

# **ITTO GUIDELINES FOR THE SUSTAINABLE MANAGEMENT OF NATURAL TROPICAL FORESTS**

**ITTO Policy Development Series 1**

International Tropical Timber Organization (ITTO)  
International Organization Center, 5<sup>th</sup> Floor  
Pacifico-Yokohama, 1-1-1, Minato-Mirai  
Nishi-ku, Yokohama 220-0012  
Japan

July 1992

© International Tropical Timber Organization (ITTO)

First printing: December 1990

Second printing: July 1992

Copy Editor: Habsah Marjuni (FRIM)

Prepared for ITTO by:

Forest Research Institute of Malaysia (FRIM), Kepong, 52109 Kuala Lumpur, Malaysia

Printed in Malaysia

## CONTENTS

### FOREWORD

### 1 INTRODUCTION

### 2 POLICY AND LEGISLATION

- 2.1 Forest Policy
- 2.2 National Forest Inventory
- 2.3 Permanent Forest Estate
- 2.4 Forest ownership
- 2.5 National Forest Service

### 3 FOREST MANAGEMENT

- 3.1 Planning
  - 3.1.1 Static and dynamic inventory
  - 3.1.2 Setting of management objectives
  - 3.1.3 Choice of silvicultural concept
  - 3.1.4 Yield regulation, Annual allowable Cut (AAC)
  - 3.1.5 Management inventory and mapping
  - 3.1.6 Preparation of working plans
  - 3.1.7 Environmental impact assessment
- 3.2 Harvesting
  - 3.2.1 Pre-harvest prescriptions
  - 3.2.2 Roads
  - 3.2.3 Extraction
  - 3.2.4 Post-harvest stand management
- 3.3 Protection
  - 3.3.1 Control of access
  - 3.3.2 Fire
  - 3.3.3 Chemicals
- 3.4 Legal Managements
  - 3.4.1 Concession managements
  - 3.4.2 Logging permits on private or customarily held land
  - 3.4.3 Salvage permits
- 3.5 Monitoring and Research
  - 3.5.1 Yield control and silviculture
  - 3.5.2 Environmental impact studies

### 4. SOCIO-ECONOMIC AND FINANCIAL ASPECTS

- 4.1 Relations With Local Populations
- 4.2 Economics, incentives, Taxation

#### Appendix 1. CATEGORIES OF FOREST LAND

#### Appendix 2. NATIONAL FOREST INVENTORY

#### Appendix 3. ROADS AND HARVESTING

#### Appendix 4. CONCESSION LEGISLATION

#### Appendix 5. UNITED NATIONS ENVIRONMENT PROGRAMME STATEMENT ON SUSTAINABLE DEVELOPMENT

#### Appendix 6. INDICATIVE SCHEME OF PREREQUISITES FOR SUSTAINABLE MANAGEMENT AT VARIOUS LEVELS, INCLUDING GUIDELINES

## FOREWORD

It is with great pleasure that I hereby introduce the first publication in the ITTO Policy Development Series. For our young Organization this publication represents a major milestone in our efforts to meet the overall objective of achieving management of tropical forests on a sustainable basis. It also represents a major breakthrough in cooperation between the member countries of ITTO, conservation NGOs and the trade in tropical timber which had provided valuable inputs in its formulation.

Guidelines for "best practice" in relation to the sustainable management of natural forests were first requested by the ITTO Council at its fourth session in May 1989. The Overseas Development Administration of the United Kingdom assisted the ITTO Secretariat in this task and a report was presented at the fifth ITTO meeting in November 1989. Following approval, the Council allocated funds to develop these Guidelines further as part of the action programme in the field of Reforestation and Forest Management. An international 13-member panel of experts, comprised of representatives from producer and consumer countries in tropical timber, environmental NGOs (WWF), UN Agencies (FAO), the Trade, and other consultants from ODA, CSIRO and IIED, was established. Following a workshop in March 1990, their report was endorsed at the eighth Council session in Bali in May 1990.

