

STATUS OF TROPICAL FOREST MANAGEMENT 2005



INTERNATIONAL TROPICAL TIMBER ORGANIZATION



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The International Tropical Timber Organization (ITTO) is an intergovernmental organization promoting the conservation and sustainable management, use and trade of tropical forest resources. Its 59 members represent about 80% of the world's tropical forests and 90% of the global tropical timber trade. ITTO develops internationally agreed policy documents to promote sustainable forest management and forest conservation and assists tropical member countries to adapt such policies to local circumstances and to implement them in the field through projects. In addition, ITTO collects, analyses and disseminates data on the production and trade of tropical timber and funds projects and other actions aimed at developing industries at both community and industrial scales. All projects are funded by voluntary contributions, mostly from consumer member countries. Since it became operational in 1987, ITTO has funded more than 700 projects, pre-projects and activities valued at more than US\$280 million. The major donors are the governments of Japan, Switzerland and the USA. ITTO contact details can be found on the back cover.

This report and an associated summary are made available by ITTO as part of its policy of contributing in a timely manner to public debate on issues related to the conservation and sustainable management, use and trade of tropical forest resources.

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FOREWORD

Is forest management improving in the tropics? This report sets out to answer that question.

The fate of the tropical forests has been on the global agenda since at least the 1970s. ITTO itself was created in the early 1980s partly out of a desire to assist tropical countries in their efforts to improve the management of their timber-producing tropical forests. An early survey by ITTO (in 1988) found that a miniscule amount of such forest was being managed in accordance with good forest practice; the remainder was either being 'mined' for timber or had not yet been reached by the tractors and chainsaws. Some activists, particularly in developed countries outside the tropics, called for bans on tropical timber imports.

At the same time, many tropical countries were undergoing profound political, economic, social and cultural changes, and restricting the tropical timber trade was often neither possible nor desirable. Forest-based industries supplied many tropical countries with much-needed foreign exchange and local employment, and also assisted the development of agriculture by providing access to previously inaccessible land. This process has arguably taken place in almost all now-developed countries, and tropical countries were thus pursuing a tried-and-true development model.

ITTO's approach has been to urge countries to undertake land-use planning, in which land is assigned as 'permanent forest estate' for the sustainable production of timber and other forest goods and services. On this land, ITTO has encouraged countries to adopt sustainable forest management, whereby the inherent values of the forest are maintained (or at least not unduly reduced) while revenues are earned, people employed and communities sustained by the production of timber and other forest products and services.

It hasn't always worked. Some countries have already lost a significant part of their natural forest heritage and now have relatively little forest and large areas of degraded, unstable and unproductive land. A key task of the forestry sectors in such countries is to restore forest cover where possible and appropriate. But others still have vast natural forests and are better placed to implement sustainable forest management on a large scale.

This report provides a comprehensive analysis of the forest management situation in all 33 of ITTO's producer member countries. Using information submitted by the countries themselves and supplemented by data from a wide range of other sources, it addresses the policy and institutional settings in each country, the approaches taken to the allocation and management of resources, and the status of management of those resources.

The data indicate that significant progress has been made since 1988 towards the sustainable management of natural tropical forests, but the extent of such progress remains far from satisfactory. It is clear that the security of the tropical forest estate is still in jeopardy in many countries. Processes that allow the greater participation of local communities and other legitimate stakeholders in the management of and benefit-sharing from forests are often still insufficiently developed.

We know that tropical forests are important at the global level. Therefore, the international community must strengthen its assistance to countries in their quest to establish sustainable forest management across their permanent forest estates. This report adds considerably to our understanding and knowledge of the status of management in tropical forests and provides a basis for informed debate on how best to encourage further progress.

Manoel Sobral Filho

Executive Director

International Tropical Timber Organization

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SUMMARY

Despite difficulties and some notable deficiencies, there has been significant progress towards sustainable forest management (SFM) in the tropics since an initial survey by ITTO in 1988. Countries have established and are starting to implement new forest policies that contain the basic elements of SFM. More forests have been given some security by commitment as permanent forest estate (PFE – or a similar concept) for production or protection, and more are actually being managed sustainably. Moreover, some of the PFE is also certified – a new development since 1988. All this is encouraging, but the proportion of natural production forest under SFM is still very low, and SFM is distributed unevenly across the tropics and within countries.

In ITTO producer member countries of all three regions combined, at least 25.2 million hectares of the natural production PFE (7.1% of the 353 million hectares of total natural production PFE) are estimated to be managed sustainably. An estimated 11.2 million hectares (2.4%) of the protection PFE (461 million hectares) are thought to be so managed. Thus, a minimum of 36.4 million hectares (4.5%) of the total natural PFE (814 million hectares) are considered to be under SFM. An estimated 96.2 million hectares (27%) of natural production PFE are covered by management plans and 10.5 million hectares (3.0%) are certified; about 17.8 million hectares (3.8%) of protection PFE have management plans. An estimated 14.3 million hectares of plantations (32% of all plantations in the PFE) are covered by management plans; 1.77 million hectares (3.9%) are certified.

In all ITTO African producer member countries combined, at least 4.30 million hectares (6.1%) of the natural production PFE (70.5 million hectares) are estimated to be managed sustainably. At least 1.73 million hectares (4.4%) of the protection PFE (39.3 million hectares) are estimated to be so managed. Thus, at least 6.03 million hectares (5.5%) of the overall natural PFE (110 million hectares) are considered to be under SFM. An estimated 10.0 million hectares (14%) of natural production PFE are covered by management plans and 1.48 million hectares (2.1%) are certified; about 1.22 million

hectares (3.1%) of protection PFE have management plans. An estimated 488,000 hectares of plantations (59% of all plantations in the PFE) are covered by management plans; none is certified.

In all ITTO producer member countries in the Asia-Pacific region combined, at least 14.4 million hectares (15%) of the natural production PFE (97.4 million hectares) are estimated to be managed sustainably. At least 5.15 million hectares (7.3%) of the protection PFE (70.9 million hectares) are estimated to be so managed. Thus, a total of 19.5 million hectares (11.6%) of the overall natural PFE (168 million hectares) are considered to be under SFM. An estimated 55.1 million hectares (56%) of natural production PFE are covered by management plans and 4.91 million hectares (5.0%) are certified; about 8.25 million hectares (12%) of protection PFE have management plans. An estimated 11.5 million hectares of plantations (30% of all plantations in the PFE) are covered by management plans; 184,000 hectares (0.5%) are certified.

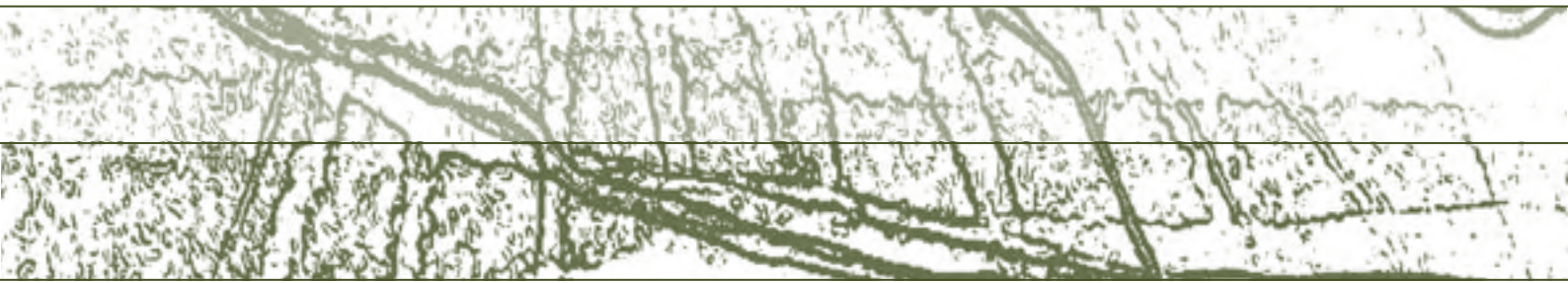
In all ITTO producer member countries in Latin America and the Caribbean combined, at least 6.47 million hectares (3.5%) of the natural production PFE (185 million hectares) are estimated to be managed sustainably. At least 4.34 million hectares (1.2%) of the protection PFE (351 million hectares) are estimated to be so managed. Thus, at least 10.8 million hectares (2.0%) of the overall natural PFE (536 million hectares) are considered to be under SFM. An estimated 31.2 million hectares (17%) of natural production PFE are covered by management plans and 4.15 million hectares (2.2%) are certified; about 8.37 million hectares (2.4%) of protection PFE have management plans. An estimated 2.37 million hectares of plantations (42% of all plantations in the PFE) are covered by management plans; 1.59 million hectares (28%) are certified.

Despite the progress made since 1988, significant areas of tropical forest are still lost every year, and unsustainable (and often illegal) extraction of tropical forest resources remains widespread. However, with most countries now attempting widespread implementation of SFM, it is hoped that the pace of progress will increase in coming years.

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PART 1 – OVERVIEW

INTRODUCTION

The purpose of this report is to review the status of forest management in ITTO producer member countries. These countries account for nearly all the world's closed tropical forest resources and therefore this report presents a global perspective on tropical forests. It complements the forest resource assessments of the Food and Agriculture Organization of the United Nations (FAO) and ITTO's *Annual Review and Assessment of the World Timber Situation*: together they provide the principal elements of a comprehensive picture of the changing condition of the world's forests.

Since the early 1970s there has been widespread public concern about the rate at which tropical forests are being degraded or destroyed. These processes have been going on in certain localities for a long time, but they have accelerated greatly

since the 1960s as a result of mechanization, improved transport, and economic and population growth. While global forest area loss has declined in recent years, almost all this decline is due to the expansion of natural forests in temperate countries and plantations in temperate and tropical countries; natural tropical forest, meanwhile, was lost at an estimated rate of 17 million hectares per year in the 1990s (FAO 2001).

When the International Tropical Timber Agreement (ITTA) entered into force in 1986 it had one very unusual characteristic for a trade and commodity agreement: it was concerned not only with production and trade but also with the quality of management of the resource on which that trade was based. Accordingly, early in its life – 1987 – the International Tropical Timber Organization (ITTO), the body created

Box 1 ITTO's revised C&I

In 2005, ITTO published a third edition of its criteria and indicators for the sustainable management of tropical forests (ITTO 2005a). The first edition was published in 1992 (as *Criteria for the sustainable management of natural tropical forests*) and the second (as *Criteria and indicators for the sustainable management of natural tropical forests*) in 1998; for the present report, countries submitted information following the ITTO (1998) format.

ITTO is aware of the potential impacts of revisions to its C&I, which will need to be incorporated into any national sets based on them. The revised C&I therefore do not include wholesale or wide-ranging changes but attempt to reduce duplication, improve conciseness and enhance clarity.

The new edition incorporates the latest information on C&I and takes into account recent developments in forest policy. It follows a comprehensive review of the C&I undertaken by ITTO following expert meetings convened by ITTO, FAO and others in 2002 and 2004. These expert meetings recommended, among other things, that countries should start reporting on forest management using a streamlined set of indicators for which data were already available, and that a global set of common thematic areas of SFM closely aligned with the existing seven criteria of ITTO (see Box 3) should be adopted. The revised C&I take both recommendations into account. The new edition also takes into account the experiences of the many ITTO producer member countries that are implementing national C&I based on the ITTO framework.

The revised C&I offer a simpler and more comprehensive tool for ITTO member countries to monitor their forest resources and to report on progress towards SFM on a regular and ongoing basis. To support these efforts, ITTO is continuing its training program on the use of its C&I at the national level, as well as funding projects designed to institutionalize the use of the C&I in tropical forest management.

The revised ITTO C&I and reporting format can be downloaded from the ITTO website (www.itto.or.jp).

in the ITTA to put it into effect, commissioned a survey of the management of tropical forests in its member countries, specifically directed at forests managed for timber production. The results were presented in a report to the fifth session of the International Tropical Timber Council (ITTC), the Organization's governing body, in November 1988. The scope was later extended by the publication *No Timber without Trees* (Poore et al. 1989), which set this study in the wider context of the management of tropical forests for all purposes.

An alarming conclusion emerged from that survey: that an insignificant proportion of the world's tropical forests was managed sustainably, although some – but not all – of the conditions for sustainable management were present in a much larger area.

Much of ITTO's subsequent work has been aimed at addressing this situation. Numerous projects have been conducted in the field, and a series of policy guidelines has been published, including a pioneering set of criteria and indicators (C&I) for the monitoring, assessment and reporting of sustainable forest management (SFM) in 1992 (subsequently revised in 1998 and again in 2005; see Box 1).

It has been a central purpose of ITTO to encourage SFM in all its producer countries. To this end, the ITTC adopted in 1990 its Year 2000 Objective, which set the goal of achieving exports of tropical timber from sustainably managed sources by 2000; in 2000, the ITTC reviewed the progress of its members towards this objective (Poore & Thang 2000). That study was able to provide general information on policy changes and management and showed that there had been some progress since the late 1980s. However, the data still did not allow a reliable estimate of the area of forest sustainably managed for either production or protection: they were derived primarily from country

reports submitted by ITTO member countries using a format prescribed by Council that "was not well adapted to elicit the most appropriate replies" (ibid.).

Accordingly, at its 30th session in 2001, the ITTC decided to prepare a new and more comprehensive report on SFM in the tropics and, in Decision 9(XXX), it authorized the Executive Director "to prepare and publish [a] *Status of Forest Management Report*, based on available evidence, including (i) an examination of country reports; (ii) meetings with government officials, professional foresters, industry, concessionaires, non-governmental organizations (NGOs) and people's organizations; and (iii) field visits to a random sample of forest management units". This report is the result. It discusses the nature and assesses the reliability of available data; attempts to determine, as far as these data allow, the extent of the permanent forest estate (PFE) in each ITTO producer member country; examines, for each country, the policy and institutional settings for the adoption of SFM; estimates the area of forest that is actually managed sustainably for production and protection; and discusses how the situation has changed since 1988 and the significance of these changes for the future.

The main focus of the report is on forests managed for timber, because this is central to the ITTO mandate. Moreover, timber remains the most economically important product derived from most tropical forests and can be an important driver of development. Improvement in the management of timber production forests, therefore, would be an important step towards sustainable development in many tropical countries. Since production forests should be complemented by a network of protected areas, where logging and other extractive activities are not permitted, an attempt is also made in this report to examine the management status of protection forests.

METHODOLOGY

Coverage and structure

The report covers all 33 ITTO producer member countries. Grouped into three regions, these are: *Africa* – Cameroon, Central African Republic (CAR), Democratic Republic of Congo (DRC), Republic of Congo (sometimes referred to as Congo Brazzaville or simply, as in this report, Congo), Côte d'Ivoire, Gabon, Ghana, Liberia, Nigeria and Togo; *Asia & the Pacific* – Cambodia, Fiji, India, Indonesia, Malaysia, Myanmar, Philippines, Papua New Guinea (PNG), Thailand and Vanuatu; and *Latin America & the Caribbean* – Bolivia, Brazil, Colombia, Ecuador, Guatemala, Guyana, Honduras, Mexico, Panama, Peru, Suriname, Trinidad and Tobago and Venezuela.

Part I summarizes the key data on the status of tropical forest management, globally and by region. Part II contains profiles of all ITTO producer member countries, compiled from a wide range of sources (as described later), on which Part I is based. Each profile follows a standard format. The year of reporting is nominally 2005 but the actual year to which the data refer may vary considerably according to availability; where possible, the actual reference year is given. The countries and forests covered by this report supply more than 90% of the global tropical timber trade and account for about 80% of global tropical forests and nearly all closed tropical forests¹.

The country profiles provide the basis for assessing the performance of each country in the sustainable management of its forests. Particularly important are the data relating to the area of forest in each country considered to be permanent – the PFE, what proportion of this is under sustainable management, the measures and standards adopted to ensure sustainability, and the conditions in each country that affect efforts to achieve SFM. The country profiles provide the most complete set of data assembled so far to enable an assessment of SFM in tropical forests.

The information in the country profiles has been used to prepare synoptic tables that are presented in Part I:

- Table 1: global summary of management status in the tropical PFE;
- tables 2a, 3a and 4a: total forest area and PFE (by region);
- tables 2b, 3b and 4b: management of the production PFE (by region); and
- tables 2c, 3c and 4c: management of the protection PFE (by region).

These tables, and other information presented in the country profiles, provide the main basis for analysis and discussion of the following topics:

- what areas have been secured as PFE;
- what kinds of management are being applied;
- what is the enabling environment (institutional and socioeconomic); and
- how much forest is now being managed sustainably.

Part I also analyzes the changes since 1988, considers the future outlook, and makes recommendations to accelerate progress towards SFM.

Definitions

Sustainable forest management

It is now generally accepted that countries should aim to manage their PFEs sustainably and one of the main purposes of this study is to determine the area of PFE so managed. The definition of SFM is therefore critical. ITTO (2005) defines SFM as:

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

¹ The distinction between tropical and closed tropical forests is clarified later in 'Classification of forest types'

To elaborate the definition and assist the monitoring, assessment and reporting of SFM, ITTO has developed a set of seven key criteria and associated indicators for the sustainable management of tropical forests (ITTO 2005a). These comprise the essential elements of SFM; along with the definition of SFM given above, they constitute the basis of the assessment of SFM presented in this report.

The essential aim of SFM is to maintain the potential of a nation's forests to deliver the mix of goods and services that its people are expected to require of them over time. This implies that the use of a nation's forests should be planned in such a way that they retain their potential to deliver a comprehensive range of goods and services (land-use planning) and that each piece of forest (forest management unit – FMU) should be managed sustainably for the purposes for which it is intended. Finally, it is essential that management should be applied consistently and continuously. Management that is sustainable at any one time can easily become unsustainable if the objectives or the implementation are changed. It is only by maintaining its potential that the forest will be able to respond adequately to changing conditions. Indeed, perhaps all that can be said about any management is that it is consistent with the concept of sustainability and the associated management objectives are in place at a given time.

The definition of SFM given here was not formulated for application in forests in totally protected areas, where forest goods are usually not extracted. Nevertheless, it can still be applied in such forests with the understanding that the extraction of 'desired goods' (both timber and non-wood forest products – NWFPs) should be zero, or close to zero, for SFM to be achieved.

Tropical forest

Consistent with the ITTA, this report defines tropical forest as forest lying between the tropics of Cancer and Capricorn, although it has proved difficult to apply in all cases. For example, many ITTO producer countries have forests at higher altitudes within the tropics that effectively are temperate forest types. Moreover, several producer

countries – Brazil, India, Mexico and Myanmar – have significant areas of forest outside the tropics. These countries do not usually distinguish between 'tropical' and 'non-tropical' in their forest statistics; therefore it has not always been possible to maintain the distinction. In such cases, the exact treatment is explained in the account of the country concerned.

Permanent forest estate

ITTO policies stress the need for countries to establish a PFE; that is, certain categories of land, whether public or private, that are to be kept under permanent forest cover to secure their optimal contribution to national development. Such permanency is one of the necessary conditions for SFM. Included in the PFE are three categories of forest: protection forests on fragile lands, forests set aside for plant and animal and ecosystem conservation, and production forests. In this report, the first two are generally grouped together as *protection PFE*, the third as *production PFE*. The production PFE includes both natural forest and planted forest (quantified separately) but excludes trees outside forests.

Countries vary in the way in which they define the different categories of forest use and in the degree of permanence accorded to each category. Many have a PFE designated by the state and accorded a considerable degree of protection under the law. Even in these, however, forest may be de-gazetted and lose its legal protection; moreover, other forests outside the legally defined PFE might also be – in effect – permanent. In other countries, PFE does not exist, at least formally. In Fiji, PNG and Vanuatu, for example, 80% or more of the forest is owned by communal groups and there is no state-designated PFE. In such instances, and in other cases where the degree of permanence is unclear, even for sizeable tracts of state-owned forests, a judgement has to be made about how much forest may be considered permanent. Another difficulty arises in Brazil, India, Mexico and Myanmar, where PFE may be defined but no distinction made between tropical and non-tropical PFE. Where there is doubt about the interpretation, the procedure followed to estimate the PFE is noted in the country profile. Additionally, many ITTO producer countries have large areas of

low-density forest cover, such as savannas and open forests, which generally play a very minor role in industrial timber production (although they may be important as protection forest). Therefore, figures given for production PFE in this report are mostly for forests with greater than 30% canopy cover (ie closed forest), and usually much more than that. In general, then, production PFE in this report comprises those closed tropical forests and planted forests for industrial timber production deemed to be accorded 'permanent' status either by law or practice. As far as possible, anomalies in the PFE, and the interpretation adopted here, are identified in the country profiles.

In the ITTO C&I and in most if not all other international sets of C&I, a distinction is made between forests that are protected for the safeguarding of soil and water and those that are protected for the conservation of biodiversity. This distinction is maintained in the country profiles presented in this report; however, not all countries categorize their protection forests in this manner, and there is often overlap between the two categories.

The IUCN categories of protected areas (see Box 6) are used throughout. Categories I–IV have the conservation of biological diversity as a principal aim, with the strictness of protection decreasing from Category I to Category IV. There is, however, no IUCN category concerned primarily with the protection of soil and water. Moreover, IUCN Category V (Protected Landscape/Seascape:

protected area managed mainly for landscape/seascape conservation and recreation) has no direct ITTO equivalent. The situation is made even more complicated by Category VI. This is defined as "managed resource protected area: protected area managed mainly for the sustainable use of natural ecosystems". This is open to many interpretations; indeed, an area of forest managed sustainably for the production of timber should qualify as Category VI. In general, estimates of protection PFE given in this report comprise protected areas in IUCN categories I–IV and other areas defined by countries as protection forests.

Classification of forest types

The classification of tropical forest types is notoriously difficult and contentious. It is, however, important to distinguish different forest types, especially for the conservation of biodiversity, because each is characterized by different species. Many countries have developed their own classification systems for this purpose, but these often do not correspond with each other. An attempt was made in this report to adopt the forest classification used by the United Nations Environment Programme-World Conservation Monitoring Centre (UNEP-WCMC – see Box 2) in the descriptions of forests in all countries, but this was not always possible. One forest type not defined in Box 2, savanna, is important in some member countries; UNEP-WCMC includes such forest in its 'sparse trees and parkland' category

Box 2 UNEP-WCMC tropical forest types

Lowland evergreen broadleaf rainforest: natural forests with >30% canopy cover, below 1,200m altitude that display little or no seasonality, the canopy being >75% evergreen broadleaf.

Lower montane forest: natural forests with >30% canopy cover, 1,200–1,800 m altitude, with any seasonality regime and leaf type mixture.

Upper montane forest: natural forests with >30% canopy cover, above 1,800 m altitude, with any seasonality regime and leaf type mixture.

Freshwater swamp forest: natural forests with >30% canopy cover, below 1,200 m altitude, composed of trees with any mixture of leaf type and seasonality, but in which the predominant environmental characteristic is a waterlogged soil.

Box 2 UNEP-WCMC tropical forest types (cont'd)

Semi-evergreen moist broadleaf forest: natural forests with >30% canopy cover, below 1,200 m altitude, in which 50–75% of the canopy is evergreen, >75% are broadleaves and the trees display seasonality of flowering and fruiting.

Mixed broadleaf/needleleaf forest: natural forests with >30% canopy cover, below 1,200 m altitude, in which the canopy is composed of a more or less even mixture of needleleaf and broadleaf crowns (between 50:50% and 25:75%).

Needleleaf forest: natural forest with >30% canopy cover, below 1,200 m altitude, in which the canopy is >75% needleleaf.

Mangroves: natural forests with >30% canopy cover, composed of species of mangrove tree, generally along coasts in or near brackish or salt water.

Disturbed natural forest: any forest type above that has in its interior significant areas of disturbance by people, including clearing, felling for wood extraction, anthropogenic fires, road construction, etc.

Deciduous/semi-deciduous broadleaf forest: natural forests with >30% canopy cover, below 1200 m altitude, in which 50–100% of the canopy is deciduous and broadleaves predominate (>75% of canopy cover).

Sclerophyllous dry forest: natural forests with >30% canopy cover, below 1,200 m altitude, in which the canopy is mainly composed of sclerophyllous broadleaves and is >75% evergreen.

Thorn forest: natural forests with >30% canopy cover, below 1,200 m altitude, in which the canopy is mainly composed of deciduous trees with thorns and succulent phanerophytes with thorns may be frequent.

Sparse trees and parkland: natural forests in which the tree canopy cover is 10–30%, such as in the savanna regions of the world. Trees of any type (eg needleleaf, broadleaf, palms).

Temperate forest types occurring in highlands and non-tropical parts of ITTO countries:

Broadleaf evergreen forest: natural forests with >30% canopy cover, the canopy being >75% evergreen and broadleaf.

Evergreen needleleaf forest: natural forest with >30% canopy cover, in which the canopy is >75% needleleaf and evergreen.

Deciduous broadleaf forest: natural forests with >30% canopy cover, in which >75% of the canopy is deciduous and broadleaves predominate (>75% of canopy cover).

Exotic species plantation: intensively managed forests with >30% canopy cover, which have been planted by people with species not naturally occurring in that country.

Mixed broadleaf/needleleaf forest: natural forest with >30% canopy cover, in which the canopy is composed of a more or less even mixture of needleleaf and broadleaf crowns (between 50:50% and 25:75%).

Unclassified forest: occurrence within tropical and non-tropical parts of the countries is not specified.

Unclassified forest data: forest locations, identified from the high-resolution MODIS (Moderate Resolution Imaging Spectroradiometer) datasets showing forest extent only with no further information about their type available.

(natural forests with 10–30% tree canopy cover). The estimates of production PFE made in this report are generally for closed tropical forest, which has been taken to include natural tropical forests with a tree canopy cover of greater than 30%. This is consistent with the approach adopted by UNEP-WCMC (2004), which in its mapping of forest cover in protected areas used a threshold of 30% canopy cover as a cut-off between forest types such as 'broadleaved evergreen rainforest' and 'sparse trees and woodland'.

Sources of data

The country profiles presented in this report were compiled from a wide range of sources. Member countries were asked to complete the reporting

format questionnaire developed for the ITTO C&I. Of ITTO's 33 producer member countries, 23 submitted data at ITTO's request. These responses provided an important body of evidence, but one that rarely proved sufficient; an assessment of the usefulness of these data is given in Box 3. Other international data sets, including some available on the internet, were used where judged reliable. The 2000 forest resource assessment of FAO (FAO 2001) was a particularly important source; however, data collected for FAO's 2005 assessment – published in 2006 – were not available in time for use in this report. Diagnostic missions conducted by ITTO at the request of some of its members were also valuable data sources. In addition, a great deal of information was derived from experience with ITTO

Box 3 Assessment of usefulness of country responses to the ITTO C&I reporting format

In 2001, ITTO producer member countries were officially requested to submit data relevant to the management of their forests according to a format developed by ITTO to facilitate reporting on its C&I and agreed by the ITTC. By early 2005, a total of 23 ITTO producer member countries had submitted country reports to ITTO; 21 reports were in the requested C&I format and two were not. The table summarizes the results of a subjective evaluation of these reports by criterion and region.

Assessment of country responses to the ITTO C&I national-level reporting format

Criterion	Number of indicators	Average score *			Overall average
		Africa (7 countries)	Asia (8 countries)	America (6 countries)	
1: Enabling conditions for SFM	22	1.6	2.1	2.3	2.0
2: Forest resource security	8	1.1	1.8	2.1	1.7
3: Forest ecosystem health and condition	6	1.0	1.9	1.8	1.6
4: Flow of forest produce	16	1.1	1.6	1.6	1.4
5: Biological diversity	12	1.2	1.6	1.8	1.5
6: Soil and water	8	0.9	1.4	0.9	1.1
7: Economic, social and cultural aspects	17	1.2	1.8	1.7	1.5
Average, all seven criteria	89	1.2	1.7	1.7	1.5

* 0 = no information submitted, 1 = information given was not of use for reporting;
2 = information given was partly of use for reporting; 3 = information given was useful for reporting

Box 4 Description of national C&I workshops

Since July 2002, ITTO has supported its producer member countries in the organization of national workshops to train forest owners, forest managers, concessionaires and representatives of non-governmental organizations in the use of ITTO's C&I and the related reporting format. The overall objective of these workshops is to test and use ITTO's C&I as a tool to sustainably manage forests and to facilitate the ability of countries to report on progress towards SFM at the national and FMU levels.

By late 2005, 19 workshops had been conducted, eight in Latin America, seven in Africa and four in Asia (see Box 5) with the participation of more than 800 people, providing a key constituency for promoting the uptake of the C&I throughout the tropics. Thirty-nine per cent of workshop participants were from national forestry administrations, 28% from the private sector, 19% from communities and NGOs and 14% from other stakeholder groups including research, education and media. Up to four additional workshops are planned for 2006.

Specifically, the workshops aim to:

- inform and train forest users on the objectives and use of the ITTO C&I;
- review the usefulness of the C&I at the FMU level and identify weaknesses and potential improvements in the approach;
- test the C&I as a tool for reporting on progress towards SFM and for improved monitoring and auditing, including evaluating indicator measurement techniques;
- exchange experiences regarding best practices in SFM, in particular in forest management planning and silviculture; and
- render assistance to the development of national sets of C&I and national-level reports on progress in SFM.

An important additional objective of these workshops is to take note of any observations from workshop participants for the improvement of the C&I. The recommendations from the first 14 workshops were used as a major input for the 2005 revision of ITTO's C&I (see Box 1).

The workshops have evolved into an excellent platform to initiate and deepen the dialogue between all interested parties on SFM. In some countries, the event was the first of its kind to bring stakeholders with opposing opinions to the same table to share their experiences of SFM in a structured manner.

During the preparation of this report, the workshops were used by ITTO as an opportunity to discuss draft country reports with national stakeholders, to fill information gaps, and to confirm and amend data sources and ITTO estimates. This report has therefore directly benefited from ITTO's program of C&I workshops.

field projects, national-level training workshops on the application of the ITTO C&I (Box 4), field visits, and discussions with organizations and individuals with specialist knowledge. Box 5 shows which of the main data sources were available by country.

All data presented in this report are as up to date as possible. However, in some countries the situation is changing rapidly and inevitably some

information was already out of date at the time of printing. C&I reports were received from countries over the period 2002–2005; unfortunately, therefore, information is most likely to be out of date for those countries that responded most quickly to the C&I questionnaire. New information received from various sources was incorporated in the country profiles up to late 2005.

Box 5 Main sources of information by country*

Country	C&I workshop (date convened)	Diagnostic mission (date reported to ITTC)	C&I report (date received)
Africa			
Cameroon	January 2003	–	July 2005
CAR	July 2005	November 2002	–
DRC	–	–	November 2003
Congo	July 2002	May 2002	March 2002
Côte d'Ivoire	August 2002	–	May 2004
Gabon	–	June 2005	October 2004
Ghana	October 2005	–	March 2004
Liberia	–	June 2005	–
Nigeria	December 2005	–	–
Togo	July 2003	–	February 2002
Asia & the Pacific			
Cambodia	March 2005	December 2004	October 2003
Fiji	–	December 2004	–
India	–	–	–
Indonesia	–	November 2001	March 2002
Malaysia	–	–	October 2003
Myanmar	–	–	April 2002
PNG	April 2002	–	September 2003
Philippines	September 2002	November 2003	March 2003 March 2005
Thailand	–	–	January 2002
Vanuatu	September 2002	–	April 2002
Latin America & the Caribbean			
Bolivia	September 2003	–	February 2004
Brazil	–	November 2002	–
Colombia	February 2003	–	January 2002
Ecuador	December 2003	July 2004	–
Guatemala	April 2005	–	January 2004
Guyana	–	May 2003	–
Honduras	–	–	September 2003
Mexico	April 2005	November 2005	–
Panama	April 2004	December 2004	April 2002
Peru	November 2003	November 2003	March 2002
Suriname	–	November 2003	–
Trinidad and Tobago	–	May 2003	May 2003
Venezuela	September 2004	–	August 2004

* C&I workshops carried out and reports submitted under ITTC decisions 9(XXX) and 4(XXXIV); diagnostic missions carried out under ITTC Decision 2(XXIX)

In many cases, estimates for the same parameter differed according to source. Where the sources were credible, such contradictory estimates are included in this report. This is particularly the case for estimates of forest area and of the area of forested protected areas and is done partly to illustrate the uncertainty associated with the data and partly to provide readers with realistic bounds for estimates.

Data on the distribution of forested protected areas provided by countries have been supplemented by UNEP-WCMC, which provided ITTO with data extracted from its database on protected areas. Maps showing forest cover (in three classes: >60%, 30–60%, <30%) at both the country and regional levels, also provided by UNEP-WCMC, are included in the report for illustrative purposes. The techniques used in the derivation of these data are explained in Annex 1. Wherever possible, local common names are used for species; Annex 2 provides a list of timber species referred to in the profiles for which common names differ between countries.

The sources of all data are given using the following conventions: a = country report to ITTO using the ITTO C&I questionnaire; b = ITTO diagnostic mission report; c = ITTO C&I training workshop; d = ITTO estimate. Details of these sources relevant to a given profile are included in the references for that profile; all other sources are referenced in the usual way. Abbreviations used in tables are: n.d. = no data; n.a. = not applicable. Estimates are given to three significant digits except where they are the product of summing within tables. Estimates of closed tropical forests are given exactly as published in FAO (2001), except where ITTO has derived its own estimates.

Estimating the area under SFM

In order to assess progress in the achievement of SFM since the survey conducted in 1988 (Poore et al. 1989), this report estimates the area of forest in each ITTO producer member country that can reasonably be thought to be under management that is largely consistent with SFM. These estimates have been derived for production forests by adding the FMUs that: (i) have been independently certified or in which progress towards certification is being

made; (ii) have fully developed, long-term (ten years or more) forest management plans with firm information that these plans are being implemented effectively; (iii) are considered as model forest units in their country and information is available on the quality of management; and/or (iv) are community-based units with secure tenure for which the quality of management is known to be of a high standard.

Determining the level of attainment of SFM is extremely difficult. By the definition given earlier, the concept requires that management cause no *undue* reductions in a range of values, including ecological. Any judgements of the status of SFM locally, regionally or globally must therefore be subjective. Moreover, actually measuring the effects of management on such values is beyond the resources of many, if not all, tropical forest managers. For the purposes of this report, there has been some, but generally little, field-checking at the level of the FMU; the limited field-checking that did take place was primarily in conjunction with diagnostic missions, C&I workshops and ITTO projects. Since trends are more useful than one-off measurements in determining sustainability, the assessment of SFM requires the long-term monitoring of forest values, which is carried out in very few tropical production forests. The pragmatic approach taken here, therefore, mirrors that used by Higman et al. (2005), which defines SFM as “the best available practices, based on current scientific and traditional knowledge, which allow multiple objectives and needs to be met without degrading the forest resource”. The estimates of SFM given in this report give the area of forests being managed in a way that, on a subjective judgement, is unlikely to cause long-term, undue reductions in the physical and social environments. It is expected that this report will establish a baseline to allow the assessment of trends in the future.

