural and spiritual needs met*
6.2.3	*Benefits accruing to local communities (with particular emphasis on women and youth)*
6.2.4	*Contributions to food security*
6.2.5	*Area and percentage 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*
7	**Legal, institutional and policies framework for sustainable forest management**
7.1	Existence of a national forest policy in harmony with other sectoral policies
7.2	Existence of multi-sectoral participation in establishing periodic forest-related planning, assessment, and policy review including cross-sectoral planning and coordination
7.3	Clarifies property right, security of tenure, incl. status of length, exclusivity, enforceability, transferability
7.4	Provides opportunities for public participation in public policy and decision-making related to forest and public access to information
7.5	Existence of a comprehensive legislative and regulatory framework providing, e.g. equitable access to resources, alternative forms of conflict resolution and consideration of land occupancy and cultural right of local populations
7.6	Existence of institutional, human and financial capacity to implement the national forestry policy, and relevant national and international laws, instruments and regulations
7.7	Existence of research and development capacity
7.8	Existence of incentives for investments in the forestry
7.9	Existence of foundation and institution for forest resource and wild animal resource monitoring
7.10	Existence and Implementation of a regional forest ecological compensation system

STRATEGIC PLAN

The continuing support from international organizations and participating countries is necessary for implementing criteria and indicators for sustainable forest management in Asia. The priority for promoting the testing and adaptation of common criteria and indicators for sustainable management of dry forests is to study the feasibility of establishing a regional process, supported by international organizations and adopted by the countries in the region. The suggested strategy and timeframe are shown in Table 16.

Table 16: Strategic Plan and Timeframe for Regional, National and Local Levels of Testing Criteria and Indicators of Dry Forests in the Region

Strategic Plan	Timeframe	Group Responsible
Distribution of the recommendations for establishing an international process and the Framework of National-level Criteria and Indicators based on the outcome of the FAO/UNEP/ITTO/USFS/IIFM Workshop on National-level Criteria and Indicators for Sustainable Forest Management of Dry Forests in Asia in Bhopal, India, 30 November - 3 December 1999. Reporting to IFF.	December, 1999	FAO/UNEP/ITTO/ USFS and countries in Asia
Identify potential sources of external assistance, technical and financial support for the regional process and keep the countries in the region informed.	December 1999 - January 2000	FAO/UNEP/ ITTO/USFS
Countries in Asia report back on the adoption of the Asia Dry Forests Process and the Framework of Regional and National-level Criteria and Indicators for Sustainable Forest Management of Dry Forests	February 2000	Countries in the region
Hold a meeting to establish a Working Group for follow-up actions for testing criteria and indicators in the region and to formally link with international organizations and initiatives. Define the terminology related to criteria and indicators for sustainable forest management	Autumn 2000	FAO/UNEP/ ITTO/USFS and member countries
Build capacity and report on progress at the national level and plan for sub-national development and testing of criteria and indicators	Early 2001	FAO/UNEP/ ITTO/USFS and member countries
Share experiences with other ongoing international initiatives for regional and national levels and report the progress on sub-national levels in each of the member countries	Late 2001	FAO/UNEP/ ITTO/USFS and member countries
Test and report at regional, national and local levels	Continuation of above actions	FAO/UNEP/ ITTO/USFS and member countries

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SUMMARIES OF COUNTRY ACTIVITIES RELATED TO MONITORING PROGRESS TOWARD SUSTAINABLE FOREST MANAGEMENT

Summaries of current sustainable forest management activities in several countries in Asia with dry forests serve to identify successes and weaknesses in developing and applying criteria and indicators at the national level.

Bhutan's first forest management plan, developed in 1964, was mainly focused on timber harvesting. A shift in the country's forest policy over the decades, encouraged by international organizations such as UNDP and FAO, led to more emphasis on conservation of the environment and biodiversity, and socio-economic aspects of forest development. Bhutan has formulated general principles to guide its forest management plans, but has no yet developed detailed criteria and indicators for sustainable forest management.

China, as a member of both ITTO and the Montreal Process, is actively developing national and sub-national-level criteria and indicators in line with these initiatives. In 1995, it established the Sustainable Forestry Research Center (SFRC) within the Chinese Academy of Forestry to lead efforts in developing and testing criteria and indicators for the country. The country is receiving support from UNDP/FAO's "Capacity Building, Research and Extension for Sustainable Forest Management Project." Important activities included formulating the Forestry Action Plan for China's Agenda 21, and establishing demonstration areas to test and refine the criteria and indicators. A provisional Framework of Criteria and Indicators for Sustainable Forest Management in China has also been produced.

India's early forest management policies supported agricultural and timber production as top priorities, but have gradually evolved to ensure environmental stability and ecological balance, with emphasis on strengthening the country's protected area network. Some current issues and constraints facing India include deforestation and degradation, increasing demand for forest products, and insufficient financial support. The Indian Institute of Forest Management took the lead in developing criteria and indicators for sustainable forest management at the national level, and launched the Bhopal-India Process in 1998. Following a national workshop in early 1999, a base set of national-level criteria and indicators for assessing forest management was formulated. Collaboration with other international organizations, such as ITTO and CIFOR, continued to extend the initiative. Through Joint Forest Management and the National Forestry Action Programmeme, the Indian government is promoting sustainable forest management, using criteria and indicators as supportive tools.

Mongolia monitors a wide range of basic indicators for forest management, including those related to forest resources protection, exploitation, and rehabilitation. It also uses "environmental reporting indicators," including 18 for forestry, that are collected and reported annually by local administrations to the central government. The Ministry of Nature and Environment also tracks a number of forest-related indicators as part of its forestry database for planning and decision-making. Some 27 forestry indicators are monitored for inclusion in the country's State of Environment Report. Mongolia's criteria and indicators for sustainable forest management are still evolving, and testing of these criteria and indicators is needed.

Myanmar's new National Forest Policy of 1995 identifies six priority areas for forest development: protection, sustainability, basic needs of the people, efficiency, people's participation and public awareness. To arrest the desertification process of the Dry Zone (one of the country's most important agricultural areas), and to focus on development and conservation, Myanmar established a Dry Zone Greening Department in 1997. Based largely on ITTO's criteria and indicators, Myanmar developed a set of national and forest management unit level criteria and indicators in 1999.

Nepal has enacted several policies and strategic plans to guide the country's natural resources development. The forestry sector underwent a major change from a timber production focus to multiple-use sustainable management. However, the country's lack of financial and human resources has led to heavy dependency on international organizations and donors. The Ministry of Forest and Soil Conservation has identified and developed criteria and indicators at the national level, based mainly on the guidance from CIFOR.

Sri Lanka's main forest management objective was wood production in the past, but current management strategies tend towards sustainable forest management for multiple purposes, incorporating input from local communities. The Forest Department monitors a traditional array of basic forestry indicators as part of its regular functions, but to date there has been no concerted effort to consolidate these indicators or to make them consistent with international criteria and indicators processes.

Thailand's Forest Research Office proposed a set of criteria and indicators to the Royal Forest Department in 1998. The Royal Forest Department then established a special committee to look into the development and implementation of these criteria and indicators. In 1999, Thailand, together with other ASEAN countries, agreed to adopt ITTO's revised criteria and indicators for sustainable management of natural tropical forests as their common framework, thus prompting Thailand to adjust its original set. Thailand is also conducting ongoing research and development of criteria and indicators at the forest management unit level under a pilot study initiated by the Danish Forest and Landscape Institute, World Bank, CIFOR, and Chiang Mai University.