The report is divided into four main sections, each stating sets of basic principles followed by actions considered appropriate for these principles. The text is intentionally kept short and concise in order to be readable to a wider audience. Because the target group is forest managers and administrators in all three tropical regions where natural forest conditions and management procedures vary considerably, actions are proposed in general terms. The framework of these Guidelines should therefore be modified and shaped into more specific guidelines which are compatible with regional and national forestry practices.

The dedication and generosity of the experts and consultants who worked to formulate the Guidelines are acknowledged. As stated, it is a major step in the ongoing process of developing sustainable forest management in the tropics. It will certainly need to be modified and expanded as we go along and gain better understanding of the complexities of managing this valuable resource. The challenge now lies in the implementation of these Guidelines on the grounds to enable modifications, as appropriate, to be made. This calls for even greater efforts, cooperation and understanding. These Guidelines will thus go a long way in achieving ITTO's target to produce tropical timber for export from sustainably managed forests by the year 2000.

Yokohama, Japan  
1 November 1990

B.C.Y. Freezailah  
Executive Director

## 1. INTRODUCTION

These guidelines contain a set of principles which constitutes the international reference standard established by ITTO for the development of more specific guidelines, at the national level, for sustainable management of natural tropical forests for timber production. The development, application and enforcement of national guidelines based on this standard are matters for national decision by individual timber producing countries.

The present reference standard is based on the report of a working Group established in accordance with Council Decision 3 (VII). It has been elaborated on the basis of the Terms of Reference provided by the programme of work for ITTO in the field of reforestation and forest management for the year 1990, endorsed by the Council at its Seventh Session in November 1989. The Working Group Report was tabled at the Sixth Session of the Permanent Committee on Reforestation and Forest Management and adopted by the Eighth Session of the Council in May 1990. This initiative of ITTO refers to objective 1(h) of the International Tropical Timber Agreement, 1983: "To encourage the development of national policies aimed at sustainable utilization and conservation of tropical forests and their genetic resources, and at maintaining the ecological balance in the regions concerned."

The adoption by ITTO and its member countries of international guidelines that constitute a reference standard for sustainable management of natural forests is in the best interest of all producer and consumer countries which are concerned with the efficient and sustainable development of the tropical forest resources and forest-based industries.

ITTO attaches high priority to the definition of the essential principles and associated actions which should serve to guide the development of national guidelines in each country, in order that they may conform to the international reference standard agreed within the Organization. The Organization also gives high priority to assist member countries, which may need and request such assistance, to obtain such outside technical and financial help as they may require to develop their own national guidelines.

The ITTO guidelines are presented in the form of principles and possible actions covering considerations ranging from general policy to forestry operations aspects. Where available, examples of elements for possible inclusion in national and operational guidelines are given in appendices.

## 2. POLICY AND LEGISLATION

### 2.1 FOREST POLICY

Principle 1. A strong and continued political commitment at the highest level is indispensable for sustainable forest management to succeed. (See Appendix 6).

Possible action 1. A national land use policy aiming at the sustainable use of all natural resources, including the establishment of a permanent forest base, should be developed and adopted.

Possible action 2. A national forest policy forming an integral part of the national land use policy, assuring a balanced use of forests, should be formulated by means of a process seeking the consensus of all the actors involved: government, local population and the private sector.

Possible action 3. The organization of seminars for discussing policy, involving the above-mentioned interest groups.

Considerations in deciding a forest policy include the present proportion of land under forest; needs of protection and conservation of biological diversity (see Appendix 1); needs and aspirations of present and future generations of the population; the place of forestry in national economic planning; the various objectives of forest policy and relative importance of these; the amount of public and private forests.

Principle 2. An agreed forest policy should be supported by appropriate legislation which should, in turn, be in harmony with laws concerning related sectors.

Possible action 4. Laws and regulations at appropriate national and local government levels should be enacted, or revised as needed, to support the established forest policy, in harmony with policies, laws and regulations in related sectors.

Principle 3. There should be a mechanism for regular revision of policy in the light of new circumstances and/or availability of new information.

Possible action 5. Provision of adequate funds for research and monitoring to allow updating of policies.