For some forests, information on the quality of management is anecdotal or otherwise unpublished. Nevertheless, in most cases the estimates should be considered conservative, since they include only those forest areas where information about the quality of forest management was available; it is possible that other forest areas are also being managed well, but information was not available for

Box 6 IUCN protected-area categories

IUCN has defined a series of six protected area management categories, based on their primary management objective. A summary of categories and their definitions is provided below. Definitions of these categories, and examples of each, are provided in IUCN (1994). Notes relating to how categories are defined are also available.

CATEGORY Ia

Strict Nature Reserve: protected area managed mainly for science

Definition

Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.

CATEGORY Ib

Wilderness Area: protected area managed mainly for wilderness protection

Definition

Large area of unmodified or slightly modified land and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

CATEGORY II

National Park: protected area managed mainly for ecosystem protection and recreation

Definition

Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.

CATEGORY III

Natural Monument: protected area managed mainly for conservation of specific natural features

Definition

Area containing one or more specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.

CATEGORY IV

Habitat/Species Management Area: protected area managed mainly for conservation through management intervention

Definition

Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.

Box 6 IUCN protected-area categories (cont'd)

CATEGORY V

Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation

Definition

Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.

CATEGORY VI

Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems

Definition

Area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

them. Some observers may question the inclusion in the category 'sustainably managed' of forests for which a strict forest management audit has not been conducted. However, since even such audits and certification schemes have been subject to controversies surrounding differing interpretations of what passes for SFM, and since they have only been carried out on a small fraction of the managed tropical forest estate, the approach adopted here provides what is, in our opinion, the best available means of attaining an estimate of the full extent of forests where the requirements for sustainability have been put into place or are well advanced.

Where data allowed, estimates were also made of the extent of protected forest under management considered consistent with SFM. These estimates were derived from information provided by countries and from other (mostly unpublished) sources. Areas included are those with secure boundaries and a management plan (usually fully in place, but in some instances still under development), that are generally considered in the country and by other observers to be well managed, and that are not under significant threat from destructive agents.

STATUS OF FOREST MANAGEMENT

This study covers forests in the tropical PFEs of all ITTO producer member countries except India (for which the tropical and non-tropical PFEs could not be differentiated and analysis therefore covers the total PFE). The issues of forest management and forest conversion outside the PFE are beyond the scope of this report; it is possible that some such areas currently under tropical forest are also well managed or, conversely, will in the future be cleared to accommodate the expansion of agriculture, settlements or infrastructure.

Global overview

The clearest measures of progress towards SFM are the area effectively secured as PFE and the area within the PFE that is sustainably managed. Table 1 gives figures for the PFE in all three regions, classified into production and protection forests, production being divided into natural and planted. For the natural production forests and for the protection forests, a figure is given for the area sustainably managed. Since the priority of this report is the management of natural forests, no comparable figure is given for planted forests; for these, the area covered by management plans and the area certified are shown. Tables 2a, 3a and 4a give the same data for countries in Africa, Asia and the Pacific, and Latin America and the Caribbean, respectively, and this quantitative information is further refined in tables 2b, 2c, 3b, 3c, 4b and 4c.

The present natural PFE in Africa, Asia and the Pacific, and Latin America and the Caribbean is estimated to cover 110, 168 and 536 million hectares respectively. Of the PFE in Latin America and the Caribbean, nearly half (271 million hectares) is made up of protection PFE in Brazil. Estimates of total forest area vary according to source. At the high end of the range of estimates, Africa has 274 million hectares of forest (40% of which is in

the PFE); at the low end, 234 million hectares (47% of which is in the PFE). In the Asia-Pacific region, the figures are 316 million hectares (65%) and 283 million hectares (73%), respectively; in Latin America and the Caribbean they are 931 million hectares (58%) and 766 million hectares (71%).

The establishment of a PFE does not, in itself, guarantee security. A number of other conditions are necessary. The clear establishment and enforcement of tenure and tenurial rights within it (and adjacent to it) are essential. There must also be: some assurance that the government or other owner will not renege on the commitment and de-gazette areas already established as PFE; the clear demarcation of the area on the ground (for example by boundary marking); and effective protection from encroachment, damage and other illegal activities.

It is always possible for a country to de-gazette areas of PFE for purposes that it considers important, as the State Government of Sabah (Malaysia) did when it changed the designation of much of the lower-altitude parts of the Kinabalu National Park. Some countries have still not clearly identified a PFE (some have not even adopted the term or a concept equivalent to it), and some have undergone political changes that have acted to obfuscate forest ownership. Also, there are still frequent conflicts over tenure that engage governments, local communities and private owners – issues that must be resolved if the forest is to be rendered more secure. Taking the tropics as a whole, however, there has been great improvement in the legal security of both production and protection forests in the last couple of decades, an improvement that may be attributed mainly to the fact that governments have become aware of the need for greater clarity in tenure and purposes of management. In addition, security has now been increased in many countries by the better delimitation of boundaries.

Many countries still have large areas of forest outside the PFE. These are sometimes set aside deliberately for later planned conversion or reservation for other uses – as agricultural land, for example; this allows for the in-migration of people and an increase in agricultural production. By acting as a safety valve, these measures can also protect the PFE from deforestation and degradation. Sometimes, however, land-use plans – if formulated – are not followed and forest is parcelled up and converted to other uses in an ad hoc fashion, with potential repercussions for the PFE. Problems of forest security often occur where land has been reserved for forestry production in circumstances under which an alternative use would appear to be more profitable or otherwise more desirable. Land-use planning that leads to the clear identification of appropriate land-uses and caters adequately to changing demographic patterns can reduce this risk.

The area of natural production PFE in ITTO producer member countries is estimated to be 353 million hectares (29% of the total area of tropical closed forest estimated by FAO 2001 to be 1.20 billion hectares – see tables 2a, 3a and 4a). Of this, an estimated 96.3 million hectares (27% of the total natural production PFE) are covered by management plans, 10.5 million hectares (3.0%) are certified by a recognized independent certification organization, and at least 25.2 million hectares (7.1%) are managed sustainably. The area of protection PFE in ITTO producer member countries is estimated to be 461 million hectares (38% of the total tropical closed forest area estimated by FAO 2001), of which an estimated 17.8 million hectares (3.9%) are covered by management plans and at least 11.2 million hectares (2.4%) are being managed sustainably. A much larger but unestimated area of the forest estate is not under immediate threat from anthropogenic destructive agents, being remote from large human settlements and projected roads.

Thus, the proportion of the tropical production PFE managed sustainably has grown substantially since 1988, from less than 1 million hectares to more than 25 million hectares, and to more than 36 million hectares if the area of protection PFE so managed is included. Despite this significant

improvement, the overall proportion of the PFE known to be sustainably managed remains very low, at less than 5% of the total.

Wood from natural production forests is supplemented in many countries by planted forests, some of them covered by management plans and some certified. In ITTO producer countries, planted forests now cover 825,000 hectares in Africa (488,000 hectares with management plans, none certified), 38.3 million hectares in Asia and the Pacific (11.5 million hectares with management plans, 184,000 hectares certified) and 5.60 million hectares in Latin America and the Caribbean (2.37 million hectares with management plans, 1.59 million hectares certified). In many cases, data for plantation areas are from FAO (2001) and are therefore at least five years old. The area of the plantation estate in ITTO producer countries has no doubt grown substantially since then.

Illegal logging and the illegal movement of timber have become pressing issues in many countries, exacerbated by local warfare and by drug smuggling and other criminal activities. These have not only made forest management in the field a hazardous business and prejudiced the security of PFEs in many places, but they have undermined legitimate markets for timber and reduced the profitability of legitimate producers. Box 7 gives a brief overview of the challenges to SFM posed by these problems; this topic is also addressed where relevant in the regional summaries and country profiles.

Overview of Africa

Forest resources

There are an estimated 209 million hectares of closed tropical forests in ITTO African producer member countries, including wet evergreen, moist semi-deciduous, moist deciduous, freshwater swamp and mangrove forests. These forests provide important local environmental benefits, in particular soil and water conservation, and make an important contribution to African and global biodiversity. They play a key role in rural livelihoods. Forest production is significant in financial terms – the average

Box 7 Illegal logging and forest law enforcement

Illegal logging is a critical obstacle to SFM in both the production and protection forest estates of many ITTO producer member countries. Illegal logging in Indonesia, for example, has been reported by some sources to exceed legal production. Indonesia was the first country to enact a Presidential Instruction (No 4/2005) on the eradication of illegal logging in forest areas within its borders. In the Philippines, the control of illegal activities remains a major challenge and is considered a critical obstacle to SFM. The government there has taken a number of forest law enforcement measures, such as the confiscation of illegally harvested timber. In India, a legislative assembly has demanded a new law to seize the proceeds from all illegal logging activities. Côte d'Ivoire requires specific approval for all new logging of community teak plantations to prevent uncontrolled and illegal logging. Honduras carries out forest control in conjunction with other government agencies, including the public prosecutor's office and the national police. Cambodia has issued a new forest policy with a commitment to tackle illegal forest activities. A recent report by the NGO Forest Trends (2006) alleges that the majority of logging in PNG between 2000 and 2005 was illegal because although officially licensed it didn't fully comply with national laws and regulations. Thailand has banned logging in natural forests, but illegal logging still remains a problem.

Efforts to combat illegal logging and (particularly) illegal trade through bilateral agreements are emerging as well. For instance, the governments of Indonesia and Malaysia decided in December 2004 to carry out government-to-government timber trade where only logs received through government-designated ports would be considered legal. China, the European Union and Japan have also agreed to only buy Indonesian timber from legitimate sources. The pace of implementation of such agreements has been variable.

Multilateral initiatives

Illegal logging was first addressed at the multilateral level by the G8 Foreign Minister's Action Programme on Forests in 1998. In 2001, a Forest Law Enforcement and Governance (FLEG) initiative was launched in East Asia; this resulted in the Bali Ministerial Declaration, in which both producer and consumer countries agreed to take actions to suppress illegal logging. In response to this call, a regional FLEG taskforce was created. The primary role of the taskforce is to draft an action plan to meet the commitments made within the Bali Declaration.

The Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan of the European Union calls for compliance with national laws covering a range of practices associated with logging and timber trade. The 2002 World Summit on Sustainable Development (WSSD) also asserted the importance of taking immediate action on domestic forest law enforcement and illegal international trade in forest products. The Asia Forest Partnership was launched at the WSSD to promote SFM in Asia, giving the control of illegal logging top priority among five urgent issues, including good governance and forest law enforcement. The Sixth Ordinary Meeting of the Conference of the Parties to the Convention on Biological Diversity called for effective forest laws at the national level and recognition of the need to develop C&I which take into account the existing work and processes towards SFM.

Since 2001, ITTO has carried out several activities to assist its members in combating illegal logging and improving forest law enforcement. One important step was a decision (6(XXXI)) by the ITTC to encourage countries to submit projects that address forest law enforcement, unsustainable timber harvesting and illegal trade in tropical timber, and to urge its member countries to cooperate with each other to protect the tropical forest estate from illegal activities.

Box 7 Illegal logging and forest law enforcement (cont'd)

Several countries have submitted projects to take advantage of this decision. Three other ITTO decisions address forest law enforcement and the control of illegal logging. ITTO has also financed case studies on illegal logging and illegal trade in timber and timber products in Peru, Honduras, Brazil, Ecuador and Malaysia. Another major initiative has been cooperation between ITTO and the Convention on International Trade on Endangered Species of Wild Fauna and Flora (CITES) to ensure that trade in mahogany and ramin (both listed in CITES Appendix II) is legal and sustainable. ITTO reinforced its commitment to assist its members in forest law enforcement when related initiatives totalling almost US\$5 million were approved under the Organization's 2006–2007 work program.

annual value of primary timber exports from ITTO producer countries in the region approached US\$1.6 billion between 1999 and 2003 (ITTO 2005b) – but it also supports an estimated 200 million people who use a wide range of forest products to help sustain their livelihoods. With the exception of Gabon, ITTO producer members in Africa are low-income countries with slow growth and much rural poverty; DRC, Liberia and Togo are classified by the UN as least-developed countries (UNCTAD 2004). Only a third of the population in the region lives in towns and cities, but urban expansion is creating growing markets for forest products.

ITTO producer member countries in Africa occupy two broad biogeographical zones. The first is the Congo Basin in the central part of Africa, comprising Cameroon, CAR, DRC, Congo and Gabon. The second lies in equatorial West Africa and comprises Côte d'Ivoire, Ghana, Liberia, Nigeria and Togo.

The extent of natural tropical closed forests in the Congo Basin member countries is estimated to be about 195 million hectares. It contains the largest remaining contiguous expanse of tropical forest in Africa and the second largest in the world after the Amazon Basin. The Congo Basin is characterized by low population density (less than 20 people per km²). However, cities such as Kinshasa (DRC), Brazzaville (Congo), and Yaoundé and Douala (both in Cameroon) are growing rapidly and creating a high demand for timber, fuelwood and NWFPs, including wild meat. Deforestation is relatively low compared to other tropical regions, but there is concern about forest degradation through the over-harvesting of valuable timber species (high-

grading) and over-hunting. Timber production plays a major role in the economies of all five countries, with total 2003 exports of primary wood products worth US\$995 million.

The five ITTO member countries of equatorial West Africa contain about 13.7 million hectares of natural tropical closed forest, although a large part of this is secondary or heavily degraded; Côte d'Ivoire, Ghana, Nigeria and Togo also have large areas of savanna. Forests contribute to the livelihoods of more than 100 million people. There has been long-term, extensive deforestation in all countries, caused recently by, among other things, agricultural expansion, fire and the harvesting of fuelwood and charcoal. The main timber-producing forests have been largely logged over; West Africa was once an important supplier of tropical hardwoods to international markets, but its importance in this regard has diminished considerably in recent decades, with 2003 exports of primary wood products worth US\$592 million.

Another way to group the countries of the region is according to their endowment and use of forest resources. In Ghana, Côte d'Ivoire, Togo and Nigeria, natural forests have been heavily logged and largely converted to agriculture. There are still large areas of relatively undisturbed forest in the two Congos, Gabon and the southern parts of CAR and Cameroon – the population is sparse, access to the forest difficult and ports remote. Liberia and, increasingly, Cameroon are intermediate: forest conversion accelerated over the last decade and population pressure is increasing. But there are important differences between countries.

Armed conflicts and their aftermath are causing significant social and economic disruption in some ITTO producer member countries in the region, most notably CAR, Côte d'Ivoire, DRC and Liberia; such conflicts make SFM very difficult. Forests may be unsafe to manage; they provide refuge for armed factions, for example, and landmines may have been deployed.

PFE

Of the estimated 209 million hectares of closed natural forest in the region, an estimated 70.5 million hectares are assigned as natural production PFE and 39.3 million hectares as protection PFE. Adding the estimated 825,000 hectares of planted forest gives a total PFE of 111 million hectares (Table 2a).

Institutional arrangements in Africa

Forest tenure

In the Congo Basin, there is a general tendency to bring production forests under full state control while opening up other forest areas to communities and local forest users. In Cameroon, most forest land belongs to the state. About 345,000 hectares are 'communal forests' and are owned privately by communities. This area is increasing, in particular in the agroforestry zone outside the PFE. Generally, people living in forest areas fully retain their traditional user rights in their communal areas. In CAR, most forest is owned by the state. The forest domain as a whole comprises stated-owned forests; community forests, mainly found in the savanna; and private forests – a limited area of reforestation on private land. In DRC, the state is the sole owner of the land. According to the 2002 forest law, consultation with the local population is required before forest is classified: the local community or municipality retains customary usage rights over the forests. The state can also allocate forests to local communities as community forests. In Congo, the 2000 forest law defines two types of forest ownership in state forest and private forest; most is state-owned, but communal and community forest is registered as the private domain of the relevant group. In Gabon, the 2001 forest

law divides forests into two distinct categories. One includes the production PFE managed by private concessionaires and protected forests managed directly by the state. The other is composed of state-owned rural forest – land and forest for which usufruct rights are limited to local communities. Rural communities and forest dwellers are free to exercise their customary rights in these forests, provided that they respect all conditions imposed by the forestry administration. Production PFE is owned and administered exclusively by the state.

In West Africa, forests are often held by the state, but there is wide encroachment into forest reserves and protection forest. In Ghana, forests are owned by the tribal chiefs but, in the early 1970s, all rights for the management and development of natural resources, including those of commercial trees, were vested in the President (as a 'trust'). In Côte d'Ivoire, there are two main categories of natural-forest ownership: public forests owned by the state divided into the *domaine forestier permanent*, which includes reserved forests and protected areas, and the *domain rural*, or rural zone; and community forests, which are based on traditional customary rights. In Liberia, all forest resources belong to the government except for communal and privately owned forests; the latter comprises a very small area of planted forests. Communal land is designated for the exclusive use of local communities for purposes other than logging. In Nigeria, most forests are in principle owned by the people, but the management and control of forest reserves, which cover around three-quarters of the forest area, are vested in the state governments. Moreover, dual ownership of natural forests by local and state governments still exists in some of the 17 northern states. Local governments are responsible for communal forest areas, state governments for forest reserves, game reserves and sanctuaries, and the federal government for national parks. In Togo, most remaining closed forest is in forest reserves owned by the state. In all forest reserves, local communities have user rights according to the colonial forest law of 1938, although a lack of clarity of the legal situation reportedly contributes to forest loss within the reserves.

Forest policy and legislation

Nearly all African producer member countries have revised or adapted their forest laws and policies since the UN Conference on Environment and Development (UNCED) in 1992 and in the light of the environmental conventions and ITTO policies and guidelines; Côte d'Ivoire, the main exception, is currently in the process of doing so. Nevertheless, the principle of state-owned production forests leased out in concessions and the parallel system of extraction permits for forest products remain unchanged. In nearly all countries, the institutions responsible for forestry have changed, at least in name and sometimes also in the nature of their responsibilities. Forestry is now often part of a ministry dealing with environment and forests (eg in Cameroon, CAR, Côte d'Ivoire, DRC, Congo, Gabon, Nigeria and Togo). Ghana has a Ministry of Lands and Forests and has incorporated environmental issues within it.

In their recent forest legislation, most countries have committed themselves more deeply to policies of sustained yield. Nearly all countries have applied C&I to describe and measure their efforts towards SFM: both the ITTO C&I and the African Timber Organization (ATO)/ITTO *Principles, Criteria and Indicators for the Sustainable Management of African Tropical Forests* (PCI) have been promoted widely. However, a lack of resources, political instability, poor government support and weak enforcement have often hampered the application of forest policies and legislation. The education of foresters and research into the practice of sustainable forestry are often neglected.

Cameroon, Congo, Gabon and Ghana have recently made enormous efforts to improve their forest governance; they also permit independent monitoring and the tracking of log transport and export. The long-term effects of these measures remain to be seen.

The involvement of domestic civil society in forest management is generally low, except in Cameroon and Ghana. In Cameroon, there is intensive dialogue between the forest administration and local NGOs; in Ghana, NGOs play an important role in growing trees outside forest reserves. Local NGOs generally

lack the funds and capacity to promote SFM effectively. International NGOs are present in all countries but tend – with some exceptions – to be more interested in biodiversity conservation than the sustainable management of forests for timber production.

Status of management

Natural production forests

Forest management for the production of industrial timber is economically important in the countries of the Congo Basin. In 2003, the five ITTO member countries in the Congo Basin accounted for the bulk of internationally traded tropical timber from ITTO African member countries (2.9 million m³ of logs, 1 million m³ of sawnwood and 300,000 m³ of panels – around two-thirds of the total African trade – ITTO 2005b). The production of industrial timber is a smaller part of total forest production in Africa than in other tropical regions: industrial roundwood made up less than 10% of total roundwood (including fuelwood) production in ITTO's African member countries in 2003 (Table 5).

In the West African countries, all or nearly all the closed tropical forests have already been logged at least once. In the Congo Basin, in contrast, the easily accessible forests have been cut over but there are still large areas of primary forest. It may not be economically feasible to apply SFM consistently in many remote forest areas. Congo and landlocked CAR have especially difficult tasks in developing economically viable timber export industries; their transport costs are very high compared to other countries in Africa.

Table 3b summarizes the management status of production PFE in ITTO producer member countries in Africa. Of the estimated 70.4 million hectares of natural-forest production PFE, an estimated 44.0 million hectares have been allocated to production, either through large-scale concession arrangements or smaller-scale licences and permits for long- or short-term use.

Generally, long-term and large-scale privately owned forest concessions dominate timber production in the Congo Basin. Most of the active companies are foreign-owned.

When *No Timber without Trees* was written in 1989, hardly any tropical timber was supplied from managed natural forest in Africa. Timber came instead from forests logged without a management plan or that were being converted to other uses in either a planned or unplanned manner. Since then, considerable progress has been made towards systems of SFM, although the total area remains small and the experience dispersed. Certification, which has been an important influence in some countries in Asia and the Pacific and Latin America and the Caribbean, has received significant attention in Africa only in the last few years. On the other hand, forest management plans are now required in concessions in Cameroon, CAR, DRC, Congo, Côte d'Ivoire and Gabon, and the entire production PFE in Ghana, which does not have a concession system, is covered by management plans, as is just under a third of the Nigerian production PFE. In total, about 10.0 million hectares of Africa's production PFE are covered by management plans, an extraordinary advance on the situation in 1988. This area should continue to increase as concession-holders come into line with new requirements. Nevertheless, the extent to which such management plans are fully implemented appears to be low at present.

Cameroon has made significant efforts to regulate its concession system, with the government authority recently rejecting 17 management plans prepared by concessionaires. Some 1.76 million hectares of concessions there now have approved management plans or are well advanced in preparing them, and at least 500,000 hectares are under SFM. CAR has rationalized its approach to concessions, introducing a single permit type under which concessionaires must prepare a management plan within three years of being awarded a concession. About 186,000 hectares are considered to be under SFM. In Congo, the 2000 forest law requires FMUs to have management plans and concessionaires are now in the process of developing them. One large company with concessions covering about 1.3 million hectares has already developed and started to implement a comprehensive management plan and is undergoing certification. Forest management in DRC has been much disrupted by war, and

there is little forest under rigorous forest management in its vast forest estate; a similar situation applies in Liberia. In Côte d'Ivoire, the government agency in charge of forests, SODEFOR, prepares and implements management plans in forest reserves, but timber harvesting in those reserves has declined. In total, about 1.11 million hectares of forest reserves are under management plans. The new forest policy also requires that concession-holders in the rural domain present management plans, although few have done so to date. In Gabon, more than 2 million hectares of production PFE are under management plans and the estimate of sustainably managed forest there (1.48 million hectares) is probably conservative. Ghana has many favourable conditions for achieving SFM, notably impressive human resources and a long history of forest management, and some forest reserves are well managed. Others, however, have been over-harvested, and management of forests outside reserves is often poor or lacking. Nigeria has a long history of forest management and the formal goal of its forest policy is to achieve self-sufficiency in all aspects of forest production; however, once a significant exporter, the country is now a net importer of primary forest products and the management of its remaining, relatively small area of natural production PFE is problematic. Togo has a tiny area of natural production PFE, of which approximately 5,500 hectares are managed sustainably.

In the past, two factors seem to have been decisive in determining the character and intensity of timber harvesting in the closed forests of Africa: the distance of the forest from a suitable seaport for export and the ability of local markets to absorb the less valuable products (Poore et al. 1989). Thus, the forests of Côte d'Ivoire and Ghana, where ports are near and domestic markets are strong, have been harvested much more intensively than other forests in the region. In some countries, very selective harvesting in remote forest areas was, in the past, combined with fuller forest utilization in more accessible regions. In Congo, forests have been logged less intensively in the northeastern frontier than in Mayombe and Chaillu, as have the closed forests in Cameroon's east compared to

those in the western coastal area, and, in Gabon, forests in the centre and east compared with those of the coastal zone. This is changing. The eastern forests in Cameroon, the northeastern forests in Congo and the central and eastern forests in Gabon have been opened up over the last decade. Nevertheless, in many places SFM remains an economically marginal activity, and its financial viability in CAR, Congo and DRC – in which most forest is a thousand kilometres or more from seaports – is tenuous at current market prices for timber.

Despite the long history of silviculture in some parts of tropical Africa, recent attempts at intensive silviculture have been confined to pilot projects financed by ITTO, other international organizations or the private sector. These have not yet been expanded to an operational level, except perhaps in Gabon's okoumé forests, where there is abundant natural regeneration and simple silvicultural systems appear to work.

The number of timber species harvested in production forests has grown in recent years. This is especially the case near seaports or major local markets, where prime species have been largely logged out. Other species have become more popular, and, in countries such as Cameroon and Côte d'Ivoire, some have been banned from export in log form. Nevertheless, a handful of species still makes up the bulk of production: in CAR, loggers harvest 15–18 timber species, and five species make up 90% of production; in northern Congo, 18–20 species are harvested, but five species account for nearly 80% of production. The diversity of species and the low level of commercial interest in many of them are often major hindrances to the financial viability of SFM.

Planted forests

The total area of planted forests (825,000 hectares) is small compared to that in Latin America and the Caribbean and especially in Asia and the Pacific. More than half the plantation estate is covered by management plans. Countries vary in the quality of their plantations; unsurprisingly, those countries with diminished natural forest resources have made the most progress in developing their estates. Ghana, for example, is in the process of establishing a

significant area of *Tectona grandis* (teak) plantations; teak is also important in Nigeria and Togo. Côte d'Ivoire's teak plantations are a major contributor to timber exports.

Local hardwoods, including samba, okoumé, fraike, limba and other light hardwoods, have been widely tested in experimental plots over the last 30 years or so and are increasingly being used in plantations in the region, particularly in Congo, Côte d'Ivoire, Ghana and Togo, to increase the share of native species in forest plantations. Large rubber plantations, neglected for the last 20 years, are now being used in timber production, notably in Ghana, following the successful examples provided by countries such as Malaysia and Thailand.

Protection forests

DRC has by far the largest area of protection PFE (an estimated 27.0 million hectares) of the ITTO producer member countries in Africa. Next follow Cameroon, Congo and Gabon, with much lower areas in the remaining countries. Table 3c summarizes the management of the protection PFE in the region; Map 1 shows the distribution of protected areas in IUCN categories I–VI against a background of forest cover. Information on the status of management in the protection PFE is scarce, and even data on the extent of forests in protected areas are often confusing or contradictory. This can be seen in the large discrepancy between the estimate of protection PFE made on the basis of country reports, C&I workshops and other information (39.3 million hectares), and that given by UNEP-WCMC (2004) (20.6 million hectares). Considerable areas of lowland evergreen rainforest are attributed to IUCN categories I–IV in Cameroon, CAR, Congo and DRC. An estimated 1.22 million hectares have management plans, and 1.73 million hectares (including about 600,000 hectares in the Minkebe National Park and Forest Reserve, for which an ITTO-financed management plan is in the final stages of preparation) are being managed sustainably. Given the small amount of reliable data on which the estimate of protection forest under SFM has been made, it has a wide margin of error. Nevertheless, very large areas of forest not covered by management plans or otherwise under management

are under little or no threat from deforestation or other significant human-induced disturbance due to their remoteness from major human settlements and the difficulty of access to them. This is particularly the case in countries such as DRC, Congo and Gabon.

Overview of Asia & the Pacific

Forest resources

There are ten ITTO producer member countries in the Asia-Pacific region: Cambodia, Fiji, India, Indonesia, Malaysia, Myanmar, PNG, the Philippines, Thailand and Vanuatu. These countries vary considerably in many respects, including forest endowment, ownership, management systems and capability, forest product processing and utilization, trade in forest products and institutional arrangements. While Cambodia, Indonesia, Malaysia, Myanmar and PNG are producers and exporters of tropical timber and timber products, India, the Philippines and Thailand are now net importers. Fiji and Vanuatu are small but still largely forested. In all countries except Malaysia and the Philippines, more than half the population lives in rural areas; in PNG, the figure is as high as 83%. Malaysia's GDP (total and per capita) is much higher than those of the others. Three of the ten ITTO producer member countries (Cambodia, Myanmar and Vanuatu) are designated by the UN as least-developed countries (UNCTAD 2004).

Most of the countries of the region can be grouped into three general categories according to their endowment and use of forest resources:

- (i) high resource availability and low level of forest industry development (eg Cambodia and PNG);
- (ii) low resource availability and high level of forest industry development (eg India, the Philippines and Thailand); and
- (iii) high resource availability and high level of forest industry development (eg Indonesia and Malaysia).

Asia's closed tropical forests include wet evergreen, moist semi-deciduous, moist deciduous, freshwater swamp and mangrove forests; there are also sub-montane and montane forests. With some minor exceptions, such as the peat swamp forests in

Borneo and the upland pine forests in the Philippines, the main timber production forests of tropical Asia are all dipterocarp forests with varying proportions of species of *Shorea*, *Parashorea*, *Dipterocarpus*, *Dryobalanops* and other less-abundant dipterocarp genera. These forests also contain timber-producing species of the families Leguminosae, Burseraceae, Meliaceae, Anacardiaceae, Apocynaceae, Datisceae, Sapotaceae, Sterculiaceae and many others. The conifer genera *Agathis* and *Araucaria* occur locally. In Borneo, large areas of peat swamp forests produce two valuable non-dipterocarp timbers, *Gonystylus bancanus* (ramin) and *Dactylocladus stenostachys* (jongkong). To the east of the Wallace line², dipterocarps are generally poorly represented, though species of *Anisoptera* and *Hopea* occur in PNG. The forest there is much more mixed and often of less commercial value, though exceedingly rich forests may occur locally, such as the swamps of *Terminalia brassii*. In Thailand and Myanmar, the moist tropical forests grade into drier dipterocarp and teak forests in the north and east.

Two of the ten ITTO producer member countries in the region reportedly increased their forest cover during the period 1990–2000 – namely India and Vanuatu. Myanmar, the Philippines, Indonesia and Malaysia lost forest at an annual rate of greater than 1%.

The production and consumption of industrial wood have grown enormously during the last half-century, accompanied by a growing demand for the full range of forest goods and services (wood and non-wood, processed and unprocessed, and traded and untraded). By 2003, the ten countries were producing about 556 million m³ of roundwood, of which just over 75 million m³ were industrial roundwood (most of the rest being fuelwood).

The region is by far the largest trader of tropical timber: more than 70% of all internationally traded tropical wood products originate within it. NWFPs make a substantial contribution to trade in some countries; for example, they constitute more than 75% of all forest-based exports from India.

² The Wallace line is a hypothetical line that separates the zoogeographical regions of Asia and Australasia

While there have been few overt civil wars in the ITTO member countries of Asia and the Pacific in the last decade or so, civil unrest has probably affected forest management in parts of several countries, including Cambodia, Indonesia and Myanmar. In Fiji, a contributing factor to a military coup in the 1990s was a dispute over the ownership of the country's valuable *Swietenia macrophylla* plantation resource.

PFE

Of the estimated 204 million hectares of closed natural tropical forest in ITTO member countries in Asia and the Pacific, an estimated 97.4 million hectares (48%) are in production PFE and 71.0 million hectares (35%) in protection PFE (Table 3a). In addition, there are about 38.3 million hectares of plantations (more than 80% in India), giving a total PFE of 207 million hectares.

By far the largest area of natural production PFE is in Indonesia (46.0 million hectares), followed by India (13.5 million hectares), Malaysia (11.2 million hectares), Myanmar (9.70 million hectares) and PNG (8.70 million hectares). Thailand has no natural-forest production PFE, since it has banned logging in natural forests. The production forests of Fiji and Vanuatu could not be classed as PFE, since there are no firm legal grounds for expecting that they will be maintained as forests in the longer term. India has the largest area of protection PFE (25.6 million hectares), followed by Indonesia (22.5 million hectares) and Thailand (8.26 million hectares).

Institutional arrangements

Forest tenure

Forests in Asia are mostly owned by the state. On the other hand, customary community ownership applies to most forests in the Pacific Island countries of Fiji, PNG and Vanuatu, but even in these countries the forests are mostly administered by the government. At present, few forests are owned by private individuals or companies, but the proportion of privately owned planted forest is likely to increase. In several countries, non-forest private sources already meet many needs for wood; rubber plantations, for example, are a major source of wood for downstream industries in several countries, particularly Malaysia and Thailand.

In Cambodia, forests are mostly owned by the state, but local communities are allowed certain limited rights and privileges. In Fiji, communal groups called *mataqali* – of which there are more than 6,000 – own 84% of the forests; most of the remaining 16% is owned privately. In India, all legally constituted forests are owned and controlled by the state. Now that farmers and households are engaged in growing trees, a new category of private forest owners (of farm forests, home gardens and agro-industrial plantations) is becoming significant there. Nearly all natural forests in Indonesia are owned by the state. However, many claims by individuals and communities over traditional rights and ancestral domains have been brought into the open by recent political reform, and decentralization and forest tenure is unclear in many places. Traditional community rights (*adat*) are widely recognized. In Malaysia, where forestry is a state (provincial) matter, 90% of natural forest and 69% of planted forest are state-owned; the remainder is owned privately. In Sarawak, forests cleared by native communities for agriculture before 1958 are recognized as Native Customary Rights' Land. All forests in Myanmar are owned by the state; they are designated as reserved forests and public or unclassified forests. In PNG, customary land ownership is guaranteed by the constitution and is the key factor influencing the use of the forest: 97% of the land is held as communal or clan commons. In the Philippines, the government holds title to most forest land, but considerable portions (excluding protected areas) are held by the private sector, communities, people's organizations and indigenous people under various forms of agreement. All natural forests in Thailand are owned by the state, but trees established on private lands are private property. Rural people have rights to the collection of certain NWFPs, and some 'disturbed' state forests are available for long-term rent at low cost for grazing, cropping and tree-planting. In Vanuatu, all lands are customarily owned.

Forest policy and legislation

Most ITTO producer member countries in Asia and the Pacific have introduced new forest laws and policies – or revised the old – since 1990 to address the changing forestry situation and to highlight the role of forests in conservation. Exceptions include

Fiji, which still follows a forest policy developed in 1950, and India, the national forest policy of which dates from 1988. The Philippines lacks a comprehensive forest policy; its forestry is still governed by Presidential Decree 705 of 1975 (known as the Revised Forestry Code). Policies are not always effective or supported by strong institutions; some, such as logging bans and the decentralization of forestry administration, have had mixed effects at best and, at worst, unfortunate harmful consequences.

In all ITTO member countries in Asia and the Pacific, specialized government agencies have administrative jurisdiction over forests. Their composition, competencies, component activities and affiliations depend on the national importance of forestry and on other political factors, including the degree of decentralization to state, provincial, district and village levels. In some places, including India (at the state level) and Sarawak (Malaysia), components of the forestry administration have been corporatized. In others, the central forest authority is playing a much-reduced role in forestry regulation; in Indonesia, for example, authority over forest management is increasingly vested in the provinces and particularly the districts.