Possible action 6. Research on valuation of full economic benefits (total of marketed and non-marketed goods and services), provided by forests primarily managed for timber production, to enable foresters to better state the case for natural forest management for sustained timber production.

## 2.2 NATIONAL FOREST INVENTORY

Principle 4. A national forest inventory should establish the importance of all forests, independent of their ownership status, for the purposes identified in section 2.1 (see also Appendix 2).

Principle 5. There should be flexible provisions for such inventories to be broadened to include information not previously covered, if and when the need and opportunity for such additional information arises.

## 2.3 PERMANENT FOREST ESTATE

Principle 6. Certain categories of land, whether public or private, need to be kept under permanent forest cover to secure their optimal contribution to national development.

Principle 7. The different categories of land to be kept under permanent forest are (see also Appendix 1): land to be protected; land for nature conservation; land for production of timber and other forest products; land intended to fulfill combinations of these objectives.

Possible action 7. To identify, survey and boundary mark the various categories of the Permanent Forest Estate, in consultation with surrounding populations, taking into account their present and future needs for agricultural land and their customary use of the forest.

Principle 8. Land destined for conversion to other uses (agriculture, mines, etc.), and any land for which the final use is uncertain, should be kept under managed forest until the need for clearing arises.

## 2.4 FOREST OWNERSHIP

Principle 9. The principles and recommendations for implementation in these guidelines apply equally strictly to national forests and privately owned or customarily held forests.

## 2.5 NATIONAL FOREST SERVICE

Principle 10. There should be a national agency capable of managing the government forest estate, and assisting in the management of private and customarily held forests, according to the objectives laid down in the national forest policy.

Possible action 8. Provide for such a national agency.

## 3. FOREST MANAGEMENT

Principle 11. Forests set aside for timber production are able to fulfill other important objectives, such as environmental protection and, to a varying extent, conservation of species and ecosystems. These multiple uses should be safeguarded by the application of the environmental standards, spelled out below, to all forest operations.

### 3.1 PLANMNG

Principle 12. Proper planning, at national, forest management unit and operational levels reduces economic and environmental costs and is therefore an essential component of long-term sustainable forest management.

Possible action 9. To make adequate provision for forest management planning capacity at all administrative levels.

#### 3.1.1 Static and dynamic inventory

Principle 13. The forests set aside for timber production should be the subject of a more detailed inventory to allow for planning of forest management and timber

harvesting operations The question of type and quantity of data to be gathered should be the subject of cost-benefit analysis.

Possible action 10. Carry out inventories, concentrating on quantities of timber of currently and potentially commercial tree species of the forest for future timber production (see also Appendix 2)

Possible action 11 To establish representative series of permanent sample plots.

### 3.1.2 Setting of management objectives

Principle 14 Management objectives should be set rationally for each forest management unit Formulation of objectives should allow the forest manager to respond flexibly to present and future variations in physical, biological and socio-economic circumstances, keeping in mind the overall objectives of sustainability.

Principle 15. The size of each production forest management unit should preferably be a function of felling cycle, the average harvested volume per ha and annual timber outturn target of the operating agency (state forest enterprise, concessionaire, etc )

### 3.1.3 Choice of silvicultural concept

Principle 16 The choice of silvicultural concept should be aimed at sustained yield at minimum cost, enabling harvesting now and in the future, while respecting recognized secondary objectives

Possible action 12. To gather information which provides the basis for rational choice of silvicultural practices, such as inventories and measurements from growth and yield plots, as well as data on market demand for various end uses of timber products. A true progressive silvicultural system should be developed by gradually improving on these practices as better information becomes available. The harvesting intensity and the design of harvesting pattern should be integral parts of the silvicultural concept.

### 3.1.4 Yield regulation, Annual Allowable Cut (AAC)

Principle 17. In order to ensure a sustained production of timber from each forest management unit, a reliable method for controlling timber yield should be adopted

Possible action 13. The Annual Allowable Cut (AAC) should be set conservatively in the case of absence of reliable data on the regeneration and growth dynamics of tree species. Especially with regard to diameter increment and response to the effect of logging on trees and soil This applies both to tree species which, under current market conditions, are desirable or which have the potential to become commercially attractive in the future, recognizing that domestic and world markets for forest produce are under very dynamic de-



velopment. In practice, this will often mean conservative setting of rotation length, felling cycle and girth limits. As and when permanent sample plots begin to yield more reliable information about dynamics of desirable species, a reassessment of AAC should be considered.

Possible action 14. To make provision for regular review of AAC (5 - yearly) in order to take account of replacement of original forests by managed forests and the transfer of conversion forest to other uses. In the longer term, stand modelling should be introduced to assure efficient and responsible yield regulation.

### 3.1.5 Management inventory and mapping

Principle 18. A management inventory supported by a detailed map is indispensable to the preparation of working plans for each forest management unit.

Possible action 15. Management inventory and mapping should be carried out.

### 3.1.6 Preparation of working plans

Principle 19. Working Plans should guarantee the respect of environmental standards in field operations.

Possible action 16. Preparation of Working Plans including the following details (see also 3.2.3):

- \* sequence of annual harvesting areas and allocation of all-weather and dry-weather areas;
- \* areas to be excluded from harvesting;
- \* road and extraction track layout;
- \* details of marking, harvesting, post-harvesting inventory; silvicultural treatments;
- \* fire management plan

### 3.1.7 Environmental impact assessment

Principle 20. Forest management operations can have important positive or Negative environmental consequences, both in the forest itself and outside (trans-boundary effects). These consequences should be assessed in advance of operations to ensure overall sustainability.

Possible action 17. Specify conditions under which an Environmental Impact Assessment (EIA) should be required.

Possible action 18. Design EIA procedure and provide for qualified staff to carry out EIAs.

## 3.2 HARVESTING

Principle 21. Harvesting operations should fit into the silvicultural concept, and may, if they are well planned and executed, help to provide conditions for increased increment and for successful regeneration. Efficiency and sustainability of forest management depend to a large extent on the quality of harvesting operations. Inadequately executed harvesting operations can have far-reaching negative impacts on the environment, such as erosion, pollution, habitat disruption and reduction of biological diversity, and may jeopardize the implementation of the silvicultural concept.

### 3.2.1 Pre-harvest prescriptions

Principle 22. Pre-harvest prescriptions are important to minimize logging damage to the residual stand, to reduce health risks for logging personnel and to attune harvesting with the silvicultural concept.

Possible action 19. To draw up detailed prescriptions, including measures such as timber cutting, marking of trees to be felled and/or residuals to be retained and indications of extraction direction and felling direction.

### 3.2.2 Roads

Principle 23. Planning, location, design, and construction of roads, bridges, causeways and fords should be done so as to minimize environmental damage.

Possible action 20. Limits to dimension, road grades, drainage requirements and conservation of buffer strips along streams should be specified (see further Appendix 3).

### 3.2.3 Extraction

Principle 24. Extraction frequently involves the use of heavy machinery and, therefore, precautions must be taken to avoid damage.

Possible action 21. A logging plan should be drawn up including:

- \* areas where logging is subject to special restrictions or forbidden (flora and fauna conservation and soil protection areas, buffer strips, sites of cultural interest);
- \* specifications for construction and restoration of skidding tracks, watercourse crossings and log landing (including drainage);
- \* wet weather limitations;

allowed harvesting equipment;  
 machine operator responsibilities (directional felling, etc.); marking of trees to be retained and trees to be removed (see further Appendix 3).

### 3.2.4 Post-harvest stand management

Principle 25. Post-harvest operations are necessary to assess logging damage, the state of forest regeneration, the need for releasing and other silvicultural operations to assure the future timber crop.

Possible action 22. Carry out post-harvest inventory, establishing the need for silvicultural interventions.

## 3.3 PROTECTION

### 3.3.1 Control of access

Principle 26. Permanent production forest should be protected from activities that are incompatible with sustainable timber production, such as the encroachment by shifting cultivators often associated with the opening up of the forest.