With the exception of Malaysia, no country in Asia and the Pacific appears to have sufficient information for the thorough planning and implementation of forest management. Information is often inadequate on: the condition of the resource and changes in it; growth and yield; production and productivity; harvesting and utilization; processing and trade; conservation and protected areas; the achievements of plans and programs; and costs and benefits, and the means for their allocation.

Status of forest management

Natural production forests

The main systems for the allocation and regulation of the production PFE vary considerably according to responsibility (private, cooperative or public), size of operation and length of contract. Except for Fiji, India, Myanmar and Vanuatu, countries have tended to use concession systems³, but this is

³ For many years India and Myanmar have used a system of departmental 'working circles' with contract logging to manage reserved forests under the provisions of approved working plans

changing. Thailand closed its forest concessions in the early 1990s, some years after they were introduced, and banned the logging of natural forests. Cambodia cancelled licences for 24 concessions in 2002 and suspended those for the remaining twelve concessions pending a fundamental evaluation, and the Philippines is phasing out its remaining concessions and expects to eliminate them by 2006. Indonesia's forest concession system has also been changing; for example, the period of licences in natural forests was recently increased from 20 to 55 years. However, decentralization has caused confusion there, with some small-scale operators being granted forest concessions at the provincial or district level that overlap with the concessions designated by the national government.

Forest concessions have been reasonably successful in encouraging forest-based economic development in some forest-rich developing countries, but they have not always encouraged SFM. In the Philippines, where the rise of the forest industry in the 1970s coincided with the widespread loss and degradation of natural forests, many of the problems associated with forest destruction can be linked to a combination of land and concession tenure issues and a lack of ability or will to enforce regulations. In PNG, there are concerns about the manner in which timber concessions are awarded and controlled.

Almost all concessions in the region are at least nominally under some sort of management based on selective silvicultural systems. Diameter limits of 45–50 cm and cutting cycles of 25–35 years are common. If applied strictly, these systems can provide relatively constant volumes of timber for at least the first two cutting cycles.

Illegal logging is considered to be a significant problem in the region. In Cambodia, the government recently closed more than 1,000 illegal sawmills, although the suspension of legal logging activities (through the cancellation or suspension of all forest concessions) appears to have stimulated a significant illegal timber industry. In India, logging is banned in many natural forests, but there are no adequate measures to enforce the ban. Illegal logging is recognized as one of the most critical problems of forestry and the forest industry in

Indonesia, with annual losses estimated in the billions of dollars. In Myanmar, logging in remote border areas is largely uncontrolled and has reportedly had serious environmental impacts there. In Thailand, where logging in natural forests is banned, forests remain under pressure from illegal tree-cutting, encroachment, fire and other agents. Similar problems affect the Philippines, where a logging ban has been in place in primary forests since the early 1990s.

The logging bans in the Philippines and Thailand were imposed after loggers and farmers had already depleted most commercial timber resources. Yet forest clearing for agriculture continues in both countries. In Indonesia, local logging bans have been imposed, particularly in East Kalimantan. But experience over the past ten years has shown that logging bans have rarely served to conserve forest resources: in some places legal logging has been replaced by more destructive illegal logging.

Table 3b summarizes the management status of the production PFE in ITTO producer member countries in Asia and the Pacific. The estimated natural-forest production PFE is 97.4 million hectares. Some 69.1 million hectares of it are under licence in concessions or other systems, of which an estimated 55.1 million hectares are covered by management plans – a much higher figure than in either Africa or Latin America and the Caribbean. At least 14.4 million hectares (15% of the natural-forest production PFE) are estimated to be managed sustainably.

The main advances in certification have been in Malaysia, where the government started to develop a national timber certification scheme (the Malaysian Timber Certification Council) in 1998; some 4.62 million hectares of natural-forest production PFE are now certified. Indonesia also has its own scheme (the Indonesian Ecolabelling Institute), although it has only just started to be operationalized: a total of 275,000 hectares of natural forest have been certified, some of which has also been endorsed by the Forest Stewardship Council (FSC) scheme. The total area of natural production forest certified as of late 2005 in Asia and the Pacific was about 4.91 million hectares.

Planted forests

The total plantation estate in the region's PFE amounts to about 38.3 million hectares (Table 3b). There is much variation between countries: India has 32.6 million hectares (85% of the total and more than twice the area of its natural production PFE), but Indonesia, with the second-largest timber plantation estate, has only 2.50 million hectares in its PFE; Thailand is next with 1.87 million hectares. Most other countries have much smaller areas of plantations. All countries have a further stock of timber species planted in home gardens and as trees along roads, as well as in agricultural tree crops such as rubber and coconut and oil palm.

Hardwoods are much more important than softwoods in the region's plantation estate. Teak and various species of eucalypt are most commonly planted, the vast majority of the latter being in India. Teak plantations cover more than 5 million hectares, mostly in India, Indonesia, Myanmar and Thailand. Other important hardwood species include *Dalbergia sissoo*, *Acacia mangium*, *Gmelina arborea* and *Swietenia macrophylla*, between them covering nearly 24 million hectares. Rubber has recently become a significant timber species, particularly in Peninsular Malaysia and Thailand, which export large volumes of value-added rubberwood products. Products made from coconut timber are also of importance, particularly in the Philippines. Nearly a third (11.5 million hectares) of plantations have management plans but only 184,000 hectares have been certified.

There has been an increase in the use of agroforestry and other trees outside forests over the past 15 years to meet household requirements for fuel, poles, timber and medicines, and to satisfy local markets. Different combinations of agro-silvo-pastoral systems are used. Many countries have encouraged forest restoration and land rehabilitation on marginal private and public lands. In India, for example, 50% of plantations established since 1980 are in an agroforestry setting.

Protection forests

Table 3c summarizes the management of the protection PFE in ITTO producer member countries in Asia and the Pacific; Map 2 shows the distribution

of protected areas in IUCN categories I–VI against a background of forest cover. Hardly any information is available on the degree of protection and quality of management in these forests. In the early 1990s, large areas of degraded and unproductive forests were declared as protected areas and logging was banned by law in some countries. But illegal logging and hunting continue to take place in many protected areas. Moreover, some of the parks and nature sanctuaries are ‘islands’ without buffers or corridors. The protection PFE amounts to an estimated 71.0 million hectares. An estimated 8.25 million hectares of these are covered by management plans and 5.15 million hectares are estimated to be sustainably managed, including 3.21 million hectares in Malaysia and 1.36 million hectares in Indonesia. No estimates could be made in this regard for six of the ten ITTO producer member countries in the region.

Latin America & the Caribbean

Forest resources

ITTO members in Latin America and the Caribbean can be divided into those that contain part of the Amazon Basin (Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela) and those outside it (Guatemala, Honduras, Mexico, Panama and Trinidad and Tobago). The Amazon Basin countries contain an estimated 744 million hectares of closed tropical forest, most of which is in the Amazon Basin itself, where only about 30 million people live. However, the most economically important forest activities often occur outside the Amazon – in subtropical Brazil, in the Andean highlands of Bolivia, Peru, Ecuador and Colombia, and on the Pacific and Atlantic coasts of Ecuador, Colombia and Venezuela. Population pressure and economic activity are low, but annual deforestation in the Amazon is still 2–3 million hectares. This varies from year to year: in Brazil, an estimated 1.89 million hectares of the Amazon were deforested in a recent twelve-month period, down from 2.70 million hectares in the previous twelve months. Deforestation is also significant in Ecuador, Peru and Venezuela, but virtually non-existent in Guyana and Suriname. Deforestation is due mainly to

the expansion of capital-intensive agriculture, in particular cattle ranching and, more recently, the planting of soybeans, which are generally the most immediately profitable land-uses. Timber extraction from natural forests plays a relatively minor but increasing economic role in most of the region. Bolivia, Peru and some other countries have introduced forest concession systems that are expanding access to Amazonian timber resources; others (eg Brazil and Colombia) are considering or are in the process of doing so.

The closed tropical forests of the region include: wet evergreen forests in the Amazon Basin and the Atlantic regions of Central America (particularly Panama and Guatemala); degraded moist semi-deciduous and moist deciduous forests around the Amazon Basin and in Central America and Mexico; and freshwater swamp forest and mangroves in Brazil, Central America, Ecuador, Colombia, Guyana and Venezuela. Wet evergreen montane forests are important in the upper Amazon in Bolivia, Peru, Ecuador and Colombia; in the upper Orinoco watershed in Venezuela; and in Central America, in particular in Panama. Natural tropical coniferous forests play important ecological and livelihood roles in the ITTO member countries of Central America, particularly Honduras, Guatemala and Mexico.

Outside the Amazon Basin, the status of forest resources and the dynamics of forest resource change vary. The Pacific forest areas of Ecuador and Colombia have some of the highest deforestation rates in the world (more than 5% annually). Mexico had the second-highest annual loss of forests of all ITTO member countries in Latin America and the Caribbean in 1990–2000 (631,000 hectares); deforestation there, however, is not confined to tropical forests and in fact is more prevalent in subtropical and temperate areas. Forest fires are a major contributing factor to forest decline in the drier zones. There is also significant forest loss in Panama, Honduras and Guatemala. In Honduras and Guatemala, the lowest-income ITTO member countries in the region, deforestation is closely linked to high population pressure.

The thirteen ITTO member countries in the region can also be divided into three groups based on the status of their natural forests:

- (i) those in which very large areas of relatively undisturbed forest still remain – Brazil, Bolivia, Colombia, Guyana, Peru, Suriname and Venezuela;
- (ii) those in which remaining large tracts of relatively undisturbed forest are under imminent threat of depletion – Ecuador and Panama; and
- (iii) those in which remaining natural forests are mostly highly disturbed – Honduras, Guatemala, Mexico and Trinidad and Tobago.

Civil war or insurgency is not widespread in the region today; the exception is Colombia, where it makes SFM very difficult to achieve. However, the illegal cultivation of crops in forested areas and other forest crimes are significant issues in many countries.

PFE

Of the estimated 788 million hectares of closed natural tropical forest in the ITTO producer member countries of Latin America and the Caribbean, an estimated 185 million hectares (23%) are in production PFE and 351 million hectares (45%) in protection PFE. In addition, there are about 5.60 million hectares of plantations, giving a total PFE of 542 million hectares. By far the largest area of PFE is in Brazil, which has an estimated 373 million hectares of PFE, including 271 million hectares of protection PFE. The next-largest PFE is in Peru (41.1 million hectares), followed by Venezuela (34.5 million hectares) and Bolivia (31.8 million hectares).

Institutional arrangements

Forest tenure

The balance in land ownership between the state and communities in ITTO member countries in the region changed considerably when Guatemala and Mexico joined the Organization; in these two countries, large areas of forest are owned collectively. Whereas the legal acknowledgement of indigenous rights over forest use has a long history in the other tropical regions, in Latin America and the Caribbean it is mostly a relatively recent phenomenon that is only now starting to influence forest management. Over the past 10–15 years there has been

an important shift towards the ownership of forest by local communities in several countries. Indigenous people now own large tracts of forest in Bolivia, Colombia, Panama and Peru, while more than 100 million hectares of forest in the Brazilian Amazon are indigenous lands. In most countries, however, the state retains some legal control over forest trees, even on private land.

The situation in countries within the Amazon Basin is as follows. In Bolivia, about 28 million hectares (53%) of the forest are publicly owned and administered by the state, nearly 17 million hectares (31%) are under specific user rights or ownership (including nearly 12 million hectares of indigenous community lands), about 2.8 million hectares (5%) are privately owned by communities, and another 5.4 million hectares (10%) are privately owned by individuals and industries.

In Brazil, a significant part of the PFE in the Amazon is privately owned; legal reserves on private lands cover 198 million hectares, and indigenous lands (Indian reserves) cover 103 million hectares. Parts of these forests have been set aside as extractive reserves. Despite the fact that private ownership is significant, the forests are considered to be a common asset for all inhabitants, and ownership and tenure disputes are a major problem. Illegal occupation is also common and adds to the difficulty of determining clear tenure and ownership. Colombia's constitution recognizes the ancestral rights to land of indigenous groups and of Afro-Colombian traditional communities. Today, about 22.1 million hectares of forest, mostly in the Amazon, are owned by indigenous communities and 5 million hectares, mainly in the Pacific region, by Afro-Colombian communities. In addition, many forest plots in the Andean region, particularly of planted forests, are owned privately. In Ecuador, there are legal provisions to allocate forests to indigenous communities, colonists and other interested groups already in possession of forest lands, on the condition that such groups guarantee the sustainable management and conservation of the forests allocated to them. About 4.5 million hectares of potential production forests have been allocated to indigenous communities and are now considered to be owned privately. The remaining

PFE is mostly in farmers' plots, but their tenure is unclear. In Guyana, ownership of the PFE is vested in the state; the remainder of the forest comprises other state land, Amerindian land and private property. Nine indigenous groups have legal title to about 1.4 million hectares of land, including forest. In Peru, forests are classified into public, private and indigenous ownership categories. More than 8 million hectares of forest are classified as public forests reserved for communities and indigenous groups; of these, about 6.2 million hectares have land titles. An additional 10 million hectares or more (one estimate puts the figure as high as 22.5 million hectares) are owned privately by community and indigenous groups. In Suriname, all forests (except those on private land) belong to the state. The constitution does not provide for collective rights or use of land, but Amerindian and Maroon people claim these rights, and there are conflicts over land tenure, particularly in the coastal zone and the northern forest area. More than 90% of the forests of Venezuela are owned by the state. There are private forest lots in both natural and planted forest areas, but their extent is not known. The constitution recognizes the right of indigenous people to the collective ownership of forest territories and to use forest resources, but there is no demarcation or formal recognition process in place.

In Guatemala, an estimated 38% (1.5 million hectares) of forests are owned privately, 34% (1.4 million hectares) are national forests and about 28% (930,000 hectares) are owned municipally or communally. Indigenous communal lands (*ejidales*) have special legal status. The complicated system of land tenure has led to many overlapping rights. In Honduras, there are three main types of forest ownership: public, *ejidales*, and private. There are many claims over the use of forests, particularly private lands, and significant areas of closed forest have no clear ownership. An estimated 80% of Mexico's forests, some of which are non-tropical, is owned by local communities (mostly *ejidos*). Around 15% is owned privately and 5% is classified as national land. Most of the forests in Panama are state-owned. However, the majority of the closed forest is situated in collective landholding units known as *comarcas*, or indigenous reserves, and the constitution gives these communities

the authority to manage their lands according to customary law. Nearly 75% of forest land in Trinidad and Tobago is owned and administered by the state and the remainder is owned privately.

Forest policy and legislation

The principle of using C&I to monitor SFM has been fully accepted in all the ITTO producer members of Latin America and the Caribbean, except perhaps in Trinidad and Tobago, which still lacks a system of C&I suited to its needs. Different sets of C&I are used as tools to monitor forest management, but these are sufficiently similar to provide the basis for reasonably uniform standards.

All eight countries of the Amazon Basin have subscribed to the Tarapoto process for the development of C&I for the sustainability of the Amazon forests, which is sponsored by the Amazon Cooperation Treaty. There appears to be some overlap in the Tarapoto and ITTO processes and there have been recent moves at the regional and some national levels to harmonize them. Bolivia and Brazil recognize the Tarapoto C&I process but use the ITTO C&I as an instrument to monitor progress towards SFM. Colombia and Ecuador have developed their own C&I based on those of ITTO; Peru has adopted national C&I based on the Tarapoto process but has also decided to use ITTO's C&I at the FMU level (as has Panama). Guyana reviewed both sets in the development of a new national forest plan, Suriname plans to develop national-level C&I based on the Tarapoto model, and Venezuela plans to develop its own C&I based on the latest version of ITTO's C&I. Guatemala, Honduras, Mexico and Panama participate in the Lepaterique C&I process of the Central American countries; Guatemala and Honduras have applied the 1998 ITTO C&I to their tropical production forests, and Mexico plans to develop C&I specifically for its tropical forests based on the ITTO C&I.

All ITTO member countries in the region have revised or adapted their forest laws and policies since UNCED and in the light of the new environmental conventions and ITTO policies and guidelines. They generally have a comprehensive body of forest laws aimed at the sustainable use of forest resources, but the level of enforcement is less than adequate in many countries.

Although the laws are generally similar between countries, there are a few important differences. Few countries have a clearly designated PFE, and the estimates contained in this report are largely made on the basis of subjective judgements as to the level of commitment of the forest owner to maintaining forest cover in particular tracts of land. The legal categories of forest vary greatly between countries. Another significant difference is the degree of responsibility held by forestry services for forest management and regeneration. For example, Colombia no longer has a national forest service, and regional autonomous corporations have incorporated the task of managing forests into their broader mandates for resource management. In several countries (Bolivia, Brazil, Peru and Venezuela), the holders of concessions (or, in the case of Brazil, landowners wishing to harvest their forest) are legally responsible for forest management, but these duties are often evaded or else fulfilled by paying a fee to the forestry service to do the management for them. Partly because smaller licensed companies are not expected to manage the forests they harvest, and partly because of land-tenure issues, small operations have proliferated in some countries, notably in Ecuador and to a lesser degree in Panama and Venezuela.

Seventeen years ago, forestry was normally part of a ministry of agriculture or dealt with by a ministry of forestry. This is no longer so: in most countries, forestry is now part of wider ministries in charge of environment and remains part of the Ministry of Agriculture only in Peru, Guyana and Honduras. At the federal level in Brazil, forestry is the responsibility of the Ministry of the Environment, Water Resources and the Amazon; in Colombia, the Ministry for Environment, Housing and Territorial Development; in Ecuador, the Ministry of the Environment; in Guatemala, Mexico and Venezuela the Ministry of the Environment and Natural Resources; in Trinidad and Tobago, the Ministry of Public Utilities and the Environment; and in Panama, the National Environmental Authority. In Bolivia, forestry is part of a wider ministry in charge of rural development – the Ministry of Sustainable Development and Planning.

Specialized agencies, partly organized as semi-autonomous bodies, are responsible for forestry planning, the supervision of forest management and, in some cases, for the direct management of state forests. Their responsibilities, however, have been greatly reduced over the years. Other agencies, in particular those in charge of environment, have assumed part of the responsibility for defining, implementing and/or enforcing forest management policies. In many countries of the region, the designated forest authorities appear to lack the resources to adequately implement and enforce their forest laws.

Civil society is of great importance in forest management in this region; it includes environmental and social NGOs and industry associations. In fact, in many ITTO member countries, it is civil-society organizations that are shaping the course of national forest and environmental policies. Forest management certification has become a significant influence, particularly in Bolivia and Guatemala. Grassroots organizations in Guatemala, Honduras and Mexico are actively developing community forestry in production forests. In Guyana and Suriname, NGOs are playing an important role in monitoring logging and mining in natural forests and in advocating the causes of indigenous peoples and Maroons. International (mainly North American) NGOs are also influential in forest conservation, particularly in the countries of the Amazon Basin. Some NGOs have leased forest production concessions in Guyana and Peru to transform them into privately operated protected areas, although so far these cover a relatively small area (218,000 hectares).

Status of management

Natural production forests

Forest use is allocated through long-term and large-scale private forest concessions of up to 200,000 hectares in Bolivia, Guyana and Suriname; Peru, Guatemala, Panama and Venezuela have systems for medium-sized concessions. Timber harvesting is mostly done at a smaller scale in Colombia, Ecuador, Honduras, Mexico, Panama and Trinidad and Tobago. In the Brazilian Amazon, nearly all production management is conducted by private operators in privately owned forests.

Table 4a summarizes the management status of the production PFE in ITTO producer member countries in the region. Most of the area allocated to concessions or under licence (34.7 million hectares) is also covered by management plans (31.2 million hectares). Brazil's forests currently available for timber production are mostly privately owned and therefore there is no major concession or licensing system; a new law on public forests which will introduce a concession system was approved by Congress in February 2006 and is expected to have a major effect on commercial forestry in coming years. Brazil's privately owned forests do not figure in the area of forests allocated to concessions or under licence in Table 4a but contribute 5.25 million hectares to the area of forests under management plans. The proportion of the production PFE under management plans in Latin America and the Caribbean is set to grow as several recently revised forest laws now require the preparation of forest management plans prior to logging. At least 6.47 million hectares (3.5% of the natural-forest production PFE) are estimated to be under SFM.

The certification of forest management has become a significant factor in nearly all countries. Unlike the situation in the African and Asia-Pacific regions, a single standard – that developed by the FSC – has so far been used as the main vehicle for the assessment of forests for certification. A total of 4.15 million hectares (2.2% of the natural-forest production PFE and 60% of the estimated area under SFM) have been certified under this scheme, including 2.21 million hectares in Bolivia, 1.16 million hectares in Brazil, 520,000 hectares in Guatemala and 163,000 hectares in Mexico's tropical forests. Brazil has also developed its own national scheme, CERFLOR, and certifications by this body are likely to begin shortly as a national standard has just been completed with ITTO assistance. In Bolivia, and possibly elsewhere, certification has been promoted by international donors, but access to markets for certified timber often remains problematic. The lack of a significant price premium in the markets where certified timber is sold may make it difficult to maintain high forest management standards.

As easily accessible sources of tropical hardwoods in Asia and Africa become scarcer, the global hardwood market is turning towards the vast, relatively unexploited timber resources of the Amazon Basin. However, SFM is still quite rare there. In 1989, silviculture and other aspects of forest management were being practised in the Tapajós National Forest, Brazil, and the von Humboldt National Forest, Peru. Tapajós still functions as a demonstration area and timber production is set to increase there, but management has been abandoned in the von Humboldt National Forest. In neither country has this experience been widely extended to other forests. An exception is the Antimary State Forest in Brazil's Acre state, which is being managed in accordance with a management plan prepared under an ITTO-financed project and produced 16,700 m³ of timber in 2003 (and was certified by the FSC in late 2005). The estimated 2.21 million hectares of Bolivia's natural forests considered to be under SFM are located in the Amazon, as are Peru's 560,000 hectares. Nevertheless, a great deal more work needs to be done if SFM is to become more widespread there.

In the last 15 years, there have been many new timber inventories. Doubts have been expressed about the accuracy of some of these. Accurate or not, the findings have rarely been used, either by forest operators for the detailed planning of their logging or by the forestry services for issuing logging licences. Logging is still highly selective, but the species taken have changed. Seventeen years ago, mahogany was the principal species in many forests, but other species have now taken its place. More species are marketable internationally – about 25–40 species compared with 5–15 in the 1980s. Average logging intensities have increased from 2–5 m³ per hectare then to more than 20 m³ per hectare today and even, in some well-organized long-term concessions, to 35 m³ per hectare. Nevertheless, the economic viability of SFM based on these lesser-known species is itself unknown.

Planted forests

The total plantation estate in the tropical part of ITTO producer member countries in Latin America and the Caribbean amounts to about 5.60 million hectares, the majority (3.81 million hectares, or 68%) in Brazil (Table 4b), where the main (although not exclusive) use is for wood pulp. Venezuela boasts 863,000 hectares and Peru about 250,000 hectares. At least 2.37 million hectares (42%) of the region's plantation estate are covered by management plans. A total of 1.59 million hectares are certified, most of them in Brazil.

Venezuela has extensive tropical pine plantations, and there is some new development of planted forests in Central American countries, particularly Panama, and in Peru. Major initiatives to promote planted forests at private, community and state levels have recently been launched in Colombia, Mexico and Ecuador. Plantation forestry has been recognized in many countries of the region as a vehicle for economic development, given the comparative advantages of fast growth and lower extraction costs. However, the creation of planted forests does not necessarily – and certainly does not immediately – relieve harvesting pressure on remaining primary forests.

Eucalypts are mostly planted outside the moist tropical forest area in mountainous and dry regions. Teak is typically planted in lowland tropical areas with dry seasons, and it has recently been widely planted on private land. Certification for many of these teak plantations is being sought in order to gain access to international markets. Local hardwoods, including *Cordia alliodora*, *Cedrela* spp, *Jacaranda* spp, *Bombacopsis quinata* and *Schizolobium* spp, and other light hardwoods such as *Gmelina arborea* are also being grown in plantations. The region has an excellent base of research into plantation development.

Protection forests

Table 4c summarizes the management of the protection PFE in ITTO producer member countries in Latin America and the Caribbean; Map 3 shows the distribution of protected areas in IUCN categories I–IV against a background of forest cover.

As in the other regions, there is little consistent and reliable information about the amount and management of forested protected areas. According to the estimate given in Table 4c, the protection PFE covers 351 million hectares, considerably more than the 66.8 million hectares estimated by UNEP-WCMC (2004) to be in protected areas compatible with IUCN protected-area categories I–IV. All figures are heavily influenced by the estimate of protection PFE in the Brazilian Amazon forest, which, in this report, is taken to include indigenous lands in the Amazon and protected areas on private lands.

Data on the management of protected areas are even more questionable. An estimated 8.37 million hectares of protected areas are covered by management plans – of which more than 85% was accounted for by one country (Venezuela) – but information was not available for Bolivia, Brazil, Colombia, Guatemala, Honduras, Mexico, Peru or Suriname. Of the estimated 4.34 million hectares of the protection PFE under SFM, 2.38 million hectares are in Bolivia and 1.54 million hectares in Peru, where specific areas are known to be covered by management plans and significant resources are being invested in their implementation. Estimates of the area of protection PFE under SFM were not possible for Brazil, Colombia, Ecuador, Guatemala, Honduras, Mexico, Suriname, Trinidad and Tobago, and Venezuela.

ANALYSIS, CONCLUSIONS AND RECOMMENDATIONS

Comparing surveys

The basis of comparison for the management of production forests is their condition as presented in Poore et al. (1989). There is no comparable baseline study on forests for protection, whether for soil and water or for biological diversity. The assessment in this report of the management of these protection forests – in so far as it has been possible to assess them at all – will itself set a baseline.

Because the present report uses Poore et al. (1989) as the baseline from which to assess subsequent changes, it is important to understand the purpose and coverage of the earlier survey and the procedures followed in it. The aim was to find out how much forest was being managed in a sustainable manner for the production of timber within the then producer countries of ITTO and what were the local conditions that led to success or failure. Neither C&I nor standard country reports existed at that time. Instead, accounts of the situation were drawn up by consultants, one for each region, who visited all ITTO producer member countries (which numbered 18 at that time compared to 33 today), collected relevant information, examined a sample of forests and consulted individuals with specialist knowledge. Finally, a roundtable discussion was held in each region. The result was, therefore, the best judgement based on information from all available sources.

The first question asked in the 1988 survey was simple: how much natural forest was being managed at an operational scale for the sustainable production of timber?

The answer was unequivocal: almost none. In Latin America and the Caribbean, there were only 75,000 hectares in Trinidad and Tobago; in Africa, none. In Asia, a number of “forests and operations appeared to be reasonably successful as potential sustained-yield units” in Malaysia, Indonesia and the Philippines. About 160,000 hectares in

Queensland qualified, but these were later withdrawn from management for timber production when they were included as part of a World Heritage area. Note, however, that insufficient information was received from India in 1988 to reach any conclusions, even though India was a member country at the time.

Any comparison of findings from the 1988 and present surveys faces some obvious difficulties. The first is that comprehensive, reliable data were scarce for both surveys, although more was available for the second than the first. Another is that the number of countries surveyed expanded greatly in the second. The ITTO producer member countries in 1988 were Bolivia, Brazil, Cameroon, Congo, Côte d'Ivoire, Ecuador, Gabon, Ghana, Honduras, India, Indonesia, Liberia, Malaysia, PNG, Peru, Philippines, Thailand and Trinidad and Tobago. All remain members, but they have been joined by 15 others: Cambodia, CAR, Colombia, DRC, Fiji, Guatemala, Guyana, Mexico, Myanmar, Nigeria, Panama, Suriname, Togo, Vanuatu and Venezuela. Moreover, Australia was included in 1988 and India was excluded.

Several of the 15 additional countries have significant tropical forest resources, including Colombia, DRC and Venezuela. Combined, the 15 contribute 2.80 million hectares of the estimated area of SFM in 2005, and India contributes 4.80 million hectares. Thus, while the overall estimate of SFM in the natural production PFE in 2005 is 25.2 million hectares, the increase in the countries that were included in both surveys is about 17.5 million hectares.

Another obvious difference between this report and the 1988 survey is that this report is based on the ITTO definition of SFM and the ITTO C&I, neither of which had been formulated in 1988. However, this does not matter, as both are derived and do not differ significantly from the relevant considerations developed in the 1988 survey.

In the 1988 survey, Trinidad and Tobago was cited as the only producer member country where timber came from sustainably managed natural forest. In all other countries studied, timber came from primary and secondary forests often logged without a management plan; the planned or unplanned conversion of forests to other uses was also a very important source of timber, particularly in Brazil. In most countries, there has been at least modest improvement since then.

In addition to the gross increase in area considered to be under SFM, one of the most noticeable improvements since 1988 is the almost universal move towards the enactment of new forest laws and regulations, the reorganization of departments responsible for forests and, in many countries, moves towards the devolution of responsibilities to lower echelons of government. An increasing interest in certification within both government and the private sector is also apparent. There seem to be several reasons for these developments. An important part has undoubtedly been played by the huge international interest in forest issues since UNCED in 1992, although this has generally fallen short of providing new funds at the scale needed to address such issues. Some of the significant timber-importing countries (and, particularly, buyers' groups within them) have also become increasingly insistent on evidence of the legality of imported timber and the quality of the management of the forests from which the timber comes. However, they have shown less inclination to pay higher prices or provide financial assistance to meet the cost of such improved management and the certification thereof.

Some countries appear to have made less progress than others. Since 1988, the area of closed tropical forest for both production and protection has declined significantly in countries such as Côte d'Ivoire, the Philippines and Togo. Countries such as Liberia and DRC, which have endured major armed conflicts, have been unable to develop the administrative and private-sector capacity to pursue SFM. A lack of forest law enforcement remains a major problem in many countries, and progress in identifying, demarcating and securing a PFE has perhaps been less than might have been hoped for.

Production forests

Despite difficulties and some notable deficiencies, there has been some significant progress in the last 17 years. Countries have established and are starting to implement new forest policies that contain the basic elements of SFM. More forests have been given some security by commitment as PFE (or a similar concept) for production or protection, more are covered by management plans and more are actually being managed sustainably. Moreover, some of the PFE is also certified – a new development since 1988. All of this is encouraging, but the proportion of natural production forest under SFM is still very low, and SFM is distributed unevenly across the tropics and within countries.

The area now covered by formal forest management plans is estimated to be to 96.3 million hectares (27% of the natural production PFE). The fact that this is much more than the 7% that is sustainably managed warrants further examination. Part of the discrepancy may be because more information was available on the area covered by management plans than on the extent to which such management plans were being implemented. But almost certainly there is also a problem in the actual implementation of management plans. Companies are able to comply relatively easily with the requirement to develop management plans for the forests they are licensed to harvest, but without keen oversight by a regulatory body may not feel compelled (and in some cases may not have the capacity or the intention) to implement them. With more international support, coupled with greater enforcement of the requirements of forest management plans, SFM is likely to become more widespread in the natural production PFE. Countries such as Brazil, Congo, Ghana, Malaysia and Peru might be expected to lead the way, and many others have established at least some of the elements necessary for the greater adoption of SFM.

Planted forests

Planted forests are coming to play a much more significant role in the supply of tropical timber. The fact that this role was not even considered in the 1988 survey shows how much things have changed; the area of planted tropical forests has expanded

considerably in the past 15–20 years and continues to do so, and some countries are becoming increasingly reliant on planted forests for domestic wood supply. Unfortunately, there is a lack of comprehensive information across a range of countries as to the proportion of wood supply derived from plantations and the implementation of SFM in them, information deficits that will need to be rectified to allow more meaningful assessments of overall progress towards SFM in the tropics in the future.

Sustainable yield

Sustainable yield – the amount of timber (and other products and services) that can be harvested from a forest on a sustainable basis – is critical to SFM in the production PFE, both nationally and at the FMU level. However, few countries provided estimates of sustainable timber yields or data on actual offtakes in their PFEs and FMUs for this report.

The calculation of sustainable timber yield is complex and depends on, among other things, knowledge of growth rates of timber species under specified silvicultural prescriptions, adequate inventories of growing stock, the quality of forest management practice, the accessibility of production forest and the marketability of different species. It is therefore beyond the scope of this report to calculate potential sustainable yields or their relationship with current timber production; such an exercise would be inherently unreliable given the paucity of information on harvesting intensity, periods between re-entries to previously harvested stands, productivities of different forest types for industrial roundwood and fuelwood, the role of plantations (which usually have a much higher sustainable yield), etc.

Nevertheless, an examination of available data is useful. Table 5 shows estimated official total roundwood production (which includes fuelwood) and total tropical industrial roundwood production (which excludes fuelwood) in ITTO producer member countries in 2003, as well as total forest area and area of production PFE. If the average sustainable timber yield was about 1 m³ per hectare per year in natural production PFEs (a conservative but widely accepted estimate of tropical forest productivity), many countries would have sufficient forest resources to sustain or increase current production were they to introduce (or expand) a sustainable yield regime in their PFEs. On the other hand, some

countries would already appear to have difficulty supporting current production on a sustainable-yield basis from their natural PFEs. They must rely on timber plantations, harvesting from non-PFE forests and/or imports (as well as production from their natural PFEs) to maintain their current timber consumption. Often, such countries also have large areas of degraded forest lands, exacerbating problems of timber supply. The data in Table 5 also indicate the dominance of the fuelwood harvest in many countries (notwithstanding the generally poor quality of fuelwood statistics); it is at least ten times higher than industrial roundwood production in ten of the 33 ITTO producer member countries, and five to ten times higher in another eleven countries. Several countries (eg Ghana, Guatemala, Nigeria, Philippines and Togo) appear to be extracting unsustainable levels of fuelwood based on these estimates. A large proportion of fuelwood extraction takes place outside the PFE and in most countries extraction is also often informal, making the collection of reliable data a significant challenge.

Protection forests

Data are still sparse on the extent to which the protection PFE represents the full diversity of forest ecosystems found there. Indeed, the designation of protected areas has often been relegated – not just in the tropics – to those areas of land left over when all other economic land-uses have been satisfied or that are too difficult to harvest. But it is now recognized that they should be selected according to their intrinsic value for biodiversity conservation, which usually means the inclusion of representative samples of all forest ecosystems; any areas of exceptional biological richness or where there are concentrations of endemic species; and the breeding, feeding and staging grounds of migratory species. It is desirable, too, that protected areas should be large and contain internal variation and, ideally, should constitute a network of connected habitats if they are to accommodate the larger animals and be buffered against environmental change. They also depend crucially on the cooperation and support of local communities.

Data provided by UNEP-WCMC (2004) presented in this report estimate the extent of forest types included in protected areas conforming to IUCN protected-area categories I–IV, by country.

According to this source, 156 million hectares of tropical forest out of a total area of protection PFE of 461 million hectares are within reserves conforming to IUCN categories I-IV. Moreover, these seem reasonably well distributed among the various forest types in at least some countries. This information – classified in this way – represents a great advance on any that has been available hitherto, but much more detailed analysis would be needed to determine its reliability, the adequacy of the coverage, and how far the distribution of areas will ensure buffering against the possible effects of environmental change. Sparse though the information is, any progress in the sustainable management of protected areas must be assessed against these data; there is no earlier reliable baseline.

As noted earlier, the ITTO C&I make a distinction between forests that are protected for the safeguarding of soil and water and those that are protected for the conservation of biodiversity. However, in their responses to the reporting questionnaire very few – if any – countries appeared to recognize this distinction. Thus, data on protection forests appeared to often be double-counted, and this led to a certain amount of confusion. Nevertheless, as for forests set aside for the conservation of biological diversity, the total area of forest committed for soil and water protection is important, as is its location; more clarity of indicators related to this component of forest use is needed.

There have also been other efforts to assess the situation in protected areas. Since 2000, IUCN's World Commission on Protected Areas has been promoting a framework for assessing the effectiveness of management, to provide guidance to managers and to help harmonize assessment worldwide. This initiative has recently been included in the Programme of Work on Protected Areas of the Convention of Biological Diversity, which requires that governments should undertake assessments in at least 30% of their protected areas by 2006. This means that many governments have, in theory, started carrying out assessments.

A survey of a sample of protected areas has recently been examined using a management effectiveness tracking tool developed by the World Wide Fund for Nature (WWF) and the World Bank which, like the estimate of SFM provided in the

current report, is largely subjective. More than 200 questionnaires have now been completed, of which more than one hundred canvass protected areas in tropical forests. Biodiversity was considered to be in 'good condition' in a third of this sample and 'largely intact' in a further 50%. In the remaining 20%, some or all biodiversity values were deemed to be 'severely degraded'. The survey also assessed management strengths and weaknesses. Those considered to be strongest were: legal status, protected area design, protected area objectives, protected area demarcation, biodiversity condition assessment, resource inventory, economic benefit assessment, management of budget, regular work plan and resource management. The weakest were: equipment, management plans, current budgets, the involvement of local communities, security of budgets, monitoring and evaluation, fees, indigenous people, commercial tourism and visitor facilities. Overall effectiveness was, as might be expected, strongly correlated with staff numbers and budget (N. Dudley, M. Hockings & A. Lisle pers. comm., November 2004).

Summary of change

To summarize the present status of SFM compared to that in 1988:

- uneven progress has been made in the identification, demarcation and protection of PFEs. In many countries there still exists considerable uncertainty about the concept;
- there is greater government commitment to SFM, as demonstrated by improved legislation, administrative arrangements and consultative processes;
- forest tenure is still in a state of flux in many countries but is increasingly directed towards communities;
- there is an increase in the area of PFE that is managed sustainably, but progress is uneven within and across countries and regions;
- forest law enforcement is often weak due to the inadequate staffing and support of enforcement agencies, the remoteness of the resource, and confusion created by sometimes-conflicting legislation and by decentralization and other political processes;

- the resources allocated by governments and development assistance agencies to forest management are often seriously inadequate, reflected in chronic shortages of vehicles, equipment and trained and motivated staff; and
- there is more and better information about SFM than in the past, but it is still far from adequate for the comprehensive monitoring, assessment and reporting of SFM in either production or protection PFEs.

Constraints to SFM

Putting aside the difficulties caused by wars and armed conflicts, several constraints frequently recur in the country profiles. These vary in intensity and importance from country to country – and in the order in which they need to be tackled. Probably the most important, and the most generally applicable, is that sustainable management for the production of timber is less profitable to the various parties involved (government, concessionaires and local communities) than other possible ways of using the land. Many of the FMUs in which SFM (and particularly, in some countries, certification) has been established have benefited from external financial and technical support from development assistance agencies and NGOs. The economic viability of SFM within these FMUs will be properly tested once such support is withdrawn. Those governments and companies that have been striving to improve forest management, even when they have not yet been wholly successful, merit the long-term support of markets, development assistance agencies, NGOs and the general public.

Other constraints are related to land. There have been advances in many countries in committing forest for either production or protection and in establishing a PFE, but without the security provided by long-term government resolve and by credible arrangements for tenure, SFM is unlikely to succeed. The best results will usually be achieved where countries (or relevant sub-national political units) decide the future uses to which they wish to allocate their forest resources and set up mechanisms to ensure that this allocation happens. There is little point in devoting scarce resources to bring an area of forest to a high standard of

management if it is eventually to be converted to some other non-forest form of land-use.

Illegal logging and the illegal trade of timber are significant problems that have increasingly exercised the international forest-policy community in recent years. Discussing the problems is certainly an important first step in dealing with them but cannot, in itself, be sufficient. Ultimately they will be best addressed by improved laws and rigorous forest law enforcement, which in many cases will require increased support from governments in both producer and consumer countries. In many places, control in the field remains a central concern.

There is an almost universal lack of the resources needed to manage tropical forest properly. There are chronic shortages of staff, equipment, vehicles, facilities for research and training and all the other necessities for running an efficient enterprise – often accompanied by low staff morale. Pay and conditions of service are rarely sufficiently favourable to attract (and keep) enough able, dedicated and qualified staff to work in the field. These shortages are a reflection of the low social and economic status of field-based forestry and the relatively low priority accorded to forest management in many countries, both of which are partly attributable to the low economic returns provided by SFM.

The nature of the evidence

In the preparation of this report it became clear that, in most countries, information on the extent of forests and the status of management in the PFE is still very poor. For example, estimates of total forest area – arguably the most basic figure of all – vary by as much as 230% between sources. There also appears to be great uncertainty about the area of forest allocated to the PFE and about the extent of forests in protected areas and the level of protection afforded them. The extent of illegal activities in forests, one of the biggest hindrances to SFM, is rarely known or reported by governments, and estimates made by NGOs are often little more than guesses. As shown in Box 5, nearly one-third of ITTO producer member countries failed to submit a response to the ITTO C&I reporting format and, of those that did, many responses

were at least partially unusable due to missing or obviously inaccurate data (Box 3). The publication of this report should encourage ITTO member countries, and forest-related institutions and organizations, to continue to improve their data collection systems, since reliable information is the cornerstone for both practising and assessing SFM.

Future directions

The global setting for the management of tropical moist forests is changing. Populations and aspirations are growing and communications improving. The agricultural frontier is continuing to advance, while previously inaccessible forests are becoming accessible and others have already been logged more than once, often becoming degraded in the process. The global market economy is extending its reach, with profound implications for land-use. For timber, the demand for certification is starting to influence management in FMUs in export-oriented countries. Conversely, a ready availability of relatively cheap commodity timbers from non-tropical forests, tropical plantations and illegal operations impose strict limits on the price increases that are possible for timber from sustainably managed natural tropical forests.

There is little doubt that standards of forest management improve as countries become richer and better able to allocate resources to enforce forest laws and implement SFM. If people in tropical forest countries find their living standards rising, they are likely to pay more attention to broader environmental issues and remaining forests will become much more appreciated. One may foresee a forest landscape that includes protected areas for dedicated protection, plantations for dedicated mass timber production, and a matrix of natural forests managed sustainably and profitably for the full range or subset of forest goods and services and serving as living space for indigenous and local people. If, on the other hand, living standards do not improve, it seems inevitable that the present pressures to destroy and degrade forest will build up even further. It follows, therefore, that SFM can be expected to become more widespread in the tropics with economic growth, although such

growth might also increase deforestation, at least temporarily. Eventually, countries that continue to develop economically will attain the capacity necessary to safeguard their PFEs and manage them sustainably. Conversely, continued poverty poses a significant threat to tropical forests, perhaps the greatest of all. Civil war and other violent conflicts are similarly problematic, and those countries in which such conflicts have been prevalent since 1988 have generally made little progress towards SFM.

A number of possible developments may affect the direction of future change:

- the expansion of planted forests and the use of agricultural tree crops for timber may reduce timber-demand pressure on the natural forest by supplying an increasing proportion of wood production;
- declining timber prices and/or increased prices for agricultural products would undermine efforts towards SFM;
- a greater focus on the management of high-value timber species, an expanded range of species, and/or increased value-added production could help increase the profitability of natural forest management;
- climate change could affect forest growth, yield and even survival. A general drying in the tropics could lead to an increased incidence of forest fire and drought-related changes to forest structure. Conversely, increased rainfall could lead to higher rates of forest growth and could also cause more erosion, landslides and flooding;
- greater security of tenure may help to increase sustainable management;
- the situation of those peoples who live in or near the forest is unlikely to remain static. If living standards improve and migration to urban centres continues, local pressures on forest may decrease;
- decentralization may align forest management more closely with local interests, but there is no guarantee that this will favour SFM;

- as affluence increases, public pressure could induce governments to improve management and pay more attention to environmental values; and
- the global community could increase its payments for the global environmental services provided by natural tropical forests, thereby improving the economic viability of SFM.

Given the number of variables at play, and the likelihood that entirely new ones will arise, it is difficult to predict how the status of tropical forest management will change in the future. There is no golden recipe for success: the means to accomplish SFM must remain flexible. It seems fairly certain, however, that the global area of natural tropical forests will continue to decline in the medium term and that management in the remaining areas, responding to a combination of market pressures and growing domestic concerns for forests as countries grow economically, will continue to improve. ITTO and others seeking to promote SFM in the tropics will continue to face a challenging agenda in the years to come.

Recommendations

This report should prove helpful in illuminating the status of tropical forest management; however, its usefulness will be limited if it is not repeated at reasonably regular (and frequent) intervals, because trends are essential in assessing progress towards SFM. The ecological, economic or social sustainability of a forest management regime can never be known for sure, because the term implies no undue reduction in a forest's values in perpetuity. Moreover, the management regime that makes a forest 'sustainable' could change, literally overnight. Thus, continuous monitoring of a forest's values and continuous improvement of management systems are essential. It is therefore recommended that regular reporting on the status of tropical forest management be instituted at the international level.

It is apparent that data on the status of tropical forest management are still highly flawed and, in many cases, inadequate for reliable assessment. This fact sends a powerful signal that a great deal of work must still be done to achieve SFM across the majority of the tropical PFE. Indeed, even the clear identification and demarcation of the PFE

remain urgent tasks in many countries. If subsequent reports are to properly detect changes in the status of tropical forest management against the baseline of this report, the question of how to collect comparable information in the future must be considered. In this respect, the C&I have fulfilled a useful purpose in clarifying the parameters of SFM; in training forest managers in the identification, recording and measurement of these; and in providing the data for assessing progress towards SFM. Yet they have not drawn out all the information required for a fully accurate report on the status of tropical forest management. The revised ITTO C&I (ITTO 2005a) should be easier to use and will help countries to provide improved data in the future. However, many countries still lack the capacity to collect, analyse and make available comprehensive data on the status of forest management. It would be in the interest of the international community to make resources available to improve this capacity, and it is recommended that it does so.

There has been an appreciable degree of progress towards SFM in tropical forests over the last 17 years. The foundations for SFM have been laid in most ITTO producer member countries but there is still a long way to go in building the practice of SFM on these enabling foundations. The progress has also been patchy both geographically and in terms of the components of SFM. However, the most debilitating weakness is the failure to develop an adequate and reliable system on a global scale for funding the additional costs involved in putting SFM into practice in the forest. A general progression towards SFM in the tropics will be faster and more robust if SFM is seen as a financially competitive land-use. This in turn will be best achieved if prices for timber from natural tropical forests are strong and/or the important services provided by such forests, such as water production, biodiversity conservation and carbon storage, are paid for. The lack of markets for these services is a considerable obstacle to tropical forest conservation, because alternative land-uses, which usually involve a much more intensive use of the land, are more profitable or provide quicker returns. A final recommendation is that the international forest-related community makes its number-one priority the development of a system for ensuring that SFM is a financially remunerative land-use.

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SUMMARY TABLES

Table 1 Global summary of management status in the tropical PFE

	PFE ('000 hectares)											
	Production							Protection			All	
	Natural				Planted							
	Total area	With management plans	Certified	Sustainably managed	Total area	With management plans	Certified	Total area	With management plans	Sustainably managed	Total area	Sustainably managed
Africa	70,461	10,016	1,480	4,303	825	488	0	39,271	1,216	1,728	110,557	6,031
Asia & the Pacific	97,377	55,060	4,914	14,397	38,349	11,456	184	70,979	8,247	5,147	206,705	19,544
Latin America & the Caribbean	184,727	31,174	4,150	6,468	5,604	2,371	1,589	351,249	8,374	4,343	541,580	10,811
Total	352,565	96,250	10,544	25,168	44,778	14,315	1,773	461,499	17,837	11,218	858,842	36,386

Table 2a Total forest area and PFE in Africa

Country	Total forest area (range) (million hectares)	Total closed natural forest (FAO 2001) ('000 hectares)	PFE ('000 hectares)				
			Production			Protection	Total
			Natural	Planted	Total		
Cameroon	13.3–23.8	19,985	8,840	17	8,857	3,900	12,757
CAR	22.9–29.3	4,826	3,500	3	3,503	300	3,803
DRC	128–135	126,236	20,500	55	20,555	27,000	47,555
Congo	20.3–22.1	22,000	18,400	72	18,472	2,860	21,332
Côte d'Ivoire	7.12–11.7	3,248	3,400	167	3,567	734	4,301
Gabon	25.8	21,800	10,600	25	10,625	2,700	13,325
Ghana	2.72–6.34	1,634	1,150	97	1,247	353	1,600
Liberia	3.48–5.66	4,124	1,310	n.d.	1,310	101	1,411
Nigeria	9.7–13.5	4,456	2,720	375	3,095	1,010	4,105
Togo	0.51–1.09	272	41	14	55	313	368
Total		208,581	70,461	825	71,286	39,271	110,557

n.d. = no data

Table 2b Management of the production PFE in Africa ('000 hectares)

Country	Natural					Planted		
	Total area	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total area	With management plans	Certified
Cameroon	8,840	4,950	1,760	0	500	17	n.d.	0
CAR	3,500	2,920	650	0	186	3	n.d.	0
DRC	20,500	15,500	1,080	0	284	55	40	0
Congo	18,400	8,440	1,300	0	1,300	72	45	0
Côte d'Ivoire	3,400	1,870	1,110	0	277	167	120	0
Gabon	10,600	6,923	2,310	1,480	1,480	25	10	0
Ghana	1,150	1,035	1,150	0	270	97	97	0
Liberia	1,310	1,310	0	0	0	n.d.	0	0
Nigeria	2,720	1,060	650	0	n.d.	375	175	0
Togo	41	41	5.5	0	5.5	14	1.2	0
Total	70,461	44,049	10,016	1,480	4,303	825	488	0

Table 2c Management of the protection PFE in Africa ('000 hectares)

Country	Total area	Attributed to IUCN categories I-IV	Allocated for soil and water protection	With management plans	Sustainably managed
Cameroon	3,900	2,650	n.d.	n.d.	n.d.
CAR	300	3,090	5.7	n.d.	n.d.
DRC	27,000	9,320	n.d.	n.d.	0
Congo	2,860	2,860	3,660	380	380
Côte d'Ivoire	734	734	195	345	150
Gabon	2,700	570	0	491	1,090*
Ghana	353	174	n.d.	n.d.	108
Liberia	101	101	0	0	0
Nigeria	1,010	1,010	n.d.	n.d.	n.d.
Togo	313	60.9	200	n.d.	n.d.
Total	39,271	20,570	4,061	1,216	1,728

* Includes 599,000 hectares in the Minkebe National Park and Forest Reserve, for which a management plan is in the final stages of preparation

Table 3a Total forest area and PFE in Asia & the Pacific

Country	Total forest area (range) (million hectares)	Total closed natural forest (FAO 2001) ('000 hectares)	PFE ('000 hectares)				
			Production			Protection	Total
			Natural	Planted	Total		
Cambodia	9.33–11.1	5,500	3,460	17	3,477	4,620	8,097
Fiji	0.82–0.93	747	0	113	113	241	354
India	64.1–76.8	22,500*	13,500	32,600	46,100	25,600	71,700
Indonesia	105–120	100,382	46,000	2,500	48,500	22,500	71,000
Malaysia	19.3–19.5	19,148	11,200	183	11,383	3,210	14,593
Myanmar	34.4	32,700	9,700	710	10,410	3,300	13,710
PNG	30.6	30,150	8,700	80	8,780	1,700	10,480
Philippines	5.4–7.2	5,288	4,700	274	4,974	1,540	6,514
Thailand	13.0–14.8	10,127	0	1,870	1,870	8,260	10,130
Vanuatu	0.902	442	117	2.10	119	8.37	127
Total		204,484	97,377	38,349	135,726	70,979	206,705

* Tropical only

Table 3b Management of the production PFE in Asia & the Pacific ('000 hectares)

Country	Natural					Planted		
	Total area	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total area	With management plans	Certified
Cambodia	3,460	3,370*	150	0	0	17	7	0
Fiji	0	n.a.	n.a.	n.a.	n.a.	113	90	0
India	13,500	13,500	9,720	0	4,800	32,600	8,150	0
Indonesia	46,000	43,200	18,400	275	2,940	2,500	2,500	0.152
Malaysia	11,200	6,790	11,200	4,620	4,790	183	183	183
Myanmar	9,700	n.a.	9,700	0	291	710	0	0
PNG	8,700	5,600	4,980	19	1,500	80	n.d.	0
Philippines	4,700	n.d.	910	0	76	274	274	0
Thailand	0	n.a.	n.a.	n.a.	n.a.	1,870	250	1
Vanuatu	117	n.d.	0	0	0	2.1	2.1	0
Total	97,377	69,090	55,060	4,914	14,397	38,349	11,456	184

* Suspended

n.a. = not applicable

Table 3c Management of the protection PFE in Asia & the Pacific ('000 hectares)

Country	Total area	Attributed to IUCN categories I-IV	Allocated for soil and water protection	With management plans	Sustainably managed
Cambodia	4,620	3,360	4,200	n.d.	n.d.
Fiji	241	3	18	37	55
India	25,600	3,060	n.d.	n.d.	n.d.
Indonesia	22,500	14,400	16,000	5,000	1,360
Malaysia	3,210	1,400	3,210	3,210	3,210
Myanmar	3,300	195	6,560	n.d.	n.d.
PNG	1,700	362	n.d.	n.d.	n.d.
Philippines	1,540	1,540	n.d.	n.d.	n.d.
Thailand	8,260	5,450	9,320	n.d.	522
Vanuatu	8.37	0	n.d.	n.d.	n.d.
Total	70,979	29,770	39,308	8,247	5,147

Table 4a Total forest area and PFE in Latin America & the Caribbean

Country	Total forest area (range) (million hectares)	Total closed natural forest (FAO 2001) ('000 hectares)	PFE ('000 hectares)				
			Production			Protection	Total
			Natural	Planted	Total		
Bolivia	52.2–59.5	47,999	17,000	60	17,060	14,700	31,760
Brazil	444–544	489,515	98,100	3,810	101,910	271,000	372,910
Colombia	49.6–65.6	51,437	5,500	148	5,648	8,860	14,508
Ecuador	8.40–11.4	10,854	3,100	164	3,264	4,300	7,564
Guatemala	2.85–4.29	2,824	1,140	71	1,211	1,240	2,451
Guyana	16.9	16,916	5,450	12	5,462	980	6,442
Honduras	5.38	3,811	1,590	48	1,638	1,600	3,238
Mexico	55.2–64.0	33,120	7,880	100	7,980	5,600	13,580
Panama	2.88–3.48	3,052	350	56	406	1,580	1,986
Peru	65.2–86.4	64,204	24,600	250	24,850	16,300	41,150
Suriname	13.6–14.8	14,100	6,890	7	6,897	4,430	11,327
Trinidad & Tobago	0.248–0.259	250	127	15.4	142.4	59.1	201.5
Venezuela	49.9–55.0	49,926	13,000	863	13,863	20,600	34,463
Total		788,008	184,727	5,604	190,331	351,249	541,581

Table 4b Management of the production PFE in Latin America & the Caribbean ('000 hectares)

Country	Natural					Planted		
	Total area	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total area	With management plans	Certified
Bolivia	17,000	5,470	5,470	2,210	2,210	60	n.d.	0
Brazil	98,100	n.a.	5,250	1,160	1,360	3,810	1,350	1,350
Colombia	5,500	2,150	n.d.	0	200	148	80	58
Ecuador	3,100	n.d.	65	0	101	164	65	21.3
Guatemala	1,140	540	697	520	672	71	25	7.57
Guyana	5,450	3,800	3,730	0	520	12	0	0
Honduras	1,590	1,070	671	37	187	48	28	0
Mexico	7,880	8,600	8,600	163	163	100	34	0
Panama	350	86	63	0	0	56	32	12.2
Peru	24,600	8,000	5,000	59.5	560	200-300	8	0
Suriname	6,890	1,740	73	0	0	7	7	0
Trinidad & Tobago	127	75	75	0	15	15.4	15.4	0
Venezuela	13,000	3,120	1,480	0	480	863	727	140
Total	184,727	34,651	31,174	4,150	6,468	5,604	2,371	1,589

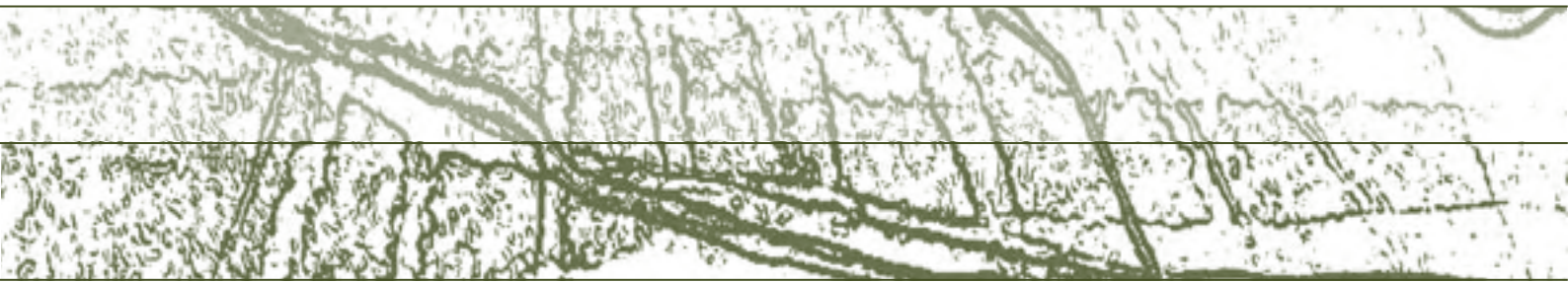
Table 4c Management of the protection PFE in Latin America & the Caribbean ('000 hectares)

Country	Total area	Attributed to IUCN categories I-IV	Allocated for soil and water protection	With management plans	Sustainably managed
Bolivia	14,700	7,660	6,790	n.d.	2,380
Brazil	271,000	19,000	n.d.	n.d.	n.d.
Colombia	8,860	8,860	312	n.d.	n.d.
Ecuador	4,300	1,790	2,450	513	n.d.
Guatemala	1,240	836	184	n.d.	n.d.
Guyana	980	980	n.d.	243	243
Honduras	1,600	434	n.d.	n.d.	n.d.
Mexico	5,600	1,040	n.d.	n.d.	n.d.
Panama	1,580	1,040	326	396	180
Peru	16,300	3,130	390	n.d.	1,540
Suriname	4,430	1,390	1,160	n.d.	n.d.
Trinidad & Tobago	59.1	29.2	n.d.	12	n.d.
Venezuela	20,600	20,600	1,740	7,210	n.d.
Total	351,249	66,789	13,352	8,374	4,343

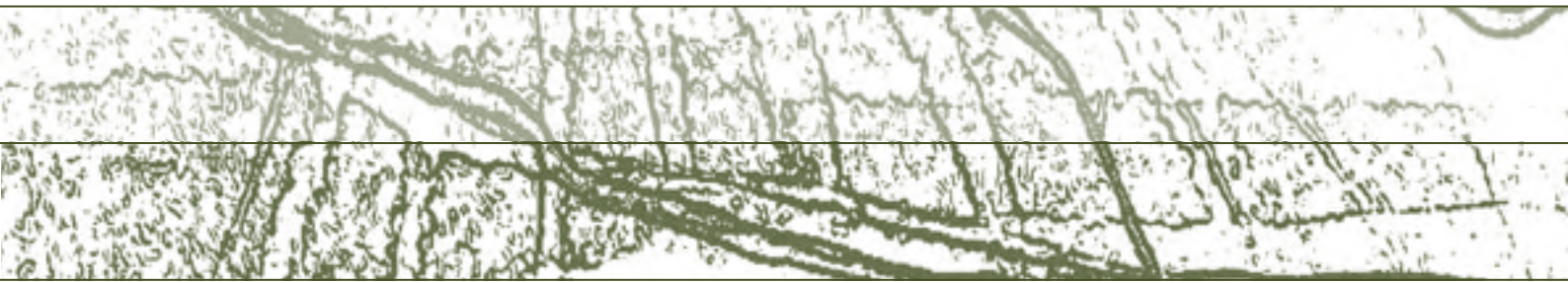
Table 5 Roundwood production and forest area

	Total forest area (low estimate; million hectares)	Natural production PFE (‘000 hectares)	Plantation production PFE (‘000 hectares)	Total roundwood production, 2003 (‘000 m³)*	Tropical industrial roundwood production, 2003 (‘000 m³)
Africa					
Cameroon	13	8,840	17	11,000	1,650
CAR	23	3,500	3	2,780	516
DRC	128	20,500	55	72,200	90
Congo	20	18,400	72	2,130	1,350
Côte d'Ivoire	7	3,400	167	10,200	1,900
Gabon	26	10,600	25	4,630	3,560
Ghana	3	1,150	97	22,100	1,400
Liberia	4	1,310	n.d.	5,690	800
Nigeria	10	2,720	375	69,900	7,100
Togo	1	41	14	5,890	208
Subtotal	234	70,461	825	206,520	18,574
Asia & the Pacific					
Cambodia	9	3,460	17	9,680	125
Fiji	1	0	113	383	120
India	64	13,500	32,600	321,000	13,500
Indonesia	105	46,000	2,500	112,000	25,000
Malaysia	19	11,200	183	24,700	21,500
Myanmar	34	9,700	710	42,200	4,240
PNG	31	8,700	80	7,240	2,300
Philippines	6	4,700	274	16,000	503
Thailand	13	0	1,870	28,800	7,800
Vanuatu	1	117	2	119	30
Subtotal	283	97,377	38,349	562,122	75,118
Latin America & the Caribbean					
Bolivia	52	17,000	60	2,860	650
Brazil	444	98,100	3,810	242,000	29,700
Colombia	50	5,500	148	12,000	2,050
Ecuador	8	3,100	164	6,260	1,240
Guatemala	3	1,140	71	15,900	90
Guyana	17	5,450	12	1,210	251
Honduras	5	1,590	48	9,500	21
Mexico	55	7,880	100	44,400	606
Panama	3	350	56	1,330	100
Peru	65	24,600	250	8,440	1,280
Suriname	14	6,890	7	199	155
Trinidad & Tobago	0	127	15	95	65
Venezuela	50	13,000	863	4,800	538
Subtotal	766	184,727	5,604	348,994	36,746
Total, all regions	1,284	352,565	44,779	1,117,637	130,438

* Total roundwood from FAOSTAT (2005); tropical industrial roundwood from ITTO (2006)

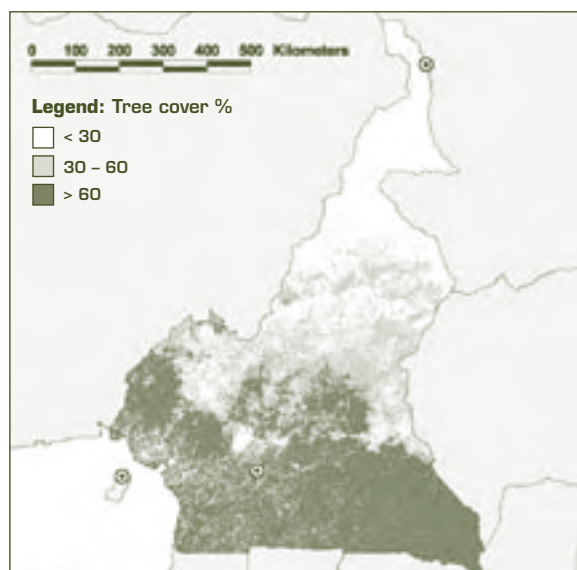


PART 2 – COUNTRY PROFILES



AFRICA

CAMEROON



* Same legend applies to all country maps

Forest resources

Cameroon has a land area of 47.5 million hectares and a population of 15.7 million people. It stretches between latitudes 2° and 13° north from the Gulf of Guinea to Lake Chad. The coastal plain is about 600 km long and 100–200 km wide, its inland limit marked by slopes and steep scarps. The southern plateau, the site of Cameroon's major closed-forest area, is 500–800 m in altitude and the central Adamaoua high plateau is generally 1,000 m or more above sea level. Mt Cameroon (4,095 m) in the south-west is the highest mountain in western Africa and is still an active volcano. Estimates of forest area include 13.3 million hectares^a (GFW 2005) and 23.8 million hectares (50% of total land area) (FAO 2005a).

Forest types. Cameroon's forests are mainly closed tropical broadleaved rainforests of two predominant types: lowland evergreen and lowland semi-deciduous. The closed evergreen forest that formerly covered

the entire coastal lowland has been largely cleared and, where it still exists, consists of secondary forests and degraded primary forests. Inland, semi-evergreen lowland forest gives way to a mosaic of degraded rainforest and secondary grassland. North of this is Sudanian woodland with *Acacia* wooded grassland.

The closed evergreen forests can be divided into two broad categories: the Biafran forest, forming an arc around the Gulf of Guinea, and the Congolese forest farther inland. The Biafran forest in low-altitude coastal areas is characterized by species like *Lophira alata* (azobé) and *Sacoglottis gabonensis*. There is a long-standing trade in timber from this forest, especially in azobé and *Pycnanthus angolensis* (ilomba). The Congolese forest includes closed evergreen rainforest and semi-deciduous forests. The closed evergreen rainforest differs from the Biafran forest in the absence of species of *Caesalpinaceae* – with the exception of *Gilbertiodendron dewevrei*; another feature is the importance assumed by *Baillonella toxisperma* (moabi). The medium-altitude closed semi-deciduous forests are marked by an abundance of *Sterculiaceae* such as *Cola* spp, *Eriobroma oblonga* (eyong), *Mansonia altissima* (bété) and *Triplochiton scleroxylon* (ayous). They are particularly rich in commercial species, including various *Meliaceae* such as *Entandrophragma cylindricum* (sapelli) and *Entandrophragma utile* (sipo).

Dynamics of forest resource change. Annual deforestation in Cameroon in the period 1990–2000 was an estimated 222,000 hectares (FAO 2005a), the main cause being land conversion for small-scale agriculture and agro-industry.

Forest fires occur regularly in the drier northern part of the country. There is some anecdotal evidence of a lengthening of the dry season over the past decade or so^c.

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
13.3–23.8	19,985	8,840	17	3,900 *	12,757

* Source: GFW (2005)

Permanent forest estate. The forest law of 1994 divides the forest area into permanent and non-permanent forest areas (*domaine forestier permanent et non permanent*). The permanent forest includes the categories forest reserves, protected areas and council forests; non-permanent forest includes communal forest, community forest and private forest. Cameroon has an estimated 12.8 million hectares of natural-forest PFE, comprising 8.84 million hectares of production forest (including council forests, the objectives of which may vary between councils) and 3.90 million hectares of protection forest (Table 1). Article 22 of the 1994 forest law requires that the PFE covers at least 30% of the national territory (ibid.).

Planted forests. Planted forests cover about 17,000 hectares in Cameroon. Most have been established by the state; no information is available about private planted forests. There are extensive agro-industrial plantations, including an estimated 42,000 hectares of rubber (FAO 2001).

Institutional arrangements

Forest tenure. Most forest land in Cameroon belongs to the state. The permanent forest in the main forest zone in the south is nearly all state-owned under the categories of timber production, protected and protection forests. About 345,000 hectares of closed forests are communal forests. According to the 1994 forest law, forests outside the PFE exist in three ownership categories: community forests, communal forests and private forest. Generally, people living in forest areas fully retain their traditional user rights in their communal areas within both non-permanent and permanent forests. Stakeholder disputes over forest ownership and the demarcation of boundaries are common (GFW 2005).

SFM policy framework. Various C&I systems have been prepared for or tested in Cameroon's forests, including ITTO's C&I, the C&I toolkit of the Center for International Forestry Research (CIFOR), and more recently the ATO/ITTO PCI. A national multi-stakeholder working group developed the basis for national C&I that are compatible with FSC standards. However, none of these processes has so far been implemented beyond experimental field-testing and capacity-building. Cameroon participated in the

development of the convergence plan for forest management in the Congo Basin, which was endorsed by a conference of African heads of state in March 1999; this plan aims to increase coordination and cooperation among countries of the Congo Basin in all activities relating to forests.

Forest policy and legislation. A new forest policy prepared by a coalition involving the ministry in charge of forests and the World Bank was adopted in 1995 after a five-year process. The main underlying principle is that of ensuring the sustainability and development of the economic, ecological and social functions of the nation's forests through integrated management that leads to the sustained and lasting conservation and utilization of resources and forest ecosystems. The policy has five goals:

- (i) to ensure the protection of forests, safeguard the environment and conserve biological diversity;
- (ii) to improve the integration of forest resources in overall rural development and to increase the participation of rural populations in forest conservation and management in order to raise their living standards;
- (iii) to sustainably develop forest resources with a view to increasing the contribution of forest production to GDP;
- (iv) to ensure forest renewal through regeneration and reforestation; and
- (v) to set up an efficient institutional system involving all concerned parties in the management of the sector.

A new law on forests, wildlife and fisheries (Law 94/01) was approved in 1994 and supporting decrees on wildlife (95/466) and forests (95/531) issued in 1995. In addition, a new environmental law was approved in August 1996 (Law 96/12). Law 94/01 provides a good basis for introducing SFM; in particular, it stresses good forest management practices through the following provisions:

- the replacement of the former forest licence system by a forest concession system;
- the compulsory preparation and implementation of long-term forest management plans in concessions and simple forest management plans (*plan de gestion*) in forests attributed to communes and communities;

- the introduction of provisions in respect to concession allocation; and
- the creation of forest brigades and an inspection panel at national and provincial levels for forest control.