Possible action 23. Access to logging roads that are not part of the national infrastructure (1.e. through-roads) should be strictly controlled. Consideration should be given to the possibility of managing special buffer zones, bordering the production forest, for the benefit of the local population.

### 3.3.2 Fire

Principle 27. Fire is a serious threat to future productivity and environmental quality of the forest. Increased fire risk in areas being logged, and even more so in areas which have been logged, demands stringent safety measures.

Possible action 24. A fire management plan should be established for each forest management unit, taking into account the degree of risks. The fire management plans may include regular clearing of boundaries between the forest estate and other areas, and between forest blocks within the forest estate. In areas being logged or already logged, additional safety measures such as restrictions on use of fire, keeping corridors between blocks free of logging debris, etc., should be specified. Advance warning systems, including those that are satellite based, should be used.

### 3.3.3 Chemicals

Principle 28. Chemicals, such as the ones used in silvicultural treatment, constitute risks both in terms of personnel safety and environmental pollution.

Possible action 25. Instructions for handling and storage of chemicals and waste oil should be provided and enforced. Special restrictions are to apply near watercourses and other sensitive areas.

### 3.4 LEGAL ARRANGEMENTS

#### 3.4.1 Concession agreements

Principle 29. There should be incentives to support long term sustainable forest management for all parties involved. Concessionaires should have the long term viability of their concession provided for (mainly by government controlling access to the forest); local population should benefit from forest management (see section 4); government should receive sufficient revenue to continue its forest management operations.

Possible action 26. Concession legislation should be adopted or reinforced to cover the following aspects: the responsibilities and authority of the forest service and the responsibility of the concessionaires; the size and duration of concession or licence; conditions for renewal and termination. '

Concession legislation is to include (see also Appendix 4): (a) categories of contracts, and application and granting procedures; (b) objects of the contract; (c) rights granted and rights withheld; (d) establishment or expansion of local wood-processing units; (e) felling, wood extraction and transport; (f) road construction and improvement of infrastructure; (g) forest management and reforestation; (h) forest taxes, stumpage and other fees; (i) control, supervision, and sanctions for disrespect of concession terms; (j) other general provisions; (k) other environmental considerations.

#### 3.4.2 Logging permits on private or customarily held land

Principle 30. For private or customarily held forests the basic approach to sustainability is the same as for government forests (see 3.4.1).

Principle 31. The national forest service should provide assistance to customary rights holders and private forest owners to manage the forests sustainably.

Possible action 27. Provide for or strengthen a forestry extension service which can provide forest management training for various categories of land-holders.

#### 3.4.3 Salvage permits

Principle 32. Timber from forest land to be converted to other uses, and from forests damaged by hurricanes and other disasters, should be optimally utilized. At the same time, disruption of management of the permanent production forest should be prevented.

Possible action 28. Devise mechanisms to provide for orderly introduction of timber from salvage operations into the market.

Possible action 29. Provide for volume adjustment of log removal from logging concessions to account for timber, including material of below-minimum exploitable diameter, becoming available from conversion land.

### 3.5 MONITORING AND RESEARCH

Principle 33. Monitoring and research should provide feedback about the compatibility of forest management operations with the objectives of sustainable timber production and other forest uses.

#### 3.5.1 Yield control and silviculture

Possible action 30. Develop design of Permanent Sample Plot (PSP) procedure (distribution, number, design, minimum measurements) and of monitoring of PSPS to increase accuracy of Annual Allowable Cut calculations.

Possible action 31. Assessment of compatibility of management practices and silvicultural systems by carrying out regeneration surveys, and studies on need for post-harvest stand treatment and other relevant subjects.

Possible action 32. To study the dynamics of main timber species to enable stand modelling.

#### 3.5.2 Environmental impact studies

Possible action 33. To assess compatibility of logging practices with declared secondary objectives such as conservation and protection, and with the overall principle of sustainability.

## 4. SOCIO.ECONOMIC AND FINANCIAL ASPECTS

Principle 34. Sustained timber production depends on an equitable distribution of incentives, costs and benefits, associated with forest management, between the principal participants, namely the forest authority, forest owners, concessionaires and local communities.