Institutions involved in forests. The Ministry of Forests and Fauna (*Ministère des Forêts et de la Faune* – MINFOF), formerly the Ministry of Environment and Forests (MINEF), is primarily responsible for forest policy and the supervision of the legislative framework. Within MINFOF, the Directorate of Forests (*Direction des Forêts*) is responsible for forestry implementation. It contains several major sub-directorates, including the forest management and inventory unit (*Sous-Direction des Inventaires et Aménagements Forestiers*) and the unit for community forests (*Sous-Direction des Forêts Communautaires*). The National Forestry Development Agency (*Office National de Développement des Forêts* – ONADEF) – a parastatal agency – was, until recently, responsible for technical forestry, including inventories, forest management, reforestation, wood promotion and desertification control, but was dissolved in 2003 and replaced by the National Agency for Forestry Development (*Agence Nationale de Développement des Forêts* – ANAFOR). The government employs a total of 282 staff with university degrees in forest-related positions^a. However, despite considerable efforts to reorganize the forest administration and to improve forest law enforcement, the implementation capacity of MINFOF remains weak due to a lack of funding, training and internal control^c. More than 100 national and international NGOs, including major conservation NGOs such as IUCN, WWF, Conservation International, The Nature Conservancy and the Wildlife Conservation Society (WCS), are active in Cameroon. Global Forest Watch (GFW), a US-based NGO affiliated with the World Resources Institute (WRI), is working with MINFOF to improve forest statistics.

Status of forest management

Forest for production

As provided by Law 94/01, commercial forestry is mainly implemented in the PFE through concessions and timber-licence contracts between the state and private entrepreneurs. FMUs are the basic unit of

timber harvesting; they are limited to a maximum size of 200,000 hectares and allocated by public tender. A forest concession consists of one or several FMUs. The preparation of the management and business plans and arrangements for implementation are the responsibility of the concession-holder under state supervision; to assist this, in 1998 ONADEF produced a guide to the preparation of forest management plans in production forests. Bids can be submitted by national or foreign investors to MINFOF, which awards the FMU on the advice of a technical committee. After paying a security deposit within 45 days of notification, the winning party receives a three-year provisional concession licence. During this period the concessionaire must prepare a fully-fledged forest management plan and make arrangements with all stakeholders involved, in particular any local forest users. The contract for the full concession is valid for 15 years and is renewable. A second type of management arrangement has also been developed (also under Law 94/01) in which communities can obtain forest user rights for 15 years for forest plots of up to 5,000 hectares.

In 2004, nine foreign companies (a few with some local ownership) held 3.15 million hectares of the concession area in 45 FMUs (GFW 2005). Of all 72 FMUs, 32 had approved management plans, the management plans of 17 had been rejected by MINFOF, the status of 14 was unknown and 19 were in process (ibid.). Poor logging practice, illegal logging and encroachment are reportedly common^c, but no official data on their extent are available^a.

In addition to the allocation of larger tracts of production forests to industrial investors, communities can manage communal forests for timber and non-timber production based on simplified forest management plans. In March 2001, eleven communal forests had established such plans, and 52 other proposals were being prepared.

There are two other logging permit systems in force, reserved for Cameroonian citizens. The harvesting permit (*permis d'exploitation*) is directly allocated by the minister in charge of forests and is applicable in the non-permanent forest estate; each permit is restricted to 500 m³ in volume. The *autorisation de récupération*, a type of logging right allocated by the provincial representative of MINFOF, allows the cutting of up to 30 m³ per permit.

Table 2 Some commonly harvested species for industrial roundwood^c

Timber species	Remarks
<i>Triplochiton scleroxylon</i> (ayous)	Nearly 30% of production (2000–2003)
<i>Entandrophragma cylindricum</i> (sapelli)	Nearly 20% of production
<i>Lophira alata</i> (azobé)	Locally important, more than 10% of production
<i>Terminalia superba</i> (fraké)	About 40,000 m ³ per year, 5% of production
<i>Chlorophora excelsa</i> (iroko)	Nearly 38,000 m ³ per year harvested on average between 2000–2003

Silviculture and species selection. A 1998 decree of Law 94/01 stipulates silvicultural standards for forest management. The felling cycle is set at 30 years and minimum harvesting diameters are indicated for each species. The standards further describe the designation of future crop trees, the tending of natural regeneration, thinning, enrichment planting and refinement^c.

Cameroon has over 600 tree species, of which some 300 are fairly common in the tropical moist forests. Of those, fewer than 30 are currently used in significant quantities for timber and fewer than a dozen species make up the bulk (80%) of the trade. Table 2 lists some commonly harvested species.

Planted forest and trees outside the forest.

The first planted forest was established with ayous in 1937. Several thousand hectares of plantations have been established since, but most of them were abandoned before maturity. Plantations were established during the 1950s, with a variety of species such as *Terminalia ivorensis*, *Aucoumea klaineana*, *Tectona grandis*, *Pinus* spp, various Meliaceae and eucalypts. In addition, *Gmelina arborea* was planted to produce matches. Firewood plantations, and plantations to protect soil and farmland and for other purposes, were started about 30 years ago with good results and were promoted on agroforestry land; species used include *Cassia siamea* and *Dalbergia sissoo*.

Forest certification. No forest has yet been certified in Cameroon. The government is actively involved in the development of the African Timber Certification Scheme, and some companies – including the Dutch Wijima Douala SARL – have undergone preliminary auditing as part of the FSC certification process.

The Swiss-based auditing firm *Société Générale de Surveillance* (SGS) is responsible for checking exports of timber and ensuring that the government collects the correct level of levies, and has developed a computerized log-tracking system with bar codes for this purpose. Cameroon is also participating in an ITTO project that is helping to build capacity for the implementation of the ATO/ITTO PCI at the national level in the African ITTO member countries. It aims to train at least 60 forestry staff in each country in the implementation of the PCI, develop an auditing framework for African forests, and train at least 60 trainers in the procedures for conducting audits based on the PCI at the FMU level.

Estimate of the area of forest sustainably managed for production. At least 500,000 hectares of natural-forest PFE are estimated to be under SFM. This area comprises the forests allocated to long-term concessions leased out to timber companies which have been present in the area for several years, have approved forest management plans, and are presently engaged in a process of certification.

Timber production and trade. The total roundwood production in 2002 was estimated to be about 10.9 million m³, of which 9.33 million m³ were used as fuelwood (FAO 2005b). Total industrial roundwood production in 2003 was 1.65 million m³, down from the 2.65 million m³ produced in 1999 (ITTO 2004, 2006 in prep.). Sawnwood production in 2003 was an estimated 658,000 m³ and plywood production in 2003 was about 39,000 m³, significantly lower than the 92,000 m³ produced in 1999 (ibid.). Veneer production in 2003 was 50,000 m³ (ITTO 2006 in prep.). Cameroon is the seventh-largest exporter of tropical timber and the second-

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
8,840	4,950*	1,760**	0	500 ^d	17	n.d.	0

* Source: GFW 2005

** Includes concession areas that already have a management plan or have completed forest inventories for the preparation of a forest management plan

largest in Africa. The export of logs is banned except for lesser-known species for market promotion and in the first phase of establishment of a new forest concession (up to 30% of the logs may be exported for the first five years after establishment); in 2003, Cameroon exported an estimated 70,000 m³ of logs (ITTO 2006 in prep.).

Non-wood forest products. The bark and fruits of *Garcinia cola* and *G. lucida* (onie and essok) and the nuts of *Gnetum* are used as medicines and stimulants. The nut of *Elaeis guineensis* (Eton palm) is used to make palm wine, *Irvingia* spp (andok or wild mango) and *Ricinodendron heudelotii* (ezejang) as condiments, and *Dacryodes edulis* (plum or assa) as food. The bark of *Prunus africana* is sold to pharmaceutical companies for use in the treatment of prostate gland problems. The powdered bark of *Pygeum africanum* is used worldwide to control urinary disorders in men and as a herbal supplement for benign prostatic hyperplasia. *Baillonella toxisperma* (moabi), a highly priced hardwood member of the Sapotaceae family, is traditionally used by forest-dwellers for the oil from its seeds. Wild meat and other animal products are of major significance in rural and urban areas; the trade in wild meat has been blamed in some forests for declines in the abundance of certain mammals. NWFPs are traded regionally, in particular with Nigeria. Products of *Dacryodes*, *Gnetum*, *Ricinodendron* and *Irvingia* species are frequently found in specialized shops in European cities.

Forest for protection

Soil and water. There are no clear figures on the extent of natural forest and planted forest set aside primarily for water and soil protection.

Biological diversity. Cameroon is rich in biodiversity, accommodating more than 8,300 plant species, about 297 mammal species and 848 bird species; nearly half of all the bird and mammal species of Africa are present in Cameroon's forests. Twenty-one mammals, 14 birds, three reptiles, one amphibian and 74 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 30 mammals, 13 birds, 47 amphibians and 249 plants are found in forests (IUCN 2004). In addition, 43 plant species are listed in CITES Appendix II, including *Prunus africana* and *Pericopsis elata* (afroormosia) (CITES 2005).

Protective measures in production forests. The forest management prescriptions devised in 1998 include measures to protect soil, biodiversity and the flow of water in concession areas. They also include a series of stand treatments to encourage the regeneration of commercial tree species in natural stands. Provisions specify zones where hunting is permitted or banned and the length and dates of the hunting season depending on location and species.

Extent of protected areas. An estimated 3.90 million hectares of forests are in some form of protected area, comprising national parks (2.91 million hectares), wildlife reserves (739,000 hectares), wildlife sanctuaries (24,600 hectares) and zoological gardens (6,700 hectares); a further 867,000 hectares of FMUs have been set aside for conservation purposes (GFW 2005). According to UNEP-WCMC (2004), 2.65 million hectares of forest are in protected areas conforming to IUCN protected-area categories I–IV, of which 2.26 million hectares are lowland evergreen broadleaved rainforest. The first six national parks in Cameroon were set up primarily to attract tourists to Sudanian savanna and woodland vegetation types in the north

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
3,900	2,650	n.d.	n.d.	n.d.

of the country. The major forest zone in the southern part of the country was, until recently, less well represented in the protected-area system. The Korup area was upgraded from faunal reserve to national park by presidential decree in 1986 and the forest reserves of Dja and Pangar Djerem are also being proposed as national parks.

Estimate of the area of forest sustainably managed for protection. Insufficient data were available to estimate the area of protection PFE sustainably managed (Table 4). Threats to protected areas include poaching for the commercial wild-meat trade and encroachment by shifting cultivation. A tri-national treaty (*Convention de la Trinationale de la Sangha*) was signed in early 2000 to allow the sustainable management of three adjacent protected areas in the transboundary zone of Cameroon, CAR and Congo. The Mengame Gorilla Reserve, a transboundary protected area connected to the Minkebe Protected Area, Gabon, is the subject of an ITTO project to strengthen management there, but while it is making good progress it is not yet possible to categorize its management as sustainable.

Socioeconomic aspects

Economic aspects. Timber is Cameroon's second most important export after petroleum; wood-based exports generated revenue of US\$210 million in 2001. According to their licence contracts, forest concession-holders need to link the forest concession with industrial processing units, thus providing stable employment in remote rural communities. An estimated 45,000 people are employed in the forestry sector^a.

Livelihood values. Forests provide many local communities with foods, medicines and locally traded goods. Forests also have a major spiritual value for the various ethnic groups in the country.

Social relations. Law 94/01 stipulates public participation in the design and implementation of forest management policies, enlisting all partners,

including governmental agencies, the private sector, communities and people living in and around the PFE. Arrangements are made between concession-holders and local people on a case-by-case basis according to rules established in the forest law. Local people should receive 10% of the forest fees and taxes from commercial forest concessions. From such fees collected, 40% are to be invested into local and district development. Forest concessions situated within the jurisdiction of a community also need to be accessible for NWFP harvesting by local populations.

Summary

Cameroon possesses significant forest resources with good potential for SFM. The policy environment is sound and governmental responsibility for forests is vested in a single ministry, the Ministry of Forests and Fauna (MINFOF). However, the capacity of the ministry to fully enforce the forest law and implement the forest policy is low. Cameroon is yet to translate many of its ambitious forest management goals into practice and effectively protect its PFE from deforestation and degradation.

Key points

- Cameroon has an estimated 12.8 million hectares of PFE, comprising 8.84 million hectares of natural production forest, 3.90 million hectares of protection forest and 17,000 hectares of industrial timber plantations.
- At least 500,000 hectares of natural-forest production PFE are estimated to be managed sustainably. Insufficient data were available to estimate the area of protection PFE so managed.
- In 2004, nine foreign companies held 3.15 million hectares of the concession area in 45 FMUs. Of 72 FMUs, 32 had approved management plans, the management plans of 17 had been rejected by MINFOF, the status of 14 was unknown and 19 were in process.

- Of the 4.95 million hectares of PFE under licence or allocated to concessions, about 1.76 million hectares had a management plan or had completed forest inventories for the preparation of a management plan.
- The integrity of the PFE is threatened by encroachment, poaching and poor logging practices, including illegal logging, but no official data on the extent of these are available.
- There is a good framework of policy and legislation but its implementation is limited.
- Despite considerable efforts to reorganize the forest administration and improve forest law enforcement, the implementation capacity of MINFOF remains weak due to a lack of funding, training and internal control.
- Cameroon is rich in biodiversity, accommodating more than 8,300 plant species, about 297 mammal species and 848 bird species; nearly half of all the bird and mammal species of Africa are present in Cameroon's forests.
- Hunting for wild meat, including for commercial sale, is believed to have significantly reduced the abundance of certain mammals in some areas.

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- ^c Information derived from the report of, and discussions with participants at, a training workshop on ITTO criteria and indicators, held 15–18 January 2003, Kribi, Cameroon, attended by 32 people from government, civil society and the private sector.
- ^d ITTO estimate

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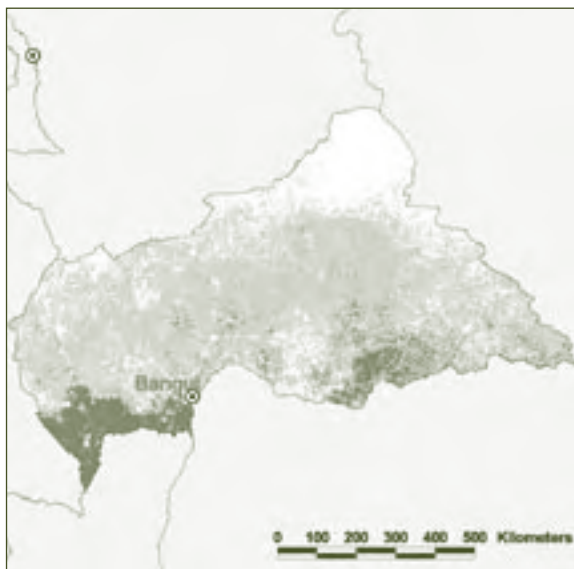
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CENTRAL AFRICAN REPUBLIC



*For legend see page 58

Forest resources

The Central African Republic (CAR) has a land area of 62.3 million hectares and a population of 3.7 million people. Situated in the northern Congo Basin, this landlocked country comprises five biogeographical zones. These are, from south to north: the humid Guinean zone, with annual precipitation between 1,500 and 1,800 mm per year and covered by dense, moist forest; the Sudano-Guinean zone, with annual precipitation between 1,000 and 1,500 mm; the drier Sudano-Guinean zone, containing scattered semi-moist forests and open dry forests and savanna; and the Sahel zone, characterized by dry savanna with annual precipitation of less than 800 mm. The general relief of the country is formed by a peneplain with altitudes varying between 500 and

700 m and two separate basins, the Chad Basin in the north and the Congo Basin in the south. The forest area, including the large expanse of open dry forests and savanna, was estimated to be 22.9 million hectares in 2000 (FAO 2001).

Forest types. The major closed forest type is the semi-deciduous rainforest located in the south-western and southeastern parts of the country (*Forêt de Bangassou*). North of the closed forest there is a transition zone between forest and savanna which stretches in an east-west direction. Beyond this, gallery forests border the large rivers. But by far the largest forest area is the open savanna, covering an area of about 17 million hectares^b. The semi-deciduous rainforests are some of the richest in Africa, containing a high density of high-value timber species such as *Terminalia superba* (limba), *Entandrophragma cylindricum* (sapelli) and *Triplochiton scleroxylon* (ayous), as well as charismatic mammals such as gorillas, forest elephants and bongo. The total standing volume of timber in the southwestern forests was estimated to be more than 127 million³ in a 1993 survey by the Natural Resource Management Project^b.

Dynamics of forest resource change. The estimated annual deforestation rate in 1990–2000 was about 30,000 hectares per year (FAO 2005a). Bushfires are widespread, particularly in the savanna and in the transition zone from forest to savanna.

Permanent forest estate. About 5 million hectares of semi-deciduous closed forests are considered to be productive, including the inventoried forests in the southwest (3.8 million hectares) and the less known, largely unexploited forest of Bangassou in

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^{c,d}			
		Production		Protection	Total
		Natural	Planted		
22.9–29.3	4,826	3,500	3	300	3,803

the southeast (1.5 million hectares)^c. Nearly the whole forest area in the southwest has been allocated, either to forest concessions or as conservation areas^b. In total, about 2.7 million hectares are classified as harvestable. Over the whole country, 46 classified forests (*forêts classées*), ranging in size from 20 to 120,000 hectares and covering a total area of 633,000 hectares, were set aside between 1948 and 1955 for conservation and production purposes; it is not clear how much of these classified forests are still forested. Table 1 shows the estimated PFE derived by ITTO from various sources; it includes only state-administered closed forest. The estimate of protection PFE includes 250,000 hectares of reserves and parks in the southwest and 50,000 hectares of classified forests; the production PFE is taken here to be the area available for (and currently allocated to) concessions. Outside this PFE, a significant area of degraded primary and secondary forest – as much as 1 million hectares in the southwestern forest area, in particular in the zone of Lobaye – has the potential to be productive under SFM^c.

Planted forests. Planted forests cover an estimated 1,800–3,000 hectares^c. In addition, the country's one rubber (*Hevea brasiliensis*) plantation covers an estimated 1,000 hectares.

Institutional arrangements

Forest tenure. Most of CAR's forest land is owned by the state, including the state forests that constitute the PFE. There are also community forests, found mainly in savanna areas, which include natural forests and reforestation areas created by communities, and private forests (a small area of reforestation on private land).

Forest policy and legislation. The forestry policy adopted in 1989 has three main goals: (i) preservation of the stability of forest ecosystems by management and development, (ii) the rational use of forest resources, and (iii) protection of the forest heritage for future generations. A number of measures have been introduced in an effort to implement this policy:

- a new administrative structure that involves stakeholders, including the rural population, more closely in forest management;
- a new forest code which takes into account the needs of local populations and the principles of SFM in forest concessions;
- a review of forest taxation to simplify it and provide incentives for local processing and the utilization of secondary species;
- the promotion of local processing and a restriction on log exports;
- a cooperative endeavour to conserve and restore forest cover;
- an inventory of closed forests in 1996–1998;
- land-use planning, in consultation with rural populations, for the better allocation of forest lands; and
- improved distribution of forest revenues between the treasury, communities and the Forest and Tourism Development Fund^b.

In recent years, significant progress has been made in all of these except land-use planning, as no national zoning plan to define the PFE has yet been created^b. The forest code (Law 90-003), which was promulgated in 1990, was developed with wide inter-ministry and interdisciplinary consultation but little participation by rural populations^c. The forest code describes, among other things: the different forest types and their legal status, the conservation of forest resources in production forests, and the involvement of local populations in decisions on the granting of forest licences. Forest harvesting remains fully the responsibility of the industrial concession-holders. The country has endorsed the ATO/ITTO PCI and is actively involved in various regional initiatives to promote SFM in the Congo Basin, in particular through the Commission in Charge of Forests in Central Africa (*Commission en Charge des Forêts d'Afrique Centrale* – COMIFAC).

Institutions involved in forests. Forestry administration is the responsibility of the Ministry of Environment, Water, Forests, Hunting and Fishing (*Ministère des Eaux, Forêts, Chasses, Pêches, Environnement et du Tourisme* – MEFCPET). MEFCPET is responsible for gathering taxes and fees and for providing funds for programs relating to forests, wildlife and the development of tourism. Other ministries involved in forest development include the Ministry of Commerce and Industry;

Table 2 Some commonly harvested species for industrial roundwood*

Timber species	Remarks
<i>Triplochiton scleroxylon</i> (ayous)	21 million m ³ growing stock, 31% of log exports in 2004
<i>Entandrophragma cylindricum</i> (sapelli)	
<i>Aningeria</i> spp (aniegré)	
<i>Entandrophragma utile</i> (sipo)	6% of log exports in 2004
<i>Chlorophora excelsa</i> (iroko)	12% of log exports in 2004

* Source: MEFCPET 2005

the Ministry of Economic Reform, Planning and International Cooperation; and the Ministry of Finance and Budget.

Staff training and forestry research are undertaken by the University of Bangui and its Agronomic Research Institute. However, both are constrained by a lack of funds and capacity and most professional and technical training is provided on the job by forest companies^b.

The private-sector Chamber of Agriculture, Animal Breeding, Waters, Forests, Hunting, Fishing and Tourism acts in an advisory role to MEFCPET on issues relating to forest management. A number of local NGOs, such as *Amis de la Nature*, the *Mouvement Femmes-Environnement* and the *Organisation Centrafricaine de Défense de la Nature*, are also active in the forestry sector, although due to a lack of capacity they play only a marginal role in forestry matters.

Status of forest management

Forest for production

Large-scale industrial harvesting started in 1968 in the southwestern forests, following an intensive inventory. A second forest inventory carried out in 1991–1993 estimated the standing volume of the 18 most important species at 93 million m³; based on a 30-year rotation, the commercial volume harvestable per hectare was estimated at 15–20 m³/year^c.

After a national consultation on forestry in September 2004, harvesting in the PFE is now carried out in large-scale concessions using only one kind of permit called a PEA (*permis d'exploitation*

et d'aménagement); the system of special cutting area permits (*permis spécial de coupe*) that co-existed with PEAs was abandoned. Small-scale logging outside the PFE is still permitted under artisanal permits (*permis artisanal*). PEAs are valid for the lifetime of the company. Once a PEA is awarded, the concessionaire must prepare a forest management plan within three years, during which time the concessionaire may start harvesting according to specific prescriptions of the Ministry. In mid 2005, ten timber companies, all foreign-owned, were operational in the southwest over an area of 3.3 million hectares (MEFCPET 2005); the size of forest concessions varied between 200,000 and 562,000 hectares^c. The PEA stipulates that local people living in or adjacent to the concession must be involved in the process of establishing permits^b.

There is little awareness in the private sector of the need for SFM. Moreover, the forestry administration lacks the capacity to oversee management of the PFE and to enforce the law, including by imposing sanctions when rules and regulations are infringed^b.

Forest harvesting is taxed in various ways. There is a general company tax and a value-added tax, in addition to three specific forestry taxes: an annual, area-based forest fee (in 2005 this was US\$1 per hectare^c); a felling tax of 7% of the taxable value of the felled volume of timber; and a replanting tax paid at the rate of 11% of the taxable value, which is determined by the Finance Law in relation to FOB value at the seaport of Douala, Cameroon. There is also an export tax of 10.5% on roundwood and 4.05% on sawnwood. In late 2004, an environmental tax was introduced for those companies that do not start the preparation of forest management plans as required under the PEAs; this doubles the

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
3,500	2,920	650 ^{c,*}	0	186 ^{c,d}	3	n.d.	0

* Concessions covering a further 1.5 million hectares are in the process of developing forest management plans

area-based tax to US\$2 per hectare^c. A study was carried out in 2004 on ways to replace the area-based fee by a rental fee which takes into consideration the timber value of the forest covered by the permit, but no decision has been taken yet on this matter.

Silviculture and species selection. The 1990 forest code makes specific reference to silvicultural management criteria, including: quantitative limits on logging to avoid creaming and favour natural regeneration; the determination of minimum diameters for felling (80 cm for redwood species in the Congo Basin and 60 cm for whitewood species such as ayous^c); the protection of young trees during logging operations; and the involvement of both rural populations and foresters in conservation and the management of tree-planting. As PEAs are of unlimited duration, long-term management and harvest planning should be possible.

There are about 300 potential timber species in the closed forest area, 79 of which are considered marketable today. Around 30 timber species were harvested in 2004^c; however, loggers tend to focus on 15–18 high-value species. Table 2 lists five species that made up 90% of production in 2004 (MEFCPET 2005). This selective logging is a possible constraint on SFM because the high-value species will almost certainly become rarer, changing forest dynamics and, in the long term, reducing the financial viability of SFM^b.

Planted forest and trees outside the forest.

Most of CAR's planted forests are not maintained and are regularly affected by forest fire^c. Plantations of fast-growing limba, *Terminalia ivorensis* (fraké), *Cedrela odorata* and *Cordia alliodora* have generally been abandoned. Various tropical hardwoods, including *Tectona grandis* and *Gmelina arborea*, have performed quite well in experimental trials,

but these have not been scaled up. Small community-based firewood plantations of eucalypts, *Acacia mangium* and *Cassia siamea* are important in non-forested areas. In drier areas, trees planted outside forests are of some importance, including neem, *Butyrospermum parkii* (karité), *Anacardium excelsum* and *Acacia albida*.

Forest certification. Some timber companies are involved in International Technical Tropical Timber Association (*Association Technique Internationale des Bois Tropicaux* – ATIBT) and ATO initiatives on the certification of African timber (see below). One forest concession, *Industrie Forestière de Batalimo* (IFB), which is 186,000 hectares in size, is in an advanced process of certification under the Keurhout system^c.

Estimate of the area of forest sustainably managed for production. In mid 2005, two companies (IFB and SESAM) with concessions totalling about 650,000 hectares were working under comprehensive forest management plans, and five more covering 1.5 million hectares had made good progress in developing such plans^c. The IFB concession (186,000 hectares) is pursuing certification and is thought to be sustainably managed^c.

Timber production and trade. Total roundwood production in 2003 was an estimated 2.82 million m³, of which at least 2 million m³ was fuelwood (FAO 2005b). CAR produces relatively small volumes of mostly high-value timbers. In 2003, total industrial roundwood production amounted to an estimated 516,000 m³, down from 553,000 m³ in 1999 (ITTO 2004, 2005). At least 60% of log production must be processed locally into sawnwood, plywood or other value-added products. Some 223,000 m³ of logs and about 58,000 m³ of sawnwood were exported in 2003 (ITTO 2005). CAR's exports face numerous constraints: train transport through

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
300	3,090	5.7	n.d.	n.d.

neighbouring Congo is slow and highly insecure and costs are very high through Cameroon to the port of Douala.

Non-wood forest products. Wild meat and other animal products are important NWFPs in CAR's forests. Many foodstuffs, medicinal plants and condiments – including *Piper guineense* (forest pepper), *Xylopia aethiopica* and *Afromomum* spp – are collected in closed and savanna forests and sold locally or exported. No quantitative data were available for this report.

Forest for protection

Soil and water. A number of small areas totalling about 5,700 hectares have been set aside for catchment protection purposes (*mise en défens*).

Biological diversity. CAR contains more than 3,600 plant species, 209 mammals and 668 birds. Twelve mammals, three birds, one reptile and 15 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, nine mammals and eight plants are found in forests (IUCN 2004). One plant species is listed in CITES Appendix I and seven in Appendix II (CITES 2005). Several other mammals are locally threatened; the population of elephants, for example, has reportably decreased to a critical level^c.

Extent of protected areas. The first forest conservation areas to protect the now locally extinct white rhinoceros were created in 1925 (*Réserve de Zimongo*, and the parks of Baminigui, Bangoran and Manovo-Gonda-Saint Floris); these covered more than 1 million hectares of open savanna. Today, protected areas have been greatly extended and cover almost 6.76 million hectares (about 11% of the national territory); they comprise mainly savanna and dry shrub land^c. The main part of the protected area estate is found in the drier northeast; only about 300,000 hectares are closed forest^b. According to UNEP-WCMC (2004), 3.09 million hectares of forest are in protected areas conforming to IUCN protected-area categories I-IV,

including 112,000 hectares of lowland evergreen broadleaved rainforest and 2.01 million hectares of deciduous/semi-deciduous broadleaved forest.

Estimate of the area of forest sustainably managed for protection. Few data are available on the status of forest management in CAR's protection PFE. Considerable efforts have been made to protect the 120,000-hectare Dzanga-N'doki National Park, which is CAR's part of a tri-national protected area between CAR, Congo and Cameroon; however, insufficient information was available to determine the current status of management there.

Socioeconomic aspects

Economic aspects. Forest taxes account for about 14% of state revenues and its contribution to GNP rose from 2.6% in 1997 to 5.3% in 2001 (MEFCPET 2005). Tax incomes from forests represent 14% of total tax revenues (ibid.). The forest sector is important for employment and in socioeconomic development; about 4,000 people are directly employed in the formal forestry sector^b.

Rents and felling taxes on forest harvesting are required to be distributed among the beneficiaries as follows: 30% to the Treasury, 40% to the Forest and Tourism Development Fund, and 30% to communities. Of the revenue generated by the replanting tax, 25% goes to communities and 75% to the Forest and Tourism Development Fund.

Livelihood values. Wild meat and the gathering of edible fruits, nuts, insects and roots are of great importance for local communities dependent on the forest, in particular Pygmies in the closed forest. Yams (*Dioscorea* spp) are a staple food of the Pygmies.

Social relations. The 1990 forest code stipulates the involvement of local people in forest management. According to the law, local people are to have a say in the allocation of concessions and logging permits, and a significant share of revenues generated by forest taxes is to be redistributed to local communities. However, such revenues are unevenly distributed between and within forest communities^b.

Summary

CAR possesses a substantial forest resource base in the south with a sizeable growing stock of high-value hardwood timber. Forest production provides important export revenues and contributes 5% or more to GDP. Two forest inventories have been carried out, the results of which can support forest management planning and economic analysis. In 1990, the country introduced a forest code that sets out social, environmental and silvicultural norms. However, there is a gap between the law and its implementation in the field.

Key points

- CAR has an estimated 3.80 million hectares of PFE, comprising 3.50 million hectares of natural production forest, 300,000 hectares of protection forest and 3,000 hectares of industrial timber plantations.
- At least 186,000 hectares (about 5%) of the natural-forest production PFE are under SFM. Insufficient data were available to estimate the area of protection PFE so managed.
- Commercial harvesting is carried out mostly by private entrepreneurs under management permits (*Permis d'exploitation et d'aménagement*), which are valid for the lifetime of the company.
- In mid 2005, ten timber companies, all foreign-owned, were operating in the southwest of the country in an area of 3.3 million hectares.
- A relatively small area of closed forest is contained in protected areas.
- There is little awareness in the private sector of the need for sustainable management, although such awareness may be growing as companies are obliged to develop forest management plans.
- The ministry in charge of forests, MEFCPET, generally lacks the capacity to oversee management of the PFE and to enforce the law, including sanctions when rules and regulations are infringed.
- The forest sector generates about 14% of state revenues.
- Wild meat and the gathering of edible fruits, nuts, insects and roots are of great importance for local communities.
- According to the forest law, a significant share of revenues generated by forest taxes is to be redistributed to local communities. However, such revenues are unevenly distributed between and within such communities.
- CAR is a landlocked country and the transport costs of exported timber are relatively high compared to those of other countries in the Congo Basin, limiting the profitability of SFM.

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DEMOCRATIC REPUBLIC OF CONGO



* For legend see page 58

Forest resources

The Democratic Republic of Congo (DRC) has a land area of 234 million hectares and a population of 57 million people. It lies entirely within the Congo Basin, with only 42 km of coastline on the Atlantic Ocean. The north comprises plateaux of 600–800 m in height and, in the south, of 1,000–2,000 m in height. The highest peaks reach 4,500 m in the Virunga volcanic massif on the border with Rwanda and exceed 5,000 m in the Ruwenzori Mountains on the border with Uganda. Some 77% of the country is at an altitude of over 1,000 m. Estimates of total forest cover range from 128 million hectares^a to 135 million hectares (FAO 2005).

Forest types. Moist evergreen and semi-deciduous forests occupy much of the central and western regions, with moist evergreen forests accounting for about a third of the country's forests (35–40 million hectares). Submontane and montane closed forests include montane rainforests with conifers, montane sclerophyllous forests between 1,500 and 3,200 m, and submontane sclerophyllous forests of *Grewia* spp, *Carissa edulis* and *Euphorbia* spp. Swamp forests are extensive in DRC, covering about 20 million hectares, primarily in the central basin.

Dynamics of forest resource change. Forests were lost at an estimated annual rate of 532,000 hectares (0.4%) in the period 1990–2000 (FAO 2005). Uncontrolled forest fires occur regularly at the end of the drier seasons and cause local damage to forest stands that have already been opened up, especially in the less-forested areas.

Permanent forest estate. There is so far no formal land-use planning in DRC, but pilot zoning is being applied in the *Province de l'Equateur* over an area of 1.8 million hectares^a. The state forest area (*domaine forestier de l'Etat*) comprises three forest-use types: classified forests, protected forests and permanent production forests. The government plans to establish a forest survey that would formally recognize the PFE^a. The closed forest area suitable for industrial harvesting has been variously estimated at about 81 million hectares^a and 60 million hectares (Sebastien & N'Yanga-Nzo 2001). Table 1 shows a possible eventual PFE based on an ITTO estimate.

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^{d, *}			
		Production		Protection	Total
		Natural	Planted		
128–135	126,236	20,500	55	27,000	47,555

* The country is in a transitional period in respect to land-use planning. The figures given here are indicative only

Planted forests. Planted forests have been established to produce both timber and fuelwood and to protect land from erosion, but the total area is unknown. FAO (2001) estimated the total plantation estate at 96,700 hectares, but this most likely included agro-industrial plantations, particularly of oil palm and rubber; the government of DRC estimated an area of 55,500 hectares^a.

Institutional arrangements

Forest tenure. According to Law 73/021 of 1973, the state is the sole owner of the land and this is confirmed by the new forest code of 2002 (see below). According to this, the local population must be consulted before any area is classified in the planned PFE. Communities or municipalities have customary rights over the forests within their jurisdiction and are able to become long-term concession-holders of such forests. The state can also allocate forests to local communities as community forests.

SFM policy framework. DRC has adopted the ATO/ITTO PCI for natural tropical forests in Africa as an instrument for monitoring progress towards SFM.

Forest policy and legislation. Forest management was formerly implemented under the colonial Forest Law of 1949 and applied through the *Guide to Forest Exploitation*, which came into force in 1975. A new and comprehensive forest code (Law 11/2002) promulgated in 2002 describes the institutions and responsibilities in regard to forest management and lays down prescriptions for national forest planning and forest management; for example, it devotes an entire chapter to forest management (Title V, Chapter II, articles 71–76) and another to local community rights (Title VIII, Chapter III, articles 111–113). A number of ministerial decrees to implement the code were promulgated in March 2003; these deal with methods for the preparation of forest management plans (*Arrêté ministériel* (AM) 46/03), law enforcement (AM 45/03), reforestation (AM 49/03), forest survey (AM 43/03) and protected forest species (AM 42/03). A number of other decrees dealing with, for example, concession management, community forests, the creation of the PFE and the establishment of a

national forest inventory, still need to be finalized and approved by government. Other relevant new laws are Law 007/03 on mining and Law 015/2002 on labour relations.

Institutions involved in forests. DRC has been devastated by about ten years of civil war, which ended officially in late 2002. This left the country with severely damaged infrastructure, an impoverished population and weak or non-existing institutions. The ministry in charge of forests is the Ministry of the Environment, Nature Conservation, Water Resources and Forests (*Ministère de l'Environnement, Conservation de la Nature, Eaux et Forêts*). Within this, the Directorate of Forest Management (*Direction de la Gestion Forestière* – DGF) is responsible for monitoring forest management and harvesting, the Directorate for Water Resources (*Direction des Ressources en Eau* – DRE) for the management of water-related ecosystems, and the Directorate of Fauna and Hunting (*Direction de la Faune et Chasse* – DFC) for game and hunting. A number of governmental services are in place, including: the Permanent Service for Inventories and Forest Management Planning (*Service Permanent d'Inventaire et d'Aménagement Forestiers* – SPIAF); the Congolese Institute for the Conservation of Nature (*Institut Congolais pour la Conservation de la Nature* – ICCN), responsible for the management of protected areas; and the National Reforestation Service (*Service National de Reboisement* – SNR). The lack of trained and motivated staff to manage and control the forests is a crucial bottleneck in building up an effective institutional framework for SFM^a.

In the present reorganization of state institutions it is intended that the different provinces and districts will be given greater political and economic autonomy. The new forest code includes the concept of community forests, but as yet there are no procedures to put this into effect.

In the 1980s, there were fewer than 100 registered NGOs dealing with natural resource management. Today, more than 1,000 NGOs and associations are involved in forest-related activities. Some multi-national NGOs, including Conservation International, WCS and WWF, have recently engaged in forest conservation in DRC.

Status of forest management

Forest for production

The forests near the coast, being relatively accessible, have been logged heavily since colonial times; more recent harvesting has moved into the central basin, where subsistence agriculture is now also affecting some of the swamp forests. Farther inland, outside concession areas, forest harvesting mainly consists of the removal of trees of the most profitable species. The existing legal framework on forest management laid out in Law 11/2002 has not been implemented effectively so far^a.

Inventories have been carried out over about 21 million hectares, and 16.5 million hectares were mapped before 1992 (ITTO 2003). About 20 million hectares had been allocated to commercial forest operations by mid 2003, but according to DRC forestry officials (pers. comm., June 2005) this area may soon be extended to 50 million hectares. No large-scale concessionaire has been in operation since the end of the war, most of the logging being done on a small scale by forest users who have felling permits but no management obligations (eg for inventory or silviculture). Several interested parties – including mining operators and the military – have been logging without official harvesting contracts. Some large logging companies – mostly foreign-owned – that were active in the past still have legally valid forest concession rights; some of these are interested in re-engaging in the country in the near future should the political situation prove stable. In addition, new foreign-based companies are also prospecting for large-scale forest concessions. According to Law 11/2002, concessions can be allocated for 25 years and are renewable. The maximum area of a forest concession is 500,000 hectares. There are several steps to obtaining forest harvesting rights:

- an authorization for 'forest prospecting' (*autorisation de prospection forestière*) must be obtained to conduct a forest inventory in a given area. This is valid for one year and no harvesting is permitted;
- a letter of intention (*lettre d'intention*) must be secured. This is valid for three years, during which time the concessionaire must invest a minimum of 50% of his planned investment,

particularly in setting up a wood-processing unit. In this period, a concessionaire can, under certain circumstances, begin to harvest timber;

- a supply guarantee (*garantie d'approvisionnement*) must be obtained. This is valid for 25 years and is renewable. It establishes the forest concession and authorizes timber harvesting; and
- cutting permits (*permis de coupe*) are required. These determine the yearly cutting area, limited to 1,000 hectares; a concessionaire may have several cutting permits, depending on the size of the concession. The cutting permit includes a detailed harvesting map and contains information on the timber stand, any protection measures that apply and the social conditions in the area.

In practice, none of these steps are administered in a transparent way. Moreover, the forest service is unable to effectively control illegal logging and other irregular forestry activities (DRC forestry officials, pers. comm., June 2005). Only one zone (Bolobo-Mushie) has a regional forest management plan; this dates from 1986 and covers 1 million hectares (Sebastien & N'Yanga-Nzo 2001).

As of August 2003, two authorizations (347,000 hectares), 27 letters of intent over an area of more than 4.7 million hectares and 112 supply guarantees (granted concessions) over an area of more than 15.5 million hectares were approved, but a further 45 supply guarantees over 9.1 million hectares had not become operative. Even though the number of licences is high, forest harvesting activities are very much less than what would be possible under SFM (see below). Nearly all of the exported timber comes from only six companies, out of which one is producing half. None of the concessions has a management plan (DRC forestry officials, pers. comm., June 2005).

Silviculture and species selection. The only silvicultural prescriptions contained in Law 11/2002 are the determination of a minimum harvesting diameter by species and some specific requirements for certain timber species.

The country has an enormous diversity of tree species. The total number of commercial tree species is more than 200, of which about 25 are sold internationally. Some important commercial timbers are shown in Table 2; others include *Gambeya africana* (longhi), *Guarea cedrata* (bossé), *Guibourtia*

Table 2 Some commonly harvested species for industrial roundwood^a

Timber species	Remarks
<i>Gossweilerodendron balsamiferum</i> (tola)	16% of the export value in 2002
<i>Millettia laurentii</i> (wengé)	45% of the export value, mainly from Bandundu region
<i>Chlorophora excelsa</i> (kambala/iroko)	11% of the export value
<i>Entandrophragma cylindricum</i> (sapelli)	6% of the export value
<i>Terminalia superba</i> (limba)	3% of the export value

spp (benge), *Lovoa trichilioides* (dibetou), *Entandrophragma angolense* (tiama), *Entandrophragma utile* (sipo or lifaki), *Entandrophragma candollei* (kosipo), *Pericopsis elata* (afromosia) and *Nauclea diderrichii* (bilinga).

Planted forest and trees outside the forest.

Terminalia superba (limba) is the main species used in plantations, the first of which were established in 1905. Agroforestry plantations (*taungya*) were introduced in the 1940s and are still widespread. Other species planted for industrial production before the 1960s included *Ceiba pentandra*, *Bombax flammeum*, *Entandrophragma* spp, *Lovoa trichilioides*, *Eucalyptus* spp, *Grevillea robusta*, *Casuarina equisetifolia* and *Cupressus* spp. Species of *Eucalyptus*, *Acacia*, *Pinus* and *Gmelina arborea* have been used for fuelwood and soil protection.

Forest certification. So far no forests have been certified in DRC, but some foreign companies are undertaking some baseline studies for certification. DRC participates in the ATO working group on an African certification scheme.

Estimate of the area of forest sustainably managed for production. In 2003, no area of production PFE was known to be managed sustainably. However, three forest sites dedicated to forest research and education totalling 284,000 hectares are thought to be so managed (Table 3).

Timber production and trade. It is estimated that the closed forest area could sustainably produce about 35 million m³ per year of industrial wood (Sebastien & N'Yanga-Nzo 2001), but the actual production is far from reaching this figure. Total official production of all roundwood was an estimated 77.2 million m³ in 2003, but industrial roundwood was only 90,000 m³ in 2003, down from 170,000 m³

in 1999 (ITTO 2004, 2005); however, illegal timber production is likely to have been much higher than that. The country exported an estimated 58,000 m³ of logs in 2003 (ITTO 2005). Timber-processing capacity has been greatly reduced and needs to be rebuilt.

Non-wood forest products. The NWFPs derived from the closed forests are very important all over DRC but particularly in those regions where the prevailing economic hardship is exacerbated by armed conflict. For many people, forests are likely to be the main source of food, medicine and stimulants like cola and palm wine. Wild meat has become scarce in regions where there is armed conflict, thus contributing to malnutrition and famine. No information on the trade of NWFPs was available for this report.

Forest for protection

Soil and water. No specific measures to promote soil and water conservation in areas of closed forest are in place, although Law 11/2002 cites the need to protect, among others, springs and streams and to conserve soils. Soil and water conservation is regulated by a 1958 decree. Some small plantations have been established for erosion control in the last 30 years.

Biological diversity. Of the 11,000 known species of plant in DRC, about 3,200 are considered endemic. Forest inventories suggest that tree species number more than 700, and there are an estimated 415 mammal species and 1,086 bird species. Thirty-two mammals, 30 birds, three reptiles, 13 amphibians and 66 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 23 mammals, 21

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
20,500	15,500*	1,080 ^{c, **}	0	284 ^d	55	40 ^d	0

* Includes concessions with valid permits (*garanties d'approvisionnement*); not all of them were operational at the time of writing

** Regional forest management plan, Bologo-Mushie

birds, 13 amphibians and 15 plants are found in forests (IUCN 2004). Although the country is large, there is enormous pressure on wildlife through poaching. Wild meat is in demand in rural and urban markets. The elephant population in the forest zone (about 300,000 before 1980) had been reduced to less than 50,000 in 2000 (Sebastien & N'Yanga-Nzo 2001). DRC has listed eight plant species in CITES Appendix I and 53 in Appendix II (CITES 2005).

Protective measures in production forests.

Article 48 of Law 11/2002 prohibits logging along streams and within 50 m of riverbanks and 100 m of springs. Poaching is thought to be widespread (DRC forestry officials, pers. comm., June 2005).

Extent of protected areas. In general, the major ecosystems remain relatively intact. In 1999, the government approved a strategy and a plan of action for the sustainable use of biodiversity. The country has ten national parks, four of which are listed as UNESCO World Heritage sites, totalling about 9.3 million hectares of forest. In addition, there are three biosphere reserves totalling 300,000 hectares and 21 maintained hunting reserves covering more than 10 million hectares. According to UNEP-WCMC (2004), 9.32 million hectares of forest are in protected areas conforming to IUCN protected-area categories I–IV, including 5.84 million hectares of lowland evergreen broad-leaved rainforest and 861,000 hectares of upper montane forest.

Estimate of the area of forest sustainably managed for protection. Protected areas are generally without effective control. Encroachment is widespread and trophy hunting, wild-meat hunting and timber theft are widespread (Sebastien & N'Yanga-Nzo 2001). However, large areas of

DRC's forests are currently under no threat from deforestation or other significant human-induced disturbance due to their remoteness from major human settlements.

Socioeconomic aspects

Economic aspects. There is no recent information about the contribution of the forest sector to GDP or employment. The forest sector could become a pillar of economic development in DRC in a stable political and macroeconomic environment. There is an important informal sector dealing with wood extraction and wood-processing that generally meets local needs for timber, fuelwood and charcoal.

Livelihood values. Natural forests play an important role in the livelihoods of many people, in particular as an important source of food. An estimated 12 million people gain much of their living from forest resources^a.

Social relations. Law 11/2002 (Title VII, Chapter III, articles 111–113) requires that the local population be consulted before any area is awarded to a concession or given protected status. However, it does not address local rights governing the use of forest resources, although it does allow communities to manage a forest concession within their traditionally recognized ancestral lands. There is widespread frustration among rural communities because forest concessions generally only benefit local leaders, who often do not share the benefits with the wider population (Sebastien & N'Yanga-Nzo 2001). In remote areas in particular, forest concessions are sometimes the only providers of primary education and health care, and forest roads have improved access to many remote villages.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
27,000	9,320	n.d.	n.d.	0

Summary

The civil war took a heavy toll on DRC's infrastructure and development. Despite vast forest resources, the forestry sector failed to attract international investors or donors and remains undeveloped. There has been some improvement since 2002 (when the war ended) and the government has developed a policy aimed at encouraging the sustainable use of forest resources. The arrangements for forest and concession management and the enforcement of rules are currently in a state of flux; capacity for SFM remains minimal and its widespread adoption seems a long way off. Nevertheless, the forest sector has the potential (with appropriate planning and regulation) to play a crucial role in the country's recovery and subsequent development.

Key points

- DRC has vast closed tropical forests and a relatively low level of conversion to other uses, but the forest sector is in disarray as the country emerges from a long civil war.
- DRC has an estimated 47.6 million hectares of PFE, comprising 20.5 million hectares of production forest, 27.0 million hectares of protection forest and 55,000 hectares of industrial timber plantations.
- At least 284,000 hectares of the natural-forest production PFE are being managed sustainably, comprising three research and education forests. No areas of protection PFE are deemed to be so managed.
- Although not under formal management, large areas of DRC's forests are currently under no threat from deforestation or other significant human-induced disturbance due to their remoteness.
- Only one area of production forest, of about 1.1 million hectares, is covered by a management plan.

- Under the 2002 forest law, concessions of up to 500,000 hectares can be allocated for 25-year periods (renewable).
- Forestry administration is the responsibility of three directorates within the Ministry of Environment, Nature Conservation, Water Resources and Forests. A severe lack of capacity hinders efforts to supervise the forestry sector.
- The volume of timber harvested in DRC is only a tiny fraction of the potential sustainable yield, even accounting for likely significant levels of illegal logging.
- Four of the country's ten national parks are listed as UNESCO World Heritage sites; an estimated 9.32 million hectares of forest are contained in protected areas conforming to IUCN categories I-IV.

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REPUBLIC OF CONGO



*For legend see page 58

Forest resources

Congo has a land area of 34.2 million hectares and a population of 3.7 million people. Stretching from 3° north to 5° south, it can be divided into three broad biogeographical zones: the southern zone, which covers the forested Mayombe and Chaillu mountains and extensive grassland and savanna; the central zone, which consists of the Bateke Plateau highlands, wholly covered by grass or shrub savanna apart from gallery forests and scattered forest islands; and the northern zone, located mostly north of the equator, which consists of three subregions: the Cuvette, Likouala and Sangha, all mostly covered by intact closed forests. About half of the population lives in the two major cities in the south (Brazzaville and Pointe-Noire), whereas the rural population is concentrated in the southern and central parts of the country. The main forest zone, in northern Congo, is sparsely populated.

Estimates of total forest cover include 20.3 million hectares^a and 22.1 million hectares (FAO 2005).

Forest types. The Mayombe forest, originally rich in *Aucoumea klaineana* (okoumé), has been heavily cleared due to the high population density along the road between Brazzaville and Pointe-Noire and repeated logging. It covers less than 1 million hectares, including extensive secondary forests^c. The Chaillu forest area, covering 3.4 million hectares, is rich in okoumé, *Terminalia superba* (limba), *Pycnanthus angolensis* (ilomba) and *Entandrophragma utile* (sipo); it has been locally over-harvested and is increasingly encroached upon by farmers. Together, these two forest areas form the southern sector. The northern forests contain redwoods, especially sipo, *Entandrophragma cylindricum* (sapelli), and *Millettia laurentii* (wengé), as well as light hardwoods (eg *Triplochiton scleroxylon* – ayous); they cover 16.5 million hectares, about 40% of which is situated on soils that are flooded for a large part of the year.

Dynamics of forest resource change. The deforestation rate between 1990 and 2000 was about 17,000 hectares per year, or 0.1% of the total forest area (FAO 2005). For a long time, the northern forests remained almost untouched because of a lack of infrastructure and low population density. Over the past ten years, however, logging has started in these forests and there is now more in-migration from southern Congo and neighbouring countries. Uncontrolled forest fires occur regularly in the south at the end of the dry seasons.

Permanent forest estate. Virtually all the closed natural forest is contained within Congo's PFE (Table 1).

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^{a,c,d}			
		Production		Protection	Total
		Natural	Planted		
20.3–22.1	22,000	18,400	72	2,860	21,332

Planted forests. The area of industrial forest plantations is variously estimated at 55,000 hectares^b, 72,000 hectares^a and 83,000 hectares (FAO 2005). About 10,000 hectares of timber plantations have been set up in the Mayombe region. Most of these have been established in order to develop low-fertility savannas by introducing eucalypts (mainly high-performance clones and hybrids). There are also some oil-palm and rubber plantations in southern Congo.

Institutional arrangements

Forest tenure. According to the current (2000) forest law (see below), there are two types of forest ownership: state forest and private forest. State forest can belong to government, local councils (*collectivités locales*) and public bodies. Once declared, any community and communal forest is registered as the private domain of the relevant group. According to Law 32/82 of 1982, access is free and user rights are granted to local people in non-classified forests. Local people are also allowed to harvest palm trees, rattan, leaves of *Gnetum*, etc, as well as single trees for lumber and firewood – including for commercial use.

SFM policy framework. The broad policies for SFM are set out in the Program of Social and Economic Development (2000–2003) and the National Forestry Action Plan. The objectives include: the adoption of a master plan for forest management in Congo, the creation and management of forest by appropriate silvicultural techniques, the adoption of agroforestry systems that provide sound soil and vegetation management, and the adding of value to wood and non-wood forest products. In 2001, Congo developed its own set of C&I based on those of ITTO and ATO; these were first tested with the private sector in 2002 and are expected to be used for monitoring SFM in FMUs.

Forest policy and legislation. Congo has important forest resources that have been relatively little used in the past. Nevertheless, the country has had a set of related laws and regulations for 30 years. A new forest code (Law 16/00) was adopted in November 2000 and new regulations and taxation systems are being prepared. Together, these will provide a legal framework that integrates all the principles of SFM. According to the new law, state forest is divided into permanent and non-permanent forest estates, the PFE comprising the state forest estate

(*le domaine forestier de l'état*), which is forest belonging to the state, local communities and public bodies. The non-permanent forest estate comprises the public forest estate (*le domaine public de l'état*), which is forest that has not yet been classified.

A fauna and protected-areas code and a land-use code are being drawn up to replace the Land Use and National Estate Code (Law 52/83), which has never been applied by decree.

Institutions involved in forests. The main institution in charge of forests is the Ministry of Forestry Economy and Environment (*Ministère de l'Economie Forestière et de l'Environnement* – MEFE). The 2000 forest code provides for the setting up of a forestry fund into which will be paid a proportion of the taxes levied in the sector. These will accrue to MEFE in order to facilitate its activities and consolidate its investments. New bodies and centres set up by the forest code include the General Forest Economy Inspectorate, responsible for internal auditing, inspection and control; the National Timber Trade Information and Statistics Centre; and the National Inventory and Forest Management Centre (*Centre National d'Inventaire et d'Aménagements des Ressources Forestières et Fauniques* – CNI AF), responsible as an independent body for all aspects related to forest management plans. There appears to be considerable political will to put in place an SFM regime^b, but the institutional capacity to follow through on this is still very weak^a.

The present governmental structure has evolved as a result of a military coup in 1997 followed by civil war until early 2000 and elections in 2002. The country's socioeconomic development is based on central planning and a strong public service including parastatal companies. The country is now moving towards privatization, but not yet the devolution of state functions.

Several international NGOs operate in Congo, including WCS and WRI.

Status of forest management

Forest for production

The production PFE is divided into 34 FMUs. All management, production, conservation, silviculture and infrastructure development is conducted

Table 2 Some commonly harvested species for industrial roundwood^c

Timber species	Remarks
<i>Entandrophragma cylindricum</i> (sapelli)	30–60% of the total volume harvested, 100% for export
<i>Triplochiton scleroxylon</i> (ayous)	Light-colored timber, used in Europe to replace birch in sauna construction
<i>Entandrophragma utile</i> (sipo)	Decorative species, important for veneer
<i>Chlorophora excelsa</i> (iroko)	Traditionally one of the most popular dark hardwoods
<i>Millettia laurentii</i> (wengé)	Fine dark wood for multiple high-quality uses

at the level of these FMUs. In 2002, an area of about 8.5 million hectares was allocated to timber harvesting and required management plans. At the beginning of 2003, there were 50 forest concessions (of differing legal status) and 31 mostly smaller units (*unités d'exploitation* and 'lots') in the south and 19 forest concessions for production and protection in the north^c. Expatriate enterprises, mainly from Europe but also from Malaysia, Hong Kong and the Middle East, are of great importance and account for more than 80% of national timber production.

Forest management is very different between the southern Mayombe and Chaillu regions and the northern part of Congo. Southern forests have been harvested for more than 50 years. Most of these forests are degraded, and current timber harvesting is often the third or fourth re-entry into logged-over forests^c. In addition, the former larger FMUs have been subdivided into smaller logging units, allowing mainly national extractors access to the timber resources. In the last ten years, more than 1 million hectares of forest have been allocated in lots of about 50,000 hectares each. Many of these have been subcontracted to logging operators without knowledge of, interest in or capital for forest management, and damage is widespread^c. The approach to forest management in northern Congo is different. The integrity of large FMUs has been maintained and concessions allocated to large industrial companies with an annual production capacity of over 100,000 m³, large enough to invest in wood-processing units.

The 2000 forest code requires that FMUs have forest management plans. In theory, these plans are to be prepared by the forest administration in close collaboration with the forest concession-holders, but, in practice, the concession-holders

undertake most of the work. Some management plans were expected to be completed by mid 2004 and provide the basis for the first SFM units in the country. Inventories for commercial timber and regeneration have been carried out on at least 6.4 million hectares of forests of the PFE^c. A new approach, recently applied in three FMUs in northern Congo, has integrated NWFPs as part of the resource inventory. On the basis of forest inventories carried out over the past 30 years, the annual potential sustainable timber yield from the forest is estimated to be about 2 million m³, based on a 40-year rotation^c.

The allocation of concessions in the FMUs is attributed either through an industrial processing agreement (*convention de transformation industrielle*), a management and processing agreement (*convention d'aménagement et de transformation – CAT*) or a special permit (*permis special*). In addition to these, Article 65 of the 2000 forest code specifies another type (*les permis de coupe des bois de plantations*) for the harvesting of plantations. Enterprises that are candidates for the development of an FMU are selected by tender. Harvesting is carried out in designated areas according to an annual allowable cut (AAC), which corresponds to the maximum annual volume authorized by the forest administration. The AAC can only cover areas that have been subject to a full enumeration of all harvestable trees and the most sought-after species. Every year, concession-holders must submit a request for approval of the AAC, together with a map of tree enumeration (scale 1:20,000) and a map (1:50,000) indicating existing log yards, roads and skidding trails. Every three months the operator must submit to the forestry administration a summary account indicating the volume of production by species and destination.

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
18,400	8,440	1,300 ^{c,*}	0	1,300 ^{c,d}	72	45	0

* Forest management plans are being prepared in most of the concessions in northern Congo; at the time of compilation one company, CIB, had submitted its plan for further consideration by the forest administration and two others were about to do so

Silviculture and species selection. Congo has a long tradition of forestry research and education, and there is broad scientific knowledge of silviculture and forest dynamics in natural and planted forests^b. Under the 2000 forest code, management plans must specify the species selected for felling and for preservation, any silvicultural treatments including enrichment planting, and the silvicultural planning schedule for each harvesting plot. Felling cycles can vary between 25 and 50 years and harvestable diameters between 60 and 80 cm according to species. Harvesting in FMUs for which a management plan has not yet been approved should be preceded by a felling inventory for the specified area.

In northern Congo, 18 to 20 timber species are harvested, mainly for the export market. The five major timber species listed in Table 2 make up nearly 80% of total production. More species are used in southern Congo; the major species there are okoumé and *Gambeya africana* (longhi).

Planted forest and trees outside the forest. The most important industrial plantation species are clonal eucalypts, followed by various tropical pines. Limba has been planted extensively since 1949 with some success. There are some small-scale enrichment plantings using local species such as ayous, *Nauclea diderrichii* (bilinga) and *Entandrophragma angolense* (tiama). Okoumé has been planted or regenerated in southern Congo with limited success.

Forest certification. Congo is actively involved in the development of the Pan-African Certification Scheme based on the ATO/ITTO PCI. Foreign companies operating in northern Congo are showing some interest in forest management certification and at least one large operation is pursuing FSC certification.

Estimate of the area of forest sustainably managed for production. At least 1.3 million hectares of the natural-forest production PFE are thought to be under SFM (Table 3). This area comprises three FMUs located in northern Congo managed by *Congolaise Industrielle des Bois* (CIB). CIB, which has been in the region since 1959, applies – with the assistance of an ITTO project and WCS – high forest-management and social standards and is well advanced in a process of independent certification under the FSC scheme.

Timber production and trade. Total roundwood production was an estimated 2.45 million m³ in 2003 (FAO 2005b), including an estimated 1.35 million m³ of industrial roundwood (ITTO 2006 in prep.). Sawnwood production in that year was 168,000 m³, an increase over 1999 (74,000 m³) (ITTO 2004, ITTO 2006 in prep.). In 2003, Congo exported an estimated 738,000 m³ of logs, 127,000 m³ of sawnwood and 14,000 m³ (almost all production) of veneer (ITTO 2006 in prep.). Production and transport costs for exporting timber are relatively high compared to other countries in the Congo Basin; labour costs are the second-highest in the region after Gabon^c.

Non-wood forest products. Many foods, medicinal plants and condiments are collected in the closed forest area and savanna forests; these are mainly sold domestically. Fibres such as raphia and rônier leaves (*Borassus aethiopum*) are important products that are traded with neighbouring countries. Mammals (particularly antelopes), invertebrates, snails and fish are important sources of protein for forest-dwelling communities. The trade in wild meat now involves many species, including protected species such as apes and elephants in northern Congo; it has become a major problem since the opening-up of the forests to forest management^c.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I–IV	Allocated for soil and water	With management plans	Sustainably managed
2,860	2,860	3,660 ^a	380 ^{a,d}	380 ^{a,d}

Forest for protection

Soil and water. According to MEFE, 3.66 million hectares of forests are managed primarily for soil and water protection^a.

Biological diversity. Congo is host to more than 6,500 plant species, 200 mammal species and 500 bird species (government of Congo 2000). Fourteen mammals, four birds, two reptiles and 36 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, ten mammals, one bird and six plants are found in forests (IUCN 2004). Fifteen plant species are listed in CITES Appendix II, including one hardwood timber species, *Pericopsis elata* (CITES 2005).

Protective measures in production forests. Forest management plans are now compulsory for concession-holders. They prescribe measures to protect water flows, biodiversity and soils. Specific provision is to be made to preserve wildlife in production forests^a.

Extent of protected areas. The first national park (Odzala) dates from 1935, and the second, Nouabale-Ndoki, was created in 1993. According to the government of Congo, three national parks have protected-area status equivalent to IUCN categories I and II covering a total area of nearly 2.3 million hectares, and eleven protected areas covering 1.4 million hectares are classified in IUCN categories III to VI^a. Of the 14 protected areas, twelve (86%) are linked by forest corridors. According to UNEP-WCMC (2004), 2.86 million hectares of forest are in protected areas conforming to IUCN protected-area categories I–IV, including 2.07 million hectares of lowland evergreen broad-leaved rainforest.

Estimate of the area of forest sustainably managed for protection. The Nouabale-Ndoki National Park (380,000 hectares) is covered by a fully-fledged management plan that is being implemented effectively; CIB is harvesting timber in its buffer zone and implementing measures to

further protect the integrity of the park. The park is therefore considered to be under SFM^{a,d} (Table 4).

Socioeconomic aspects

Economic aspects. In 2002, the forest industry contributed about 2% of GDP^b. It is estimated that more than 8,000 people are employed in the forestry sector^c; forestry is a particularly important employer in northern Congo.

Livelihood values. Wild meat and the gathering of edible fruits, nuts and roots are of great importance for forest-dependent local communities, particularly Pygmies in the closed forest. Leaves of *Gnetum* spp are widely used as vegetables. Fruits of *Irvingia gabonensis*, *Gambeya africana* and others are collected and eaten. The government's new procedures for forest management plans contain provisions for the local use of NWFPs.

Social relations. Communities living in or near primary forests rely heavily on hunting for subsistence, but this is often affected by logging and particularly the presence of logging camps. Over-hunting occurs in areas with rapid population growth caused by the opening-up of the forest frontier. Indeed, the wild-meat question and social relations between indigenous forest dwellers and migrants are possibly the biggest constraints to SFM in northern Congo^b. Local populations often benefit from the long-term presence of forest industries, which construct roads that can be used for the transport of goods. Forest industries also establish medical services and schools and, to some extent, provide services that normally are the responsibility of government^b.

Summary

The Republic of Congo has a large forest resource, supportive government policies, little population pressure, and at least one large concessionaire well advanced along the path to SFM. The stage therefore seems set for the forestry sector – particularly in northern Congo – to expand the area of forest

under SFM, provided that issues related to local communities and the over-hunting of certain mammal species can be addressed.

Key points

- The Republic of Congo has a large resource of closed tropical forests, particularly in the north, and a relatively low level of conversion to other uses, although there is significant encroachment in the southern forests.
- The PFE is an estimated 21.3 million hectares, comprising 18.4 million hectares of production forest, 2.86 million hectares of protection forest and 72,000 hectares of industrial timber plantations.
- At least 1.30 million hectares of the natural-forest production PFE, comprising the concession areas of CIB in northern Congo, are thought to be under SFM. Some 380,000 hectares of protection PFE are deemed to be so managed.
- The over-hunting of wild meat within concessions, and social relations between indigenous forest dwellers and migrants, are possibly the biggest constraints to SFM in northern Congo.
- Forestry administration is the responsibility of the Ministry of Forest Economy and the Environment (MEFE). Institutional capacity remains relatively weak.
- In the south, more than 1 million hectares of forest have been allocated for harvesting in lots of about 50,000 hectares to operators largely unskilled in forest management.
- In the north, concession-holders are expected to collaborate with MEFE in the development of forest management plans; inventories have been carried out on at least 6.4 million hectares.

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CÔTE D'IVOIRE



*For legend see page 58

Forest resources

Côte d'Ivoire, which is situated on the Gulf of Guinea, has a total land area of 32.2 million hectares and a population of about 17 million people. The tropical moist forest belt extends inland from the coast in the southwest and southeast for more than 250 km; beyond the tropical forest belt lies extensive savanna. The western part of the country is in the Guinea highlands, in which the highest summits rise to more than 1,500 m above sea level. Estimates of forest cover vary from 7.12 million hectares (22% of the land area; FAO 2005a) to 11.7 million hectares^a.

Forest types. Two main forest types can be distinguished in the rainforests of the south: wet evergreen and semi-deciduous. The former is poorly stocked in commercial species but contains *Uapaca*

spp, *Guarea cedrata* (bossé), *Tieghemella heckelii* (makoré), *Tarrietia utilis* (niangon) and *Triplochiton scleroxylon* (samba). The latter, occurring in the central and northern parts of the forested zone, was once rich in valuable timber species, including samba, *Mansonia altissima* (beté), *Nesogordonia papaverifera* (kotibé) and *Khaya ivorensis* (acajou).

Dynamics of forest resource change. FAO (2005) estimated the deforestation rate at 265,000 hectares per year in the period 1990–2000, which as a percentage of remaining forest cover was higher than in most other sub-Saharan tropical African countries. Deforestation is mainly caused by increased rural poverty and the need for subsistence agriculture. Timber theft and illegal logging are widespread and are the primary reasons for the degradation of natural forests^c. Forests of both wet evergreen and semi-deciduous forest types outside protected areas are heavily degraded or in an early secondary stage^c. Bushfires are widespread in the savanna and the transitional forest-savanna, especially in the north at the end of the dry season.

Permanent forest estate. The official PFE comprises the 230 classified forests (*forêts classées*) zoned for production and protection – which officially covered 4.24 million hectares in 2003^a – as well as harvesting zones (*périmètres d'exploitation forestière* – PEFs; see below) in the rural zone (*domaine rural*)^a. However, some of these areas have almost certainly been converted to non-forest uses; for example, an estimated 628,000 hectares of classified forest were cleared for subsistence and industrial agriculture between 1992 and 1997^a. Table 1 shows an ITTO estimate of the actual PFE.

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^{c,d,*}			
		Production		Protection	Total
		Natural	Planted		
7.12–11.7	3,248	3,400**	167	734***	4,301

* Only forests in the southwest and southeast are counted here; savanna forests are omitted

** Production PFE comprises forested areas in forest reserves and the PEF of the *domaine rural*

*** Based on UNEP-WCMC (2004)

Planted forests. According to FAO (2001), Côte d'Ivoire had an estimated 116,000 hectares of planted forest in 2000. On the other hand, the government of Côte d'Ivoire estimated that the plantation estate in 2002 amounted to 167,000 hectares, including 65,000 hectares of *Tectona grandis* (teak)^a. The most important non-forest tree plantations are oil palm (about 159,000 hectares), rubber (68,000 hectares) and coconut (32,000 hectares).

Institutional arrangements

Forest tenure. There are two main categories of natural-forest ownership: (i) public forests, owned by the state, which are divided into two kinds of land-use: the *domaine forestier permanent*, which includes the reserved forest area and protected areas, and the *domaine rural*, which includes forest harvesting areas (PEFs) and forests reserved for agriculture purposes; and (ii) community forests, which are based on traditional customary rights recognized in all forest areas in the country.

SFM policy framework. In 1994, CIFOR conducted a case study on the introduction of C&I in Côte d'Ivoire. Since then, national criteria have been elaborated. In 2002 and 2003, regional workshops were held to introduce ITTO's C&I as an instrument to assess progress towards SFM. A new general forest policy framework was announced in 1999 that emphasizes the contribution of SFM to the sustainable development of the country.

Forest policy and legislation. The forest code dates from 1965 (Law 65-425). Since then, all major decisions on land-use, forest management, forest service organization and the commercialization of products have been taken by decrees or ministerial orders (*arrêtés*), including Decree 78-231 of 1978, which defined the management of the PFE and Decree 94-385 of 1994, which reformed forest harvesting. The basic law on wildlife protection and hunting also dates from 1965 (Law 65-255). A process supported by FAO commenced in 2003 to revise the forest code.

A forestry master plan (*Plan Directeur Forestier*) was formulated in 1988; when it was evaluated in 1998, a number of corrective measures were proposed to be included in the new forest policy.

In 2000, an inter-ministerial working group developed a new policy under the *Programme Cadre de Gestion des Forêts*.

Institutions involved in forests. The ministry in charge of forests has changed five times over the past nine years; since 2003, it has been the Ministry for Water and Forests (*Ministère des Eaux et Forêts* – MINEF). Ten regional offices (*directions régionales*) are in charge of forest protection and law enforcement. Field services are placed under the Society for Forest Development (*Société de Développement des Forêts* – SODEFOR), a government corporation created in 1966 and entrusted today with the management of the forest reserves and with technical advisory functions for planted forests and social forestry. Nearly 2,000 people are employed by MINEF and SODEFOR. By Decree 02/359, a national office for national parks and nature reserves (*Office Ivoirien des Parcs Nationaux et Réserves Naturelles*) was created in 2002 under the Ministry of Environment.

Forest management in the *domaine rural* is exclusively conducted by the private sector. Forest industry is organized in syndicates and is quite effective in defending its interests in the forest sector. A number of national and international NGOs are engaged in forest conservation and village development, including reforestation and agroforestry. Civil society is not actively involved in forest management *per se*.

Status of forest management

Forest for production

Two forest management systems are employed: in forest reserves, management is carried out by the state enterprise SODEFOR while in the permanent forest of the *domaine rural* it is carried out by private concession-holders. Until five years ago, forest harvesting in the *domaine rural* was based on a licence system called the PTE (*permis de transformation et d'exploitation*) system, which allocated areas of up to 2,500 hectares to a large number of concessionaires. With the new forest policy, the PTE system was abolished and replaced by a system based on PEFs. By law, a PEF is at least 25,000 hectares and is allocated for 15–20 years; it can be renewed if management by the concession-

Table 2 Some commonly harvested species for industrial roundwood^c

Timber species
<i>Tectona grandis</i> (teak) – planted
<i>Triplochiton scleroxylon</i> (ayous)
<i>Ceiba pentandra</i> (fromager)
<i>Lophira alata</i> (azobé)
<i>Terminalia superba</i> (fraké)

holder is satisfactory. Concession-holders are obliged to present a forest management plan that includes a reforestation scheme and social investments for the rural population living in or adjacent to the PEF. Management plans for PEFs must also include prescriptions for sustained-yield harvesting, the silvicultural treatment of harvested forests and measures against wildfires.

In the past, timber was mainly harvested in reserved forest areas, but excessive extraction over the past 30 years has led to their depletion. Today, nearly 90% of timber is extracted from the forests of the *domaine rural*^f. By mid 2002, 2.9 million hectares of forests in the *domaine rural* had been allocated as PEF, including 960,000 hectares of productive forests. Thirty-two concessions had so far been allocated, varying between 70,400 and 216,000 hectares in size^c. The potential AAC is about 960,000 m³, but the amount extracted is far less. Management plans are required for PEFs, but few have been prepared and harvesting is still mainly based on high-grading the remaining high-value timber^c.

In forest reserves, SODEFOR prepares and implements forest management plans; changes in the law being contemplated would allow forest reserves to be opened to private concession-holders. Forest management plans have been or are being prepared for 88 of the 230 existing forest reserves. In 2002, 25 forest reserves had an approved management plan and 1.5 million hectares were being managed. The size of the units varies, the smallest (Semien) being 3,381 hectares and the largest (Rapids-Grah) 315,000 hectares. Forest reserves are to be managed in perpetuity. In

2001, 232,180 m³ of timber were harvested in forest reserves – far less than the AAC (approximately 1.2 million m³)^c. At the beginning of 2004, nine forest reserves covering 1.11 million hectares were being managed by SODEFOR using the ITTO C&I for monitoring^a. Forest management and law enforcement have been hindered by ongoing civil unrest, and illegal logging and deforestation are thought to be widespread.

Silviculture and species selection. Prescriptions for the silvicultural management of both natural forests and plantations were developed in the 1990s through a forest-sector project supported by the World Bank. They have been fully applied in some forest reserves (Irobo, Tene, Mopri and others), but not yet to the management of the whole PFE. So far, no silvicultural directives have been applied in the permanent forest of the *domaine rural*.

There are more than 700 hardwood species in the country, about fifty of which are utilized and traded. Besides those listed in Table 2, the most valuable species are *Terminalia ivorensis* (framiré), *Entandrophragma candollei* (kosipo), *Milicia excelsa* (iroko), beté, *Entandrophragma angolense* (tiama), *Lovoa trichilioides* (dibetou), bossé, kotibé, *Pterygota macrocarpa* (koto), acajou, *Canarium schweinfurthii* (aiélé), makoré, *Pycnanthus kombo* (ilomba), *Azelia africana* (lingué) and niangon. Côte d'Ivoire has made great efforts to market lesser-known species and these have boosted the sales and exports of previously rarely traded species such as *Copaifera salikounda* (etimoé) and *Chrysophyllum* spp (aniégré).

Planted forest and trees outside the forest. The development of planted forests goes back to 1927 when the first teak plantations were established, although most of the current plantation estate has been established since 1966. By far the most important species is teak, with 65,500 hectares planted in forest reserves. Today, teak is also the main exported timber. More than 35 species have been planted in forest reserves. The most important, after teak, are: fraké, 25,800 hectares; framiré, 11,500 hectares; *Cedrela odorata*, 10,100 hectares; *Gmelina arborea*, 6,500 hectares; samba, 3,600 hectares; acajou, 2,900 hectares; sipo, over 2,200 hectares; and niangon, 2,100 hectares^c. Twenty-seven thousand hectares are

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
3,400	1,870*	1,110 ^{c, **}	0	277 ^{c, d}	167	120 ^c	0

* The sum of PFE areas allocated in 2000 and active in 2002 (960,000 hectares) in the public domain, plus forest reserves intended for production (913,000 hectares)

** Area of forest reserves in 2002 with clear management objectives and multipurpose management plans implemented by SODEFOR since 1997

registered as mixed hardwood plantations. Of the estimated 60,000 hectares or more of planted forest in the *domaine rural*, about 15,000 hectares have been recently created as community forests, often to produce firewood.

Forest certification. There is no forest certification scheme nor any certified forests in Côte d'Ivoire. A national certification working group started in 2002 but little progress has been reported so far.

Estimate of the area of forest sustainably managed for production. It is difficult to ascertain the status of forest management in Côte d'Ivoire. Even in the forests where the necessary elements of good forest management appear to be present, law enforcement is poor and illegal logging and deforestation widespread^c. Nine forest reserves of 1.11 million hectares have been managed since 1997 according to fully-fledged forest management plans for production and protection (Rapides Grah, Scio, Haut Sassandra, Niegre, Haute Dodo, Goin Debe, Cavally, Niouniourou and Okromodou)^a; about one-third of these forest reserves are considered to be managed sustainably^c.

Timber production and trade. Total roundwood production in 2003 was an estimated 11.6 million m³ (FAO 2005b). Industrial log production in Côte d'Ivoire fell from 5.3 million m³ in 1977 (FOSA 2002) to 1.90 million m³ in 2003 (ITTO 2006 in prep.). Sawnwoods like acajou, bété, niangon, makoré, aboudikro, sipo and iroko have become scarce in the past ten years, and plantation production is increasing in importance. Sawnwood production in 2003 was about 503,000 m³, veneer production amounted to 206,000 m³ and plywood to 62,000 m³ (ibid.). In 2003, the country exported 216,000 m³

of sawnwood (ibid.), down from 479,000 m³ in 1999 (ITTO 2004). The country has banned the export of logs of all valuable timber species from natural forests: only teak from planted forests can be exported as logs.

Non-wood forest products. Many NWFPs are traded locally, as well as used for subsistence. Among the most important are bamboo, *Laccosperma* spp (rattan) and *Raphia* spp (raphia palm) for basketry, furniture and housing. More generally, NWFPs directly contribute to the livelihoods of the local population; NWFP extraction is probably increasing due to poor economic conditions.

Forest for protection

Soil and water. A total area of 195,000 hectares is set aside in the nine forest reserves cited above for the protection of soil and water^a.

Biological diversity. An inventory of biological diversity completed in 1999 found over 12,000 forest-dependent species, including 232 mammals, 712 birds, 134 reptiles, 76 amphibians and 3,517 trees^a. Sixteen mammals, eleven birds, four reptiles, one amphibian and 66 plant species are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 30 mammals, nine birds, 13 reptiles and nine plants are found in forests (IUCN 2004). Fourteen plant species are listed in CITES Appendix II, including one hardwood timber species (*Pericopsis elata*) (CITES 2005).

Protective measures in production forests. Timber harvesting is limited in swampy areas, on steep slopes and along river tributaries; on these, a strip of 100 m to 1 km in width (according to their relative importance) is excluded from

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
734	734	195	345	150 ^c

harvesting. Detailed prescriptions for biodiversity conservation are applied in the nine forest reserves that are managed by SODEFOR.

Extent of protected areas. Côte d'Ivoire's nine national parks, two nature reserves, one wildlife reserve, 17 botanic reserves and those parts of the nine forest reserves that are managed for water and soil conservation cover a total area of 2.02 million hectares (6% of the country's land area); of this, two national parks (Comoé, 1.15 million hectares, and Taï, 344,000 hectares) account for more than 60%. According to UNEP-WCMC (2004), 734,000 hectares of forest are in protected areas conforming to IUCN categories I-IV, including 490,300 hectares of lowland evergreen broadleaved rainforest.

Estimate of the area of forest sustainably managed for protection. Poaching and other illegal activities are thought to be a significant problem in many forested reserves^c, due largely to a lack of sufficient financial resources for field-level enforcement^a. About 345,000 hectares of protection PFE are covered by management plans, comprising the forest managed for soil and water conservation in the nine forest reserves managed by SODEFOR (195,000 hectares) and the Taï national park (150,000 hectares). In the latter, the management plan is being implemented effectively and this area is considered to be under SFM^c.

Socioeconomic aspects

Economic aspects. Until 20 years ago, timber was Côte d'Ivoire's third most important export by value, but the industry has declined as the forests have been logged over and cleared. The formal contribution of the forest sector to GDP was estimated to be 1% in 2002^a.

Livelihood values. Forests are important in sustaining the livelihoods of many people. Edible and medicinal plants are collected in great quantities. Wild meat remains the main source of protein in

rural areas, even though hunting regulations are very restrictive. The volume of wild meat harvested is estimated to be more than 120 tonnes per year^a. The consumption of fuelwood, including charcoal, is estimated to be more than 8 million m³ per year.

Social relations. The forest code of 1965, which is still in force, does not specify any direct involvement of local people in forest management, although articles 16 and 20 set forth rights for riverine populations within the classified forest area. Social considerations have been taken into account in various more recent governmental decrees concerning forests. Relationships between concession-holders and local people are difficult in many forest areas; causes include disputes on harvesting, areas for reforestation and money matters. There are 6,705 registered sacred forests (*forêts sacrées*), covering an area of about 37,000 hectares^a. Many more forests may have cultural and spiritual value but are not registered. In some areas, local communities support the protection of forest reserves from encroachment and bushfires. Moreover, local cooperatives and villages engage in reforestation.

Summary

Côte d'Ivoire's 230 state-owned classified forests (*forêts classées*) have been over-harvested and have become depleted of timber; natural forests in the rural zone (*domain rural*) and planted forests are providing an increasing part of the timber supply. Institutional responsibility for forestry administration has changed several times in recent years, with the likely result of reducing administrative effectiveness. The level of enforcement of existing laws and decrees appears to be low in much of the PFE. Forest management plans are under preparation or have been prepared for the forest reserves, but few have been prepared for the *domain rural*. Illegal logging and deforestation are thought to be widespread, exacerbated by civil unrest.

Key points

- Côte d'Ivoire has a relatively low forest cover which continues to diminish.
- The country has an estimated 4.30 million hectares of PFE, comprising 3.40 million hectares of natural production forest, 167,000 hectares of industrial timber plantations and 734,000 hectares of protection forest.
- The estimated area of production PFE under SFM is 277,000 hectares, which is about one-quarter of the forest reserves covered by management plans. About 150,000 hectares of protection PFE are considered to be so managed.
- Forestry administration is currently the responsibility of the Ministry for Water and Forests (MINEF), which operates under a 1965 forest code and subsequent decrees. A process to revise the code is under way.
- Ten regional offices are responsible for forest protection and law enforcement. SODEFOR, a government corporation, manages the forest reserves and provides advisory services.
- MINEF and SODEFOR employ 2,000 people combined.
- Concession-holders are obliged to present a forest management plan that includes a reforestation scheme and social investments for the rural population living in or adjacent to the forest.
- There is a discrepancy between the standards applied in the forest reserves of the PFE and in the *domaine rural*.
- There is conflict between communities and harvesting operators over the use of forests.
- Poaching is believed to be a significant problem.

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 - ^c Information derived from the report of, and discussions with participants at, a training workshop on ITTO criteria and indicators, held 27–30 August 2002, Abidjan, Côte d'Ivoire, attended by 35 people from government, civil society and the private sector.
 - ^d ITTO estimate
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GABON



*For legend see page 58

Forest resources

Gabon has a land area of 26.8 million hectares and a population of about 1.3 million people. It is situated in the western part of the Congo Basin on the South Atlantic Ocean and is characterized by three biogeographic regions: a sedimentary basin in the west, containing forest and savanna; a medium-altitude Precambrian plateau (around 600 m above sea level), largely forested except for the Bateke Plateau in the east, which is natural savanna; and the scattered granite massifs in the north and south – Cristal Mountains, Mayombe and Chaillu – with altitudes ranging between 800 and 1,000 m, which are almost entirely forested. FAO (2005) estimated Gabon's total forest area to be 25.8 million hectares in 2000, which is more than 80% of the land area.

Forest types. There are three major forest types: (i) evergreen rainforest occurring in the west, which

has been heavily harvested, degraded and in some areas reduced to secondary forest characterized by the abundance of *Aucoumea klaineana* (okoumé) and *Dacryodes buettneri* (ozigo); (ii) the central Gabonese forest, covering most of the country, which is very similar to the closed moist forest found from Liberia to the Congo Basin, with many of the same tree species found throughout (eg *Canarium schweinfurthii* – aiélé, *Lophira elata* – azobé, *Entandrophragma* spp, *Khaya* spp and *Triplochiton scleroxylon* – ayous); and (iii) a semi-deciduous forest type occurring in the northeast, characterized by a predominance of Maranthaceae (rattan) in the sub-layer and by a dominance of trees such as *Terminalia superba* (limba), *Millettia laurentii* (wengé) and ayous. Okoumé is absent in this forest type.

Dynamics of forest resource change. With a low overall population density and 60% of the population living in urban areas, there is little anthropogenic pressure on forest resources. FAO (2005) estimated the deforestation rate at less than 0.1% (about 10,000 hectares per year).

Permanent forest estate. The area of potential production forest is about 20 million hectares, of which 2.6 million hectares are in forest reserves. The government strategy envisages, in the long term, that 12 million hectares in the PFE will be managed – 8 million hectares of production forest and 4 million hectares under protected-area status (Amsellem et al. 2002); Table 1 shows an ITTO estimate of the current PFE. The *Direction Générale des Eaux et Forêts* is responsible for identifying the permanent forest area and areas suitable for other uses. A land-use plan has been completed for the First Forest Zone of Gabon (see 'forests for production' below), financed by ITTO; the Second Forest Zone plan, financed by the World Bank, is

Table 1 PFE

Estimated total forest area (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^d			
		Production		Protection	Total
		Natural	Planted		
25.8	21,800	10,600	25	2,700	13,325

under preparation. Almost all of the national production forest area within the PFE is allocated to concession-holders.

Planted forests. Planted forests cover about 25,000 hectares. The government plans to raise the area of planted state forest to 100,000 hectares and to promote the establishment of an additional 100,000 hectares of private plantations, but planting rates are currently minimal. Agro-industrial plantations include about 11,000 hectares of rubber and some small plots of oil palm and coconut.

Institutional arrangements

Forest tenure. The forest law of 2001 (see below) divides forests into two distinct categories. The first includes the production PFE managed by private concessionaires and the protection PFE managed directly by the state. The second is composed of state-owned rural forest – land and forest for which usage rights are limited to local communities. Rural communities and forest dwellers are free to exercise their customary rights in the rural forest provided they respect all conditions imposed by the forestry administration. The production PFE is exclusively owned and administered by the state.

SFM policy framework. Since the timber sector is almost entirely oriented towards export markets, with particular exposure to environmentally sensitive European markets, the existence of a policy on SFM is of great interest. Several recent initiatives have been launched to develop Gabon-specific C&I for SFM. They include work with ITTO, CIFOR, ATO and FSC. Gabon has also been actively involved in the development of the ATO/ITTO PCI.

Forest policy and legislation. An environmental law (No 16/93) was adopted in 1993. It aims to preserve natural resources and to use them sustainably, to improve and protect living conditions, to generate revenues from environmental services, and to harmonize development with safeguarding the natural environment. A decree stipulating when and where environmental impact assessments are required also exists. A national environmental action plan has been funded by the Global Environment Facility (GEF). After extensive consultation at the national level, a new forest law was adopted in December 2001, replacing Law 1/82 of 1982; among other things, it defines the two main usage

categories of permanent and rural forest estates (see 'forest tenure' above).

Gabon's current forest policy was adopted in May 1996. It aims to increase and optimize the contribution of the forestry sector to economic and social development and to promote a more diversified and efficient wood industry through a significant reduction in the export of logs and an increase in the local processing of wood products. The policy makes specific reference to the application of SFM, including: the establishment of a forest management policy, the development of new forest harvesting rules, the introduction of means to monitor forest harvesting, the reform of timber licences to ensure wood supplies to local industries, the imposition of a progressive transformation tax on local forest production, and, finally, the progressive reduction of log exports from 75% of production in 1996 to 50% by the year 2005.

Institutions involved in forests. The Ministry of Forest Economy, Inland Waters and Fishing in Charge of the Environment and Nature Conservation (*Ministère de l'Économie Forestière, des Eaux, de la Pêche, Chargé de l'Environnement et de la Protection de la Nature* – MEFEPEPN) deals with the demarcation, conservation, management, reforestation and harvesting of forests. The Directorate for Forests and Water (*Direction Générale des Eaux et Forêts* – DGEF) promotes the practice of SFM, and the Directorate of Forest Inventory, Management and Regeneration (*Direction des Inventaires, des Aménagements et de la Régénération des Forêts* – DIARF) is responsible for monitoring SFM. There is also a planning, monitoring and evaluation unit in the Ministry to supervise operational activities. In 1975, the government created a privately managed timber enterprise (*Société Nationale des Bois du Gabon* – SNBG), which, until recently, had a monopoly over the export of logs of the two main species, okoumé and ozigo. SNBG supported the regulation of markets for these species by structuring supply, preventing over-production, setting quotas and acting to stabilize export prices. SNBG's monopoly was ended by the government in early 2005.

There are five research institutions dealing with forest-related issues and one forestry training institute, ENEF (*Ecole Nationale des Eaux et Forêts*). Since 2004, the management of 13 national parks

has been carried out by the National Council for National Parks (*Conseil National des Parcs Nationaux* – CNPN). Some local NGOs are involved in the development of certification, but in general there is little civil advocacy and few participatory processes in the forestry sector^b. Some international NGOs, including WWF and WCS, are active in protected-area management.

Status of forest management

Forest for production

All production forests must have an SFM plan prepared by the concessionaires, approved by MEFEPEPN, covering one rotation and based on forest inventories and ecological and socio-economic studies. Licences for harvesting production forests are granted in two ways^b:

- forest concessions under sustainable management (*concessions forestières sous aménagement durable* – CFADs): these concessions, of 50,000 to 200,000 hectares according to the 2001 forest law, consist of one or several FMUs. Each FMU, of between 15,000 and 200,000 hectares, is regulated by a licence. According to the 2001 law, each FMU requires the preparation and implementation of a forest management plan as well as a timber-processing plan. CFADs are granted at least for the rotation period established in the management plan(s), generally between 20 and 40 years. The granting of any such concession is conditional on the establishment of a local timber-processing unit; and
- associated forest licences (*permis forestiers associés* – PFAs), with an area of less than 15,000 hectares, are granted for a ten-year period. They are reserved for Gabonese nationals and must be linked to a CFAD.

In addition, occasional cutting permits (*permis gré-à-gré*), linked with the local processing of the harvested timber, may be granted to Gabonese nationals. These permits are granted in reserved forests outside CFAD and PFA areas.

Community forests may be created in rural forests. These should be managed for timber and NWFPs according to a simplified forest management plan

developed with support from the DGEF. Up to 2004, few community forests had been established^b.

The forest area open to timber harvesting has been divided into three zones. The first, reserved for national enterprises, comprises the coastal plains and is rich in okoumé and characterized by relatively easy transport. Most of this zone has been harvested one to three times since the end of the 19th century (Drouineau & Nasi 1999). The second zone is less rich in okoumé and access is more difficult. This zone has now been almost completely harvested for the first time (*ibid.*), facilitated by the establishment of the *Transgabonais*, the railway that has granted access to a large part of the centre and east of the country. Still less okoumé is found in the forests of the third zone, where the species reaches the limits of its distribution. The *Transgabonais* provides limited access to this zone but extraction becomes increasingly difficult farther from the railroad. As a consequence, there has been little harvesting so far (*ibid.*).

At the end of 2002, there were 401 timber permits of all categories in force covering a total production area of 10.62 million hectares. Forty-three per cent of the area (4.55 million hectares) was being harvested on an industrial scale. This was divided into 63 FMUs, 45 (3.3 million hectares) of which were being harvested by foreign timber concession companies – eight European holdings, seven Asian holdings and one Libyan enterprise. All concessions equal to or larger than 50,000 hectares require a forest management plan. By the end of 2002, about 1.46 million hectares of forest had already been covered by forest management plans, and forest inventories were under way in an additional 1.1 million hectares. In 2003, sixteen concessionaires were preparing forest management plans. It is expected that 6.7 million hectares allocated under CFADs will be managed according to approved forest management plans by the end of 2005 (Gabonese forestry officials, pers. comm., June 2005).

Silviculture and species selection. Timber harvesting is selective and focuses on high-value species; at present, only 4–5 m³ per hectare is extracted. In the first and second forest zones, this is due to previous overcutting of okoumé; in the east, high transport costs mean it is only economically viable to harvest the most valuable tree species.

Table 2 Some commonly harvested species for industrial roundwood

Timber species	Remarks
<i>Aucoumea klaineana</i> (okoumé)	About 1.7 million m ³ of logs exported in 2001
<i>Pterocarpus soyauxii</i> (padouk, red wood)	Important species for log export
<i>Guibourtia tessmanii</i> (kévazingo)	Decorative species, important for veneer, parquet, small handicrafts
<i>Dacryodes buettneri</i> (ozigo)	Traditionally the second most important timber species, now losing significance
<i>Hallea ciliata</i> (bahia)	Dominant in swamp forests

The gross standing volume of trees with diameter above 10 cm is estimated to be 250 m³ per hectare in unexploited forest and 220 m³ per hectare in logged-over forest. The commercial standing volumes are respectively 55 m³ per hectare and 42 m³ per hectare. Generally, forest resources can be divided into two main categories: forests with okoumé and ozigo, which regenerate well, and forests without large amounts of these two species. Okoumé is the predominant species, with about 10 m³ per hectare in about 80% of all forests. A specific silvicultural system is applied, the so-called *Méthode Okoumé*, based on favouring natural regeneration and continuous thinning until there are 80 stems per hectare with a diameter of over 70 cm. Gabonese forests regenerate well and, if management prescriptions are followed, they will maintain their productive value (Drouineau & Nasi 1999).

Over the past decade, a growing number of the approximately 400 hardwood tree species in Gabon's closed forests have been harvested, mostly for domestic or Asian markets. It is expected that the number of species acceptable to international markets will continue to increase from the current 15 or so to 30–40, including azobé, ayous and *Gambeya africana* (longhi).

Planted forest and trees outside the forest.

Reforestation and enrichment planting are generally not undertaken in logged-over forests due to the relative ease of natural regeneration. Existing plantations are mainly on former natural-forest sites and consist primarily of okoumé and, to a limited extent, limba. There are also some plantations of pines and clonal eucalypts.

Forest certification. Since 2001, a national working group on SFM and certification, financed by the

EU and the Dutch government, has been actively involved in setting standards and establishing the base conditions for forest certification. Most of the major European concessions apply the Dutch Keurhout certification scheme, with almost 1.5 million hectares certified under this scheme as of 2004. It is expected that the biggest forest concessions will also seek certification under either the FSC or the Pan-African Forest Certification (PAFC) system, which was established in Gabon in late 2004 based on the ATO/ITTO PCI. PAFC-Gabon is the first African member of the Program for the Endorsement of Forest Certification Schemes (PEFC) Council; in order to be PEFC-endorsed and to use the PEFC logo, PAFC-Gabon needs to complete development of the national scheme and submit it to PEFC assessment procedures (including an independent review and public consultation).

Estimate of the area of forest sustainably managed for production.

At least 1.48 million hectares of natural-forest production PFE are thought to be under SFM. This corresponds to the long-term concession area leased out to timber companies that have achieved certification under the Keurhout scheme.

Timber production and trade. The total standing timber volume (diameter >10 cm) is estimated to be 2.60 billion m³. The possible sustainable annual yield of potentially marketable timber species is an estimated 12–15 million m³ (government of Gabon 2001). In 2003, 3.56 million m³ of industrial logs were produced (ITTO 2005), not much changed from the 3.64 million m³ harvested in 1999 (ITTO 2004). The government plans to raise the level of harvest to 6.5 million m³ (government of Gabon 2001). Local industrial processing is promoted by

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
10,600	6,923	2,310*	1,480	1,480	25	10	0

* All 401 cutting permits in force in 2002–03 are counted here

the government, including by the imposition of a 20% tax on log exports, and has increased during the last five years; for example, veneer production grew by about 50% in the three years to 2003, when it reached 140,000 m³. Nevertheless, Gabon remains one of the largest exporters of tropical hardwood logs. China and Taiwan Province of China absorbed more than half (988,000 m³) of Gabon's log exports in 2003, with most of the rest going to Europe (ITTO 2005).

Non-wood forest products. As in the other countries of the Congo Basin, many foodstuffs, including wild meat, roots, fruits, leaves and nuts, as well as medicinal plants and condiments, are collected in the forest. They are an integral part of the subsistence of local people, but some are also marketed at the national level, such as the fruits of *Irvingia*, lianas of *Gnetum*, and plants and nuts of *Garcinia* species. Bamboo and fibres such as Marantaceae (rattan), raphia, and the leaves of *Borassus aethiopum* (rônier) are important products that are also traded internationally. Charcoal is of some importance, supplying a small but efficient informal market.

Forest for protection

Soil and water. As of 2004, no forests were reported to be managed primarily for the protection of soil and water^a.

Biological diversity. Gabon contains more than 6,500 plant species, 320 mammals and 617 birds. Thirteen mammals, five birds, three reptiles, two amphibians and 108 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, ten mammals, two birds, two amphibians and 44 plants are found in forests (IUCN 2004). Gabon has listed eleven plant species in CITES Appendix II, none of which is a hardwood timber species (CITES 2005). Although Gabon is sparsely

populated, some fauna species are under pressure in some areas due to an increasing demand for wild meat (Amsallem et al. 2001).

Protective measures in production forests. Law 16/01 includes measures to protect soil, biodiversity and water flow in concession areas. It also includes a series of stand treatments to encourage the regeneration of commercial tree species in natural stands. Provisions designed to protect wildlife specify the zones where hunting is permitted and the length and dates of the hunting season. These rules need to be enforced in forest concessions, as concessionaires and their personnel have so far done little to control poachers (Amsallem et al. 2001).

Extent of protected areas. Gabon has 13 national parks – most of them forested – covering about 3.01 million hectares^a, although none appear to be managed effectively except for the Lopé National Park and the Minkebe National Park^d. The CNPN focuses on ecotourism as well as nature conservation in park management but its main activities are concentrated on fighting poaching. Parks outside the Lopé National Park require more protection, particularly the Mounts of Cristal, the Clump of Chaillu, the Mayombe, the whole northeast of the country, the Belinga Zone and the Mounts of Boka-Boka. According to UNEP-WCMC (2004), 570,000 hectares of forest are in protected areas that conform to IUCN protected-area categories I–IV. A National Biodiversity Observation Board was created in 2000 to support the implementation of the GEF-assisted National Strategy and Action Plan for Biodiversity. ITTO and WWF are working with the government to develop a project that would prepare a management plan for the Minkebe Forest Reserve, which together with the Minkebe National Park makes up an ITTO-supported trans-boundary conservation area linked to the Mengame protected area in Cameroon.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
2,700*	570	0	491**	1,090

* National parks only

** A management plan for the Minkebe National Park and the Minkebe Forest Reserve is in the final stages of preparation

Estimate of the area of forest sustainably managed for protection. The total protection PFE under SFM is an estimated 1.09 million hectares (Table 4), comprising the ITTO-supported Minkebe National Park (600,000 hectares) and the Lopé National Park (491,000 hectares). These areas are considered to be managed and protected effectively, although poachers continue to be a threat to these and other protected areas.

Socioeconomic aspects

Economic aspects. Timber and wood industries play an important role in the economy of Gabon. Before the petroleum industry was established in the 1950s, timber provided 90% of export earnings but by 1985 this had diminished to 6%. Timber remains the second-largest source of export earnings after petroleum, earning about US\$250 million per year, now around 9% of export revenue. It is estimated that the timber industry's contribution to GDP is 5% (government of Gabon 2001). Forest taxes are primarily (>90%) derived from export levies. The country has engaged in fiscal reforms to increase and diversify income from taxes and to provide incentives for SFM and wood processing. Forestry and wood industries employ about 29,000 people (government of Gabon 2001). In order to implement its SFM policy, the government has created a National Forest Fund and an investment program with the World Bank (*Programme Sectoriel Forêt-Environnement*) that aims to pursue institutional and statutory reforms.

Livelihood values. Forests are the main source of subsistence for many villages. Local populations have free access to all forests as long as they possess appropriate customary rights and do not jeopardize the sustainability of the forest products they collect. Wild meat and edible fruits such as aiéle, leaves of *Gnetum* species, and nuts and roots (igname) are of great importance for forest-dependent

local communities, in particular Pygmies. Wild-meat availability may be threatened locally because of overhunting.

Social relations. The community forests allowed under the 2001 forest law replace the former 'family logging' rights. The forest law specifies that there should be a zone around each production forest to accommodate the customary rights of surrounding communities. One of the objectives of a memorandum (*lettre de politique*) of forest policy published by the government in May 2004 is to increase the future role of local users in community forest management.

Summary

Over the past ten years, Gabon has gone through a profound process of reform affecting the forest and environment. A new forest law has come into force that emphasizes SFM as the overall approach in the PFE. Forestry is, and will remain, one of the pillars of Gabon's economic and social development. The private sector has become a major driver of industrial forest development and the export of forest products. The government has introduced a system to institutionalize community forestry as a way of meeting local needs for timber and other forest products. Gabon has a low deforestation rate, forests rich in valuable timber species and among the best prospects for a healthy and sustainable forest industry. There are still problems – mainly in governance. For example, there is little civil advocacy and few participatory processes in the forestry sector. Protected-area management in Gabon is still in its infancy and requires greater planning and effective enforcement.

Key points

- Gabon has timber-rich and extensive forest resources with a relatively low risk of conversion to other uses.

- The PFE is an estimated 13.3 million hectares, comprising 10.6 million hectares of natural production forest, 2.70 million hectares of protection forest and 25,000 hectares of plantations.
- At least 1.48 million hectares of natural-forest production PFE are thought to be managed sustainably; at least 1.09 million hectares of the protection PFE are considered to be so managed.
- The financial viability of SFM is greatly enhanced by the high quantity and quality of a prime species (okoumé) in a large part of the forest estate, particularly on the coastal plains.
- However, because of its high value, okoumé tends to be over-harvested.
- Community forests may be created in rural forests, but few had been as of 2004.
- High standards for concession management have been developed on paper, but still need to be fully introduced and enforced. There is interest in the application of C&I as a monitoring tool and forest certification has been encouraged.
- Many protected areas do not appear to be managed effectively.
- Management for wild meat and other NWFPs is still largely uncontrolled in forest concessions.

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GHANA



* For legend see page 58

Forest resources

Ghana has a land area of 23.9 million hectares and a population of about 20.5 million people. It is located on the west coast of Africa, bordered by Togo in the east, Côte d'Ivoire in the west, Burkina Faso in the north and the Atlantic Ocean in the south. Ecologically the country is divided into a high-forest zone in the south, accounting for about a third of the land area (8 million hectares), a savanna zone (14.7 million hectares) mostly in the north, and a transition zone (1.1 million hectares). Estimates of the total area of forests in the country range from 2.72 million hectares^a to 6.34 million hectares (FAO 2005), the former estimate excluding non-PFE savanna.

Forest types. The broad forest types are rainforest (47%), moist tropical forest (32%) and dry tropical forest (21%); specific vegetation types include low

grass savanna, savanna woodland, wet and moist deciduous forest, evergreen forest, coastal savanna and mangrove swamp. The main timber-producing areas are the deciduous and evergreen forests in the southwest. The main species in the deciduous forests are *Triplochiton scleroxylon* (wawa), *Mansonia altissima* (mansonia), *Nesogordonia papaverifera* (danta) and *Khaya ivorensis* (mahogany); and in the evergreen forests *Guarea cedrata* (guarea), *Tieghemella heckelii* (makore), *Tarrietia utilis* (niangon) and *Uapaca* spp (assam).

Dynamics of forest resource change. Deforestation in Ghana usually commences with the degradation of well-stocked forests by excessive (often illegal) logging, slash-and-burn agriculture, mining and quarrying, and fuelwood collection. Degraded forests are then often completely deforested by wildfire, illegal occupation and/or land-use changes. These destructive forces are influenced by population pressure and poverty and also by infrastructure and economic development programs. Road construction near or within forest reserves facilitates encroachment. Internal migration to the western forests for cash-crop cultivation accounts for the high rate of forest degradation in those areas. Almost all forests have suffered depletion, creating eroded hillsides in some cases and destroying genetic diversity in others^c. The average estimated annual rate of deforestation between 1990 and 2000 was 120,000 hectares; the average growing stock in the remaining forest area is only 49 m³ per hectare (FAO 2005).

Forest fires occur regularly and cause severe damage; the annual financial loss due to wildfires is estimated to be about US\$24 million^a. Excessive logging can make the forests more vulnerable to fire by causing the accumulation of residues, which become readily flammable when dry.

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
2.72–6.34	1,634	1,150 ^c	97 ^a	353	1,600

Permanent forest estate. There are 204 forest reserves in the high-forest zone covering an area of 1.62 million hectares and 62 forest reserves in the savanna zone covering 600,000 hectares^a. The forests in the high-forest zone are functionally classified as: timber production, 762,400 hectares (47%); permanent protection, 352,500 hectares (22%); rehabilitation, 122,000 hectares (7%); conversion, 127,000 hectares (8%); and not inventoried, 270,000 hectares (16%)^a. The area of natural-forest PFE is estimated to be the sum of all these except conversion forests. Since the reserves in the savanna zone are not closed forest, they are not included in the PFE area estimate.

Planted forests. The estimated area of planted forest in 2003 was about 97,000 hectares (PFE only)^a. Ghana began planting *Tectona grandis* (teak) in the Volta region in 1875, and teak is the most dominant species in today's plantation estate. More than 50,000 hectares of new planted forest was established between 2000 and 2004, 60% of it teak^c. Additionally, there are agro-industrial plantations of rubber (19,000 hectares), coconut (40,000 hectares) and oil palm (37,000 hectares).

Institutional arrangements

Forest tenure. Traditionally owned forest lands, known variously as 'stool land' or 'skin land', were, in the past, under the full control of tribal chiefs or kings. Until 1970, usufruct rights over forest resources were totally under their authority based on customary laws. In the early 1970s, all rights for the management and development of natural resources (but not land ownership itself) were transferred to the President of Ghana (as a trust for the 'stools' or 'skins' and their people) to harmonize the various traditional land-tenure systems and reduce political conflicts. The transfer of forests to the national government facilitated central planning and allowed the harmonization of forest management systems and investment procedures. However, members of landholding groups were still allowed full usufruct rights.