### 4.1 RELATIONS WITH LOCAL POPULATIONS

Principle 35. The success of forest management for sustained timber production depends to a considerable degree on its compatibility with the interests of local populations.

Principle 36. Timber permits for areas inhabited by indigenous peoples should take into consideration the conditions recommended by the World Bank and the ILO for work in such areas inter alia.

Possible action 34. Provisions should be made: for consultation with local people, starting in the planning phase before road building and logging commences; for continued exercise of customary rights; for concession agreements and other logging permits to cover the extent of assistance, employment, compensation, etc., to be provided

#### 4.2 ECONOMICS, INCENTIVES, TAXATION

Principle 37. Management for timber production can only be sustained in the long-term if it is economically viable. (taking full account in the economic value of all relevant costs and benefits from the conservation of the forest and its ecological and environmental influences).

Possible action 35. National and international marketing efforts should be intensified in order to realize highest possible value of forest products and improve utilization of the resources from sustainably managed forests.

Principle 38. A share of the financial benefits accruing from timber harvesting should be considered and used as funds for maintaining the productive capacity of the forest resource.

Principle 39 Forest fees and taxes should be considered as incentives to encourage more rational and less wasteful forest utilization and the establishment of an efficient processing industry. and to discourage high-grading and logging of forests which are marginal for timber production. They should be and remain directly related to the real cost of forest management, Taxation procedures should be as simple as possible and dear to all parties involved

Principle 40 In order to achieve the main principle of good and sustainable management, forest fees and taxes may need to be revised at relatively short notice, due to circumstances outside the control of loggers and the forest agency (e.g fluctuations in international timber market and currency) The national forest agency should be granted the authority to carry out such revisions.

Principle 41 Continuity of operations is essential for sustainable forest management.

Possible action 36, In order to remain operational even in adverse budget situations, the forest authority should be granted a certain degree of financial autonomy which, among other things, should allow the accumulation of funds. This can be achieved e.g. by allowing the forest authority to collect part and maybe the full amount of forest fees and taxes without intervention from other government departments.

APPENDIX 1.  
CATEGORIES OF FOREST LAND

(a) FORESTS WHERE LOGGING IS NOT ALLOWED.

- PROTECTION FORESTS ON FRAGILE LANDS

Fragile lands to be kept under permanent forest cover comprise: critical soils; catchment areas; steep slopes; land at high altitudes. Main criteria are related to erodibility of the soil (function of climate, especially amount and intensity of rainfall, parent material and angle of slope). Other criteria are inherent infertility and unsuitability for harvesting, e.g. mountain or mist forest, ("unproductive forest").

- FORESTS SET ASIDE FOR PLANT AND ANIMAL SPECIES AND ECOSYSTEM PRESERVATION

Forests set aside for the purpose of nature conservation should be designed to preserve a representative sample of ecosystems, areas of high biodiversity, and habitats of endangered species and of wide-ranging and migratory species. These measures to be supplemented by restrictions on the use of certain additional forest areas for the conservation of wide-ranging vertebrate species.

(b) PRODUCTION FOREST. Forest designated for the sustained production of timber and other forest products, often with protection and/or nature conservation as recognized secondary objectives. Areas to be chosen because of their potential to provide a yield of high-quality timber in perpetuity. (Production forest should not be a residual use). This category may also include areas of degraded and appropriate for reforestation.

Categories (a) and (b) together constitute the permanent forest estate.

c) CONVERSION FOREST. Land destined, in the national or regional land use plans, to be converted to other uses should be kept under forest until required, and meanwhile harvested according to the same guidelines as the Permanent Production Forest. The same should apply to forest land of which the final use is not yet determined.

## APPENDIX 2. NATIONAL FOREST INVENTORY

### A. NATIONAL INVENTORY

A national inventory of the present state of all forested land should be carried out to establish its suitability for the following purposes:

- production of timber (quantifying standing timber volume of both presently merchantable and as yet unmarketable species, and regenerative capacity),
- production of non-timber products (both of present and potential value):
- protection, including that of climate:
- nature conservation,
- various agricultural and other land uses.

The most appropriate use should be made of satellite and computer technology.

### B. STATIC AND DYNAMIC INVENTORY

The main purpose of static and dynamic inventory is to assess possibilities for timber harvesting and longer-term timber production. Quantitative information should be gathered on both commercial and presently non-commercial species, including the lower diameter classes, and regeneration.

The conditions under which inventories of various scales and intensities should be used need to be established.

During timber inventories, other aspects of the forest, such as its importance for wildlife populations and the occurrence of non-timber forest products, can be qualitatively assessed at little extra cost. Cooperation with other institutions and facilitation of the exploitation of inventory data by researchers from other disciplines can help to improve the utility of forest inventories.

The history of management of a forest should be recorded if known.



### APPENDIX3. ROADS AND HARVESTING

The following considerations are important on grounds of efficiency and to keep environmental damage to the minimum:

- a) Upper limits to ramp, road and harvesting track dimensions, and clearing width for various categories of extraction roads.
- b) Location of roads, for minimum earthworks and ease of drainage. Maximum allowable road grades and exceptions to this condition (where construction can be significantly shortened or earthworks reduced, and adequate drainage can be installed).
- c) Drainage may be either side (turnout) drains, inverts or cross drains, or simply points along a track or road which, by their nature or design, are to remove water from the track or road.  
Avoiding soil displacement (for instance side cutting) as much as possible during harvesting track construction.
- e) Stream crossing design. Permanent crossing construction specifications. Temporary crossing to be located on sites with stable stream bed material and where bank restoration will be possible. Crossing to be corduroyed with logs or constructed of stable gravel material if necessary.
- f) Definition of buffer strips or streamside reserves and other "No-go" areas, to remain undisturbed except where through access has been approved. Widths of strips in proportion to watercourse width.
- g) Logging vehicles, wheeled versus tracked. Maximum blade width for harvesting machines. All machines to be fitted with a winch carrying a minimum amount of wire rope.
- h) Feller and machine operator responsibilities (directional felling, etc.)
- i) indication of periods when logging is to be restricted or stopped altogether for climatic reasons and conditions to be fulfilled for (reduced) logging to continue during climatically unfavourable periods (quality of drainage works, volume of cut, immediate snagging and hauling, area restrictions, provision for district forester to stop logging operations if the weather makes this necessary).
- j) Marking of trees to be retained: seed-bearers and healthy, growing trees of desirable species which have outstanding vigour and form. Criteria for and spacing of seed trees.
- k) Marking of trees for removal: all commercial stems over exploitable diameter as well as those stems below minimum exploitable diameter that are defective or severely damaged, and will produce a log of minimum standard.
- l) Penalties for avoidable damage to the retained stand.
- m) Logging should be carried out according to a logging plan. A logging plan, with maps, should include:
  - the area boundaries as they are to be marked in the field (Boundaries are to follow creeks wherever possible to minimize the number of creek crossings);

- special management zones, covering all areas where logging is subject to special conditions or restrictions (areas of scientific or landscape significance, erosion prone sites or particularly steep sites);
- designated streams that are to be left undisturbed for reasons of erosion risk or wildlife habitat:
- haulage roads;
- major arterial harvesting track:
- landings:
- roads:
- drainage;
- buffer strips/streamside reserves:
- watercourse crossings (permanent and temporary),
- harvesting equipment.

#### APPENDIX4. CONCESSION LEGISLATION

General considerations for concession agreements concern the relative responsibilities of the Forest Department and concessionaires, the size and duration of concession or licence and conditions for renewal.