Forest policy and legislation. The first forest policy was established in 1947; this was revised in line with Ghana's 1992 constitution and approved in 1994 as the Forest and Wildlife Policy. The policy contains five specific objectives related to: the management of the PFE for the conservation of soil, water and biodiversity; the development of

viable and efficient forest-based industries; public awareness and the involvement of rural people in forestry and wildlife conservation; research-based and technology-led forestry and wildlife management; and the development of capacity in SFM. To date this policy has been implemented most effectively within the forest reserves, with off-reserve forests often unregulated and over- or illegally harvested^c. Forests are owned by communities through traditional authorities, managed by government, and logged/utilized by private contractors. These arrangements, specified in the 1992 constitution, are reflected in the 1997 Timber Resource Management Act and the 1999 Forestry Commission Act. In general, Ghana's forest-related laws, policies and regulations are somewhat confusing and fines for breaches are low^a.

A Forestry Development Master Plan (1996–2020) was launched to guide the implementation of the Forest and Wildlife Policy. The master plan is being implemented through a multi-donor-assisted ten-year program called the National Resources Management Programme (NRMP), which has four components: high forest, savanna, wildlife resource management and biodiversity conservation in the high-forest zone.

Institutions involved in forests. The main institution in charge of forests is the Ministry of Lands and Forestry (MLF) supported by the Forestry Commission (FC), which was established in 1980, and the FC divisions of Forestry, Wildlife, and Timber Industry Development. The FC was restructured as a semi-autonomous corporate body in 1999 under Act 571 as a semi-autonomous corporate body to improve its effectiveness. In addition, the public forest-sector agencies responsible for the protection, development, management and regulation of forest and wildlife resources were brought under its purview. Some 580 professional and technical forestry personnel are employed by the government^a.

The main institutions involved in forestry research are the MLF's Forest Plantation Development Centre; the Forestry Research Institute of Ghana (FORIG) under the Ministry of Environment, Science and Technology; the Renewable Natural Resources Institute of Ghana; and the University of Ghana^a.

Community participation in forestry is being facilitated through community forest committees (CFCs) and a collaborative forest management unit of the FC^c; in 2003, there were some 100 CFCs. Local NGOs such as the Green Earth Organisation

and the Ghana Association for the Conservation of Nature and international NGOs such as Friends of the Earth (Ghana), Conservation International and World Vision are active in forestry. The Timber and Wood Workers Union of the Trade Union Congress of Ghana is also an important stakeholder. However, there are often problems of coordination between the trade union, NGOs and government forestry agencies^c.

Status of forest management

Forest for production

The ITTO C&I and ATO/ITTO PCI are incorporated in the FC's various forest-management manuals and guidelines, providing a cornerstone for natural forest management. Holders of timber utilization contracts (see below) and other forest operators are required to follow the Ghana Manual of Procedures for Forest Management and Procedures Relating to Timber Operations in Ghana, prepared under the 1997 Timber Resources Management Act and the 1998 Timber Resources Management Regulations, which together seek to ensure that timber rights are granted in a manner conducive to SFM. The Timber Resources Management (Amendment) Act of 2002 (No 617), which does not encompass private forest plantations, establishes maximum durations and area limits for timber rights and provides incentives for investors; these incentives promote strategic investments in the forest sector (Section 14 C).

Until 1991, the conventional forest concession was the common arrangement for timber harvesting. This system followed basic forest-management requirements such as harvest planning, standards for road-building and tree marking, pre-harvest operations, environmental conservation and enrichment planting. It was based on selection felling using an AAC calculated for a 40-year cycle. However, implementation in the field was not satisfactory and did not always follow the legal requirements for forest management. The maximum area granted to a concession-holder was 50,000 hectares, with the average size of an FMU being 20,000 hectares. AACs were often exceeded. Over-harvesting led to the downward revision of the national AAC in forest reserves from 1.2 million m³ in 1990 to 683,000 m³ in 1995^a. Commercial species were grouped into 'scarlet', 'red' and 'pink' groupings.

'Scarlet' species were being over-cut at a rate greater than 200% the estimated sustainable yield and were thought to be under threat of economic extinction, 'red' species were being cut at a rate of 50–200% the sustainable yield, and 'pink' species were being harvested at less than 50% the sustained yield^a.

The Forests and Wildlife Policy of 1994 abolished the concession system and replaced it with a new timber utilization contract (TUC) system (LI 1721), which was intended to promote efficiency, transparency and accountability.

The FC uses manuals for production, management and planning such as the 1998 Manual of Procedures for Forest Resource Management Planning in the High-forest Zone, the Manual of Procedures for Stock Survey and Yield Allocation (1995), and the 1998 timber resources management regulations. According to the 1998 manual for the high-forest zone, logging plans are prepared by the contractor, logging contract licences range from one to 40 years, and the forest reserves are divided into compartments of 128 hectares each (1,600 m x 800 m). The 2002 Law on Timber Resource Auctioning establishes that timber rights will be awarded by tender. The FC allocates the volumes to be harvested annually based on an 'interim yield formula', which depends on the size of the TUC area; a national AAC has been set at 500,000 m³ based on the adoption of a rotation of 40 years. The entire production PFE (1.15 million hectares) is covered by management plans and 100% of the forest boundaries have been demarcated^{a,c}. The management of many forest reserves is thought to be quite good. In others, however, inadequate control of TUCs has allowed over-harvesting. Repeated re-entries take place depending on demand for logs, often facilitated through salvage permits. There is inadequate surveillance to safeguard the integrity and ensure the security of the PFE. There are also inadequacies in survey records, maps and boundary maintenance^c. Landowners often do not show any interest in forest protection and management. Timber royalties have traditionally been poorly collected and inequitably distributed; as a result, forest revenues often do not cover the cost of forest management^c. Moreover, illegal logging is reportedly widespread^c. Illegal chainsaw operators, for example, feed a thriving domestic timber market, often selling their wood from roadside stalls with little

Table 2 Some commonly harvested species for industrial roundwood^c

Timber species	Remarks
<i>Tectona grandis</i> (teak)	Plantation species
<i>Triplochiton scleroxylon</i> (wawa)	All-purpose wood
<i>Ceiba pentandra</i> (fromager)	Off-reserve tree, used by industry for export veneer
<i>Aningeria robusta</i> (asanfina)	Sawnwood, veneer
<i>Terminalia superba</i> (offam)	Good for sawmilling and veneer production

or no government oversight. The formal wood industry has traditionally concentrated on exports. Due partly to over-capacity in export-oriented mills (see below), the volume of timber available for domestic use is much lower than the demand; supplies, therefore, are supplemented by illegal logging. Moreover, farmers who plant in forest openings are generally not adequately compensated for crop damage caused by timber harvesting, leading some of them to destroy trees and/or collaborate with the chainsaw operators to process them, thereby receiving a share of the illegal proceeds^c.

Silviculture and species selection. The silvicultural system used in natural forests is a polycyclic selection felling system using a cutting cycle of 40 years. The AAC in the natural forests is decided on the basis of stock surveys and size limits prescribed for the different commercial species by the Forest Services Division of the FC. Only 20% of the trees above the diameter limit are to be harvested (around three trees per hectare), with the rest retained for the next entry in 40 years. Post-logging silvicultural operations are also prescribed to promote growth and sustainability.

There are many hardwood timber species, but the more commercially valuable are becoming scarce. Table 2 lists some of these commonly harvested timber species. In addition to the species listed in the table, some 30 lesser-used species are classified as 'pink', including *Celtis* spp (esa), *Piptadeniastrum africanum* (dahoma), *Entandrophragma candollei* (kosipo), *Milicia excelsa* (iroko), *Entandrophragma angolense* (edinam), *Pterygota macrocarpa* (koto), makore, *Pycnanthus angolensis* (otie), *Pouteria robusta*, *Chrysophyllum* spp (alcasa), *Khaya anthotheca*, *Entandrophragma cylindricum* (sapele) and *Antiaris africana* (kyenkyen).

Planted forest and trees outside the forest.

Plantations are managed by clearfelling and replanting. The major planted species is teak, with the remaining area under other broadleaved species such as *Cedrela odorata*, *Gmelina arborea*, *Terminalia superba*, *T. ivorensis*, *Triplochiton scleroxylon* and *Khaya* spp. Teak has become the most attractive species for afforestation over the last 15 years. Yields average 8–10 m³ per hectare per year on a 25-year cycle. There is a ready demand for teak timber, both in domestic and export markets. The 2000 Forest Plantation Development Fund Act (and its amendment in 2002) provides financial assistance for the development of private commercial forest plantations. In 2002, the government embarked on a large reforestation program to be implemented by farmers. The FC provides improved planting material and monitors the program. Tree plantations under agroforestry/*taungya* systems are of great importance in Ghana, and off-reserve trees contribute considerably to timber production.

Forest certification. Ghana has been in the process of establishing a forest-management certification system since 1996, when a National Committee on Forest Certification (NCFC) was established. The Ghana Forest Management Certification System Project was initiated in 1997 with the assistance of the EU and the Netherlands to develop draft standards for certification. Field tests on the resulting chain-of-custody and log-tracking systems have been carried out since 2002, as has the development of standards for sustainably managed forests. The concessions of one company, Samartex Timber and Plywood Ltd, amounting to 110,000 hectares in the natural forest production PFE, were certified in 2003 by SGS for compliance with Ghanaian logging and chain-of-custody standards.

Table 3 Management of the production PFE ('000 hectares)

Total	Natural				Planted		
	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
1,150	1,035	1,150	0*	270 ^c	97	97	0

* The certification of Samartex Timber and Plywood Ltd by SGS is not counted here since it is not under the umbrella of a formal certification scheme. The company has committed itself to achieving FSC certification by 2007

In February 2005, Samartex signed an agreement with WWF and Friends of the Earth to become the first participant of the Ghana Forest and Trade Network and commit to achieving FSC certification by 2007 (WWF 2005).

Estimate of the area of forest sustainably managed for production. The area under concessions/TUCs within the PFE is about 1.035 million hectares, divided into 52 FMUs consisting of 719,300 hectares of forest reserves and 315,200 hectares outside reserves. The estimated area of forest under SFM is considered to cover at least 270,000 hectares^c, including the Samartex operation.

Timber production and trade. Total roundwood production in 2003 was 22.1 million m³, of which 93% was fuelwood (FAO 2005b). Official production of industrial roundwood in 2003 was 1.4 million m³, 27% more than in 1999 (1.10 million m³) (ITTO 2004, 2005). Wood-processing consists of sawmilling and the manufacture of wood-based panels (plywood and veneer), with a small secondary-processing industry. Sawnwood production was 496,000 m³ in 2003, compared to 454,000 m³ in 1999 (ibid.); 405,000 m³ of wood-based panel products were produced in 2003 compared to 225,000 m³ in 1999. The timber industry is Ghana's fourth-largest foreign-exchange earner: the export value of primary wood products amounted to an estimated US\$169 million in 2003, comprising sawnwood (US\$84.9 million), veneer (US\$59.5 million) and plywood (US\$24.5 million) (ITTO 2005). The export of round logs has been effectively banned since 1997 and levies imposed on exports of air-dried timber of nine important species. Half of all teak production is exported in sawn form, mainly to India, although Ghana's main export market remains Europe.

Non-wood forest products. Wild meat, wild fruits and tubers, honey, oils, construction materials and medicinal plants are some common NWFPs. The wild-meat sector includes 300,000 hunters at the local community level who produce between 220,000 to 380,000 tonnes of wild meat annually, mainly from forests, valued at between US\$210 million and US\$350 million, for domestic consumption^c. International marketing efforts are being directed to at least two Ghanaian NWFPs: thaumatin, a sweetener from seeds of *Thaumatococcus danielli*, and novella, an oil/margarine from seeds of *Allan-blackia parviflora*. The contribution of the forestry sector to tourism promotion has not been quantified, although it is believed to be quite significant.

Forest for protection

Soil and water. The area of forests managed primarily for the protection of soil and water was not reported^a or otherwise available.

Biological diversity. Of Ghana's estimated 1,844 forest-dependent trees, mammals, birds and amphibians, 69 are considered endangered^a. Seventeen mammals, nine birds, four reptiles, ten amphibians and 117 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 13 mammals, six birds, ten amphibians and nine plants are found in forests (IUCN 2004). One plant species is listed in CITES Appendix I and 29 in Appendix II (CITES 2005). Ghana has recently formulated a national biodiversity strategy which seeks to ensure the development and implementation of a well-coordinated biodiversity conservation policy^a.

Protective measures in production forests. Environmental provisions in the TUCs and guidelines have been set to maintain representative or special parts of each production forest as undisturbed.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
353	174	n.d.	n.d.	108 ^c

An area of about 465,000 hectares of production forest has been demarcated for catchment values, of which over 100,000 hectares are considered environmentally sensitive^a.

Extent of protected areas. The estimated area of protection PFE is 353,000 hectares. The FC reports 31 protected areas of IUCN categories I-II covering a total area of 1.11 million hectares, of which 1.06 million hectares are grass savanna. According to UNEP-WCMC (2004), 174,000 hectares of forest are in protected areas conforming to IUCN protected-area categories I-IV; the majority of this area (135,000 hectares) is unclassified as to forest type.

Estimate of the area of forest sustainably managed for protection. Table 4 shows the estimated area of protection PFE managed sustainably based on information provided at a recent workshop on the ITTO C&I .

Socioeconomic aspects

Economic aspects. Forests accounted for 2.3% of GDP in 1999^a and about 10% of export earnings. The formal sector employed about 104,000 people in 1999^a. Many more people (including illegal chainsaw operators, NWFP harvesters, etc) make at least some of their income from forests (see below).

Livelihood values. An estimated 2 million people depend on forests for subsistence uses and traditional and customary lifestyles^a. Major activities in which forest-adjacent communities are involved include wild-meat production, fuelwood and charcoal production, wood-carving and canoe-carving, rattan production, chewstick-gathering, chainsaw lumber production (an illegal activity), and hunting (often also illegal)^a. Alternative livelihood strategies are being tested as part of Ghana's poverty reduction strategy^a.

Social relations. The constitution provides for the sharing of royalties between government and traditional owners as follows: 40% to stools and 60%

to the state in reserve forests and 60% to stools and 40% to the government in off-reserve forests. Social-responsibility agreements are reached between TUC-holders and the communities where timber extraction takes place for the provision of agreed social services and amenities. Donor-assisted projects are also supporting community participation in forestry; for example, an ITTO project on participatory tropical forest development by women in indigenous communities has been ongoing since 1999. The FC will gradually divest itself of responsibility for the forest resources in the North Savanna Zone and hand it over to the local communities.

Eight forest sites covering 21,500 hectares have been set apart for research and education and 21 sites covering 1.12 million hectares for recreation^a.

Summary

Ghana has favourable conditions for the achievement of SFM, such as impressive human resources – including a strong Forestry Commission – and a long history of forest management. Nevertheless, many challenges must be met. For example, fire plays an influential and – in some forests – destructive ecological role and is difficult to control. Some forest reserves are well-managed, but others may have been over-harvested and off-reserve forests are often unregulated. Moreover, illegal activities such as chainsaw lumber production and poaching are thought to be widespread.

Key points

- The area of PFE is an estimated 1.60 million hectares, comprising 1.15 million hectares of natural-forest production PFE, 353,000 hectares of protection PFE and 97,000 hectares of plantations.
- At least 270,000 hectares of natural-forest production PFE are considered to be managed sustainably; an estimated 108,000 hectares of protection PFE are so managed.

- The silvicultural system used in natural forests is a polycyclic selection felling system using a cutting cycle of 40 years; a national AAC has been set at 500,000 m³.
- There are manuals for production, management and planning, which set out the obligations of logging contractors.
- Ghana is establishing a sizeable plantation estate of teak.
- Community participation in forestry is being facilitated through community forest committees (CFCs) and a collaborative forest management unit of the Forestry Commission; in 2003 there were some 100 CFCs.
- An estimated 2 million people depend on forests for subsistence uses and traditional and customary lifestyles.
- Ghana has introduced a new timber utilization contract system to improve efficiency, transparency and accountability in forestry, particularly in forest production activities.
- There is limited information about the condition of protected areas.

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LIBERIA



*For legend see page 58

Forest resources

Liberia has a land area of 11.1 million hectares and a population of 3.3 million people. It is bounded by Sierra Leone to the west, Côte d'Ivoire to the east, Guinea to the north and the Atlantic Ocean to the south. The country can be divided into three physiographic regions: (i) the hilly coastal region; (ii) a central plateau ranging from 200 to 250 m with table mountains up to 600 m; and (iii) highlands reaching 1,380 m in the north and northeast. According to a report issued by the Forest Resource Mapping Survey of Liberia (1985), about 50% of the land area, or some 5.5 million hectares, was forest in the mid 1980s, of which about 3.88 million hectares were productive. FAO (2005a) estimated the total forest area at 3.48 million hectares; a recent ITTO diagnostic mission to Liberia reported data compiled by a World Bank-funded study (Bayol & Chevalier 2004), which

estimated that there were about 3.4 million hectares of relatively intact forest and about 2.26 million hectares of poorer forest cover, comprising 1 million hectares of forest land that had been subject to agricultural pressure and another 1.3 million hectares that had been seriously affected by agricultural pressure and contained only islands and patches of forest^b. The intact forest comprised two main blocks: a south-eastern block of very wet evergreen forest and a drier, Upper-Guinean moist evergreen and semi-deciduous forest in the northwest^b.

Forest types. Characteristic species of the moist evergreen forests are *Lophira alata*, *Heritiera utilis* and *Sacoglottis gabonensis*, while Meliaceae (one of the most important timber families in West Africa) is represented by only two species: *Lovoa trichilioides* and *Guarea cedrata* (bossé). The semi-deciduous forests cover the northern half of the country and contain a higher representation of Meliaceae, the characteristic species being *Nesogordonia papaverifera* (danta) and *Aningeria robusta*. Common shade-intolerant species are *Albizia* spp, *Fagara* spp, *Terminalia* spp and *Pycnanthus angolensis*.

Dynamics of forest resource change. The rapid destruction of Liberia's forest resources has been caused by over-harvesting and uncontrolled logging, accelerated by civil war. In addition, shifting cultivators have accessed logged forests using the many logging roads built since the early 1960s. There has been widespread shifting cultivation, mainly for growing upland rice. Between 1990 and 2000, Liberia lost about 760,000 hectares of forest, a deforestation rate of about 2% annually (FAO 2005a). As noted above, about 2.3 million hectares of the forest estate is affected by agriculture, including 1 million hectares that has been greatly fragmented.

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^d			
		Production		Protection	Total
		Natural	Planted		
3.48-5.66	4,124	1,310	n.d.	101	1,411

Permanent forest estate. Liberia's forests are categorized as: natural forests, for granting on lease to concession-holders through forest product utilization contracts; optional forests, which have special arrangements to allow for the removal of timber before diverting them to other non-forest uses; and parks and protected areas for environmental conservation. Based on the limited information available on areas allocated to concessions, the area designated as PFE is estimated at 1.41 million hectares (Table 1); this is likely to be expanded in the near future. In general, surveys to demarcate the PFE are inadequate, as is surveillance to safeguard its integrity.

Planted forests. According to FAO (2001), there were 9,000 hectares of timber plantations in Liberia in 2000, with an annual planting rate of 100 hectares per year. They comprised about 2,000 hectares of teak, 2,000 hectares of pines and 5,000 hectares of other broadleaved species. However, these plantations are likely to have been heavily degraded or destroyed; the ITTO diagnostic mission reported an insignificant plantation estate apart from some important rubber estates "which are generally in a poor condition"^b. There are some coconut plantations and small areas of oil palm.

Institutional arrangements

Forest tenure. According to the 2000 National Forest Law, all forest resources belong to the government except for communal and privately owned forests. Communal land is designated for the exclusive use of local communities for purposes other than logging. Customary rights over such land are not automatically recognized; they must have been previously documented. The only private forest resources are those that have been developed through artificial regeneration on privately owned land. The ITTO diagnostic mission reported that the traditional land and resource rights of the majority rural population have been systematically ignored and undermined by a small elite throughout Liberia's 150-year history. Nevertheless, the Liberian constitution and specific laws, such as the National Environmental Protection Act of 2002, note the rights of rural people. There is mention of "tribal forests", "community forests" and similar terms. The mission also reported strong support across

a range of stakeholders for community-based forest management and greater benefit-sharing with rural people^b.

SFM policy framework. The 2000 National Forest Law has provisions on sustainable management and the utilization of forest resources (Section 8.2). The Forestry Development Authority (FDA) has produced a document entitled *Forest Policy Review: Towards Vision 2024*. This incorporates, among other things, the ITTO Objective 2000.

Forest policy and legislation. The forest code of 1953 was amended in 2000 and has been in force since 2002. The amended National Forest Law is intended to promote SFM as a basis for national reconstruction. Legislation was also planned to encourage the active involvement of NGOs in reforestation with the direct participation of forest dwellers, and to increase incentives for concession-holders. The Commission on Environment was set up in 2000 with powers to prepare guidelines and formulate policies for agencies concerned with nature conservation and the environment, but these powers could not be effectively exercised due to the civil crisis. The stability and sustainability of the logging sector has been threatened by procedural flaws such as exception/exemption procedures for inappropriate forestry activities, the granting of special favours, and forest crimes including timber theft, corruption and illegal logging^b. Indeed, log exports were known to be used as a source of funding for private militias, thereby prolonging the civil war. As a result of international concern over this issue, the UN Security Council passed its resolution 1478 calling on all member states to ban imports of round logs and timber products from Liberia for ten months from July 2003. The import ban was subsequently extended and remained in place as of December 2005.

Institutions involved in forests. An Act of Parliament of 1976 established the FDA as the body responsible for forestry in Liberia and also recognized the importance of forests as a key renewable natural resource. Amendments to this act in 1988, 2000 and 2003 sought to strengthen the FDA's ability to manage and protect forests. The FDA is the agent through which policy is implemented, including forest management plans. However, the FDA is seriously under-resourced;

it lost many staff to the civil war and, for those remaining, salaries are extremely low and often paid several months late^b. The weakness of the FDA has greatly limited progress in initiatives to rebuild the forest sector.

A workshop on reforming the forest sector was organized in Monrovia by the US Embassy in December 2003 involving forestry officials, logging companies, donors and NGOs. The workshop suggested that the Security Council should only lift its sanctions once: (i) UN peacekeepers had deployed forces in forest areas to ensure they were safely under control; (ii) the government had ensured that timber taxes could be accounted for; and (iii) the FDA had been reformed and strengthened (Blundell 2003). A donors' meeting took place in mid 2004, with substantial amounts of money pledged to revive the forest sector and reshape the forest administration after the civil war; however, to date, few of these projects have commenced. An informal alliance called the Liberia Forest Initiative has been formed by a number of actors including the US government, the World Bank, IUCN, Conservation International and several local NGOs such as Green Advocate.

Status of forest management

Forest for production

Because of increasing demand and in order to promote lesser-used species in the international market, the government has promulgated a regulation which re-categorized eleven 'future obligatory species' as 'current obligatory species'. There are also regulations to ensure the effective monitoring and supervision of the extraction, processing and export of timber and timber products. Salvage permits to concessionaires are to be abolished. The growing stock of commercial timber is estimated to be about 81.4 million m³. The timber harvest is supposed to be based on AAC calculations and guided by the ATO/ITTO PCI, but these principles are not adequately applied in practice.

Timber is harvested entirely by private companies through forest resources utilization agreements (FRUAs) entered into with the government, or through operation permits. In the late 1990s, more than

30 companies held logging concessions covering 40% of the national territory; the OTC (Oriental Timber Corporation) alone was logging some 1.6 million hectares both within the PFE and outside it. Some concessions were known to be illegal. The FDA has recently attempted to review these and decide which were legitimate, a difficult task since many files were lost or destroyed during the war^b. Bayol and Chevalier (2004) reported that there were 42 existing forest concessions covering a total of 5.95 million hectares (probably including non-forested areas); there was significant overlap between concessions and proposed protected areas. It was recommended that 18 of these concessions covering 1.82 million hectares be cancelled, 13 (2.43 million hectares) be further assessed, and eleven (1.7 million hectares) be allowed to resume logging^b.

The 2000 National Forest Law requires individuals or companies holding FRUAs to conduct surveys and submit comprehensive work plans to the FDA. FRUA holders also have to file a performance bond with the government issued by a reputable local commercial bank or financial institution. FRUAs have been divided into three categories based on forest size: Class A, with a minimum size of 809,000 hectares; Class B, with a minimum size of 405,000 hectares; and Class C, with a minimum size of 121,000 hectares. All agreements are valid for 25 years. A holder of a Class A agreement is required to develop a large-scale integrated wood-processing mill, for Class B a medium-sized processing mill, and for Class C a small-scale processing unit. All holders of these rights must undertake periodic environmental impact assessments of their operations and engage in community development projects. As of September 2001, 28 registered timber concessions (of which 17 were held by expatriate companies) were active in the production and export of roundwood. Global Witness (2003) reported that, by early 2003, the number of active companies had been consolidated into 14 concessions. As in Liberia as a whole, there is a serious shortage of skilled labour in the forest sector^b.

Silviculture and species selection. The Liberian Selective Logging System involves selective harvesting with no silvicultural treatments apart from assuring good natural regeneration of the

Table 2 Some commonly harvested species for industrial roundwood

Timber species	Remarks
<i>Lophira alata</i> (ekki)	Largest quantity harvested, regenerates well in forests
<i>Ceiba pentandra</i> (ghe)	From open areas, for veneer and plywood
<i>Hallea ciliata</i> (abura)	Syn. <i>Mitragyna ledermanni</i> ; general-purpose timber, from swampy areas
<i>Entandrophragma candollei</i> (kosipo)	Used for flooring and furniture making, difficult to regenerate
<i>Gilbertiodendron preussii</i> (limbali)	Used for heavy carpentry and shipbuilding, etc, difficult to regenerate

stand. The lack of any silvicultural treatments is due both to their cost and the lack of silvicultural research and know-how (Liberia has no forest research institute). FRUAs and harvest regulations prescribe operations before, during and after harvesting. The main harvest controls are girth limits and a 25-year felling cycle; the latter is short compared to those in other tropical forest regions and has been imposed mainly due to economic considerations. It is uncertain how effective harvest controls have been and how the present logging regime affects the forest. The percentage of commercial timber species varies throughout the country. Fifteen years ago, sipo and *Tarrietia utilis* (niangon) were the species with the largest export volume, but the species listed in Table 2 and others like *Tetraberlinia tubmaniana* (tetra) are more important today, both in volume and value.

Planted forest and trees outside the forest.

Planted forests currently play an insignificant role in Liberia.

Forest certification. No Liberian forests are currently certified and there has been no move to develop policies in this direction.

Estimate of the area of forest sustainably managed for production. None of the production PFE is currently under management plans, and no forest can therefore be considered to be managed sustainably (see Table 3).

Timber production and trade. Liberian statistical information on timber production and trade is highly unreliable. For example, while FAO (2003) estimated a total industrial roundwood production

of 337,000 m³ in 2001, ITTO (2005) estimated the volume of log exports that year based on trading-partner reports to be 940,000 m³.

No international statistical reports have been forthcoming from Liberia for several years due to the civil war and subsequent sanctions. During the civil war, some concessionaires took advantage of the armed conflicts to illegally increase production, while others curtailed their activities considerably. According to FAO (2005b), total roundwood production in 2003 was close to 5.9 million m³, almost 95% of which was fuelwood.

With the UN sanctions on timber trade in force, forest production has declined; total industrial roundwood production was an estimated 800,000 m³ in 2003 compared to 1.36 million m³ in 2002 (ITTO 2005). Foreign direct investment in the timber sector, which stood at US\$27 million in 1999, fell to an estimated US\$2.8 million by the end of 2002. Prior to the war, wood processing was confined to sawmilling and very limited manufacture of wood-based panels, but most mills have been destroyed or seriously damaged. A small volume of sawnwood was exported prior to the sanctions. The estimated earnings from the export of wood and wood products in 2002 were US\$325 million, falling to almost nil in recent years.

Non-wood forest products. Fruits, roots, mushrooms, leaves, honey, snails and wild meat are all harvested from forests and used as food by local communities. Wild meat is probably the main source of protein for rural people; some also enters the domestic market. Ntiamoa-Baidu (1997) estimated that wild meat contributed up to 90% of

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
1,310	1,310	0	0	0	n.d.	0	0

total protein consumption in the country. The most commonly hunted species are antelopes and monkeys. Gums, resins, medicinal plants and cola nuts (*Cola* spp) are also marketed locally and serve as sources of income.

Forests for protection

Soil and water. No areas have been designated as primarily for soil and water conservation.

Biological diversity. Liberia's forests are of great significance for biodiversity. In 1999, the West African Conservation Priority-setting Exercise funded by the GEF identified the Upper Guinean Ecosystem, of which the most intact remaining examples are found in Liberia, as the top conservation priority in West Africa^b. The forests are home to at least 2,900 flowering plants, 240 timber species, 150 mammals (including the western chimpanzee, the pygmy hippopotamus and forest elephant), 620 birds and 125 reptiles and amphibians^b. Twenty-one mammals, eleven birds, three reptiles, five amphibians and 46 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 17 mammals, ten birds, four amphibians and three plants are found in forests (IUCN 2004). Two plants are listed in CITES Appendix II (CITES 2005).

Protective measures in production forests. Limited protective prescriptions are included in the FRUAs and forestry regulations, but the extent of their implementation is uncertain.

Extent of protected areas. There are two biological reserves in Liberia: Sapo National Park (162,000 hectares) in the southeast and the Nimba Nature Reserve (13,600 hectares); neither is under effective management^b. Several new protected areas have been proposed based on recommendations by Flora

& Fauna International and Conservation International^b. According to UNEP-WCMC (2004), 100,500 hectares of forest are in protected areas conforming to IUCN protected-area categories I-IV, including 87,000 hectares of lowland evergreen broad-leaved rainforest.

Estimate of the area of forest sustainably managed for protection. No protection PFE is considered to be under SFM at present (Table 4).

Socioeconomic aspects

Economic aspects. In the past, forestry ranked first in foreign exchange earnings and in its contribution to GDP; in 2002, the reported contributions of forestry and logging to GDP and foreign exchange were 26% and 65% respectively^b. The inconsistency of information on almost all aspects of forestry is a particular problem in Liberia. In 2000, for example, the FDA reported the value of logs exported as US\$79.9 million, the Central Bank of the Government of Liberia as US\$60.3 million, and the Global Trade Atlas as US\$103.7 million, while the UN estimated it to be US\$146 million. ITTO (2003), basing its estimate on imports reported by trading partners, reported a figure of over US\$200 million, more than triple the Central Bank figure. There are similar discrepancies in reports of the number employed by the forestry sector, which, for 2000, ranged from 5,000 to 20,000, and was reported to be 7,000 in 2002^b. What is not in doubt is that all of these numbers are now significantly smaller.

Livelihood values. With around half of Liberia's 3.3 million people living in or near forested areas, livelihood and cultural values of forests are significant. Rural communities have become increasingly dependent on forests for subsistence during the recent turmoil. In many rural areas, forests are the only source of food and are crucial to the

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
101	101	0	0	0

survival of many. Thousands of people make their living from the provision of charcoal and fuelwood to urban centres^b.

Social relations. The civil war disrupted the traditional livelihoods of forest-dwelling communities. It contributed to deplorable and dangerous working conditions for timber workers, with serious human rights abuses reported in logging camps (Global Witness 2003). Illegal commercial hunting is widespread.

The sanctions imposed by the UN Security Council in 2003 have resulted in severe restrictions on the timber industry and the primary and secondary employment provided by logging and wood processing has subsequently dwindled. The support provided by logging companies for the running of schools, medical health posts, community facilities and the provision of infrastructure has likewise declined.

According to an ITTO mission, forest policy and even post-war reform efforts have over-emphasized the commercial timber sector and given little attention to resource tenure and issues of high relevance to the poor, such as wild-meat and fuelwood production^b.

Summary

Liberia is blessed with a rich forest resource, a substantial part of which, however, has been lost or degraded in recent years during civil war. Once the country emerges from its political problems, a newly reconstituted and restructured forest sector, built on the pillars of accountability and transparency, could play a major role in economic growth and sustainable development. But its success will depend very much on strong political will and international support.

Key points

- Liberia's PFE covers an estimated 1.41 million hectares, comprising 1.31 million hectares of natural-forest production PFE and 101,000

hectares of protection PFE. More forest could be committed to the PFE from the presently uncommitted area of about 2 million hectares.

- None of the PFE is currently thought to be under SFM.
- The existing protection PFE comprises less than 3% of the country's forests.
- The UN Security Council imposed an embargo on the export of timber from Liberia in 2003 and it remains in force. The embargo was designed to minimize the extent to which revenues from timber exports contributed to private militias.
- In the past, the Liberian forestry sector has generated up to a quarter or more of GDP, but this has declined due to the embargo and the general disarray of the sector.
- There are few or no reliable inventory data available to facilitate forest management.
- The Forest Development Authority (FDA) is responsible for overseeing the forestry sector, but it is seriously under-resourced.
- The FDA has recently attempted to review concession agreements and decide which are legitimate, a difficult task since many files were lost or destroyed during the civil war.
- There is strong support across a range of stakeholders for community-based forest management and greater benefit-sharing with rural people.
- No silvicultural system has been devised for Liberian forests other than a selective logging regime. The prescribed felling cycle of 25 years is relatively short.
- Much of the timber-processing capacity and other infrastructure was destroyed during the civil war and is yet to be rebuilt.

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NIGERIA



* For legend see page 58

Forest resources

Nigeria has a land area of 92.4 million hectares and a population of about 134 million people, making it Africa's most populous country. It is bordered by Benin to the west, Niger to the north, Cameroon to the east and the Atlantic Ocean to the south. The climate is humid in the south and hotter and drier towards the north. A large proportion of the country sits on a plateau, which is divided into several parts by the Niger River and its tributaries. Mountains reaching more than 2,000 m occur in the border area with Cameroon. There are two major vegetation zones: the forest zone, which occurs in

a belt 50 to 250 km wide adjacent to the Atlantic coast; and the savanna zone to the north, which can be divided into the wetter Guinea zone and the drier Sudan zone. Estimates of forest cover range from 9.7 million hectares^c to 13.5 million hectares (FAO 2005a)¹.

Forest types. About 70% of the natural forest is open tree savanna, with the remaining 30% closed forest. The closed forest includes mangrove and coastal forest (22%), fresh water swamp (38%) and lowland wet forest (40%). The latter type (also called 'high forest') is divided into lowland rainforest in the south and mixed deciduous forest to the north. These forest types, although heavily degraded, are the main remaining sources of hardwood timber but cover only about 2% of the total land area. Meliaceae and Leguminosae species such as *Khaya ivorensis* (