The following is a list of what elements concession legislation is to include:

- a) Categories of contracts and application and granting procedures. Minimum requirements and obligations related to a certain type of contract; public announcement of new concession areas; documents and information to be submitted with the application; government services and committees to be concerned with the selection of candidates; involvement of the Forest Department.
- b) Concerned parties and objects of the contract. Responsible agency issuing the contract; name, address and legal status of the grantee; description of the allocated areas; contract duration; date from which the contract becomes valid; official registration of granted contracts; renewal of expired contracts.
- c) Rights granted and rights withheld. Exclusive or non-exclusive rights to harvest timber; right to construct and operate logging roads; right to establish and operate logging camps, office buildings and wood-processing facilities; hunting and fishing rights; rights of access; rights of the local population; harvesting of non-limber products.
- d) Establishment or expansion of local wood-processing units. Minimum percentage of raw material to be processed; type of conversion unit to be established; investment to be effected; time-schedule for commencement of operations.
- e) Felling, wood extraction and transport. Minimum and maximum volume to be harvested annually; annual allowable cut by species or groups of species; submission of felling programmes; working of area in subsequent coupes; felling restrictions and minimum diameter for culling.
- f) Road construction and improvement of infrastructure. Minimum construction standards for forest roads; responsibility for maintenance; legal status of roads constructed by the grantee; facilities of public interest to be constructed (e.g. community roads, school buildings and hospitals).
- g) Forest management and reforestation. Preparation and revision of forest inventories, forest maps, and management plans; minimum tasks to be performed by the grantee with regard to forest protection and silviculture; annual reforestation programme; employment of technically qualified personnel.
- h) Forest taxes, stumpage and other fees. Categories of taxes and fees to be levied in exchange for the granted harvesting rights; methods of assessment (stumpage appraisal, standard fees, etc.); collection procedures.
- i) Control, supervision and sanction. Inspection of granted areas and

Premises thereon; timber (hammering) marks; inventories by forest officers; records and documents to be regularly submitted by the grantee; annual cutting permit; deposit of surety bond; penalty payments; suspension of operations; cancellation of contract.

j) Other general provisions. Applicable arbitration procedures; applicable law and jurisdiction; removals of equipment and machinery after cancellation or termination of contract; continuation of wood processing units linked to a particular concession area; health and safety requirements

k) Other environment considerations. Areas to be excluded from felling; modifications of harvesting take into consideration requirements related to sustainable management of genetic resource of plants and animals and protection of ecosystems, watersheds and erosion-pronesites.

APPENDIX 5.  
UNITED NATIONS ENVIRONMENT PROGRAMME  
STATEMENT ON SUSTAINABLE DEVELOPMENT

GOVERNING COUNCIL  
FIFTEENTH SESSION, 23 MAY 1989

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs and does not imply in any way encroachment upon national sovereignty. The Governing Council considers that the achievement of sustainable development involves co-operation within and across national boundaries. It implies progress towards national and international equity including assistance to developing countries, in accordance with their national development plans, priorities and objectives. It implies further the existence of a supportive international economic environment that would result in sustained economic growth and development in all countries, particularly in developing countries, which is of major importance for sound management of the environment. It also implies the maintenance, rational use and enhancement of the natural resource base that underpins ecological resilience and economic growth. Sustainable development further implies incorporation of environmental concerns and considerations into development planning and policies, and does not represent a new form of conditionality in aid or development financing.

APPENDIX 6.  
INDICATIVE SCHEME OF PREREQUISITES FOR  
SUSTAINABLE MANAGEMENT AT VARIOUS LEVELS,  
INCLUDING GUIDELINES

	National level	Management unit level	Local level
Land use policy	e.g. * establishing a permanent forest base	e.g. * demarking forest boundaries and buffer Zones	
Forest policy including forest use planning	e.g. * national inventory * assuring a balanced use of forests  * concession legislation * assuring conditions for implementation	* designating categories of forest land  * inventory	
Forest planning and management	e.g. * providing guidelines for management units	e.g. * adaptation of national guidelines * choice of silvicultural system * providing operational guidelines	e.g. * adaptation of operational guidelines * preparation of working plan
Operation		e.g. * designing roads	e.g. machine operator responsibilities

The table shows actions and outputs at different levels which in combination constitute the prerequisite for sustainable management. Some of the outputs are the consequence of other higher ranking outputs, others are complementary to each other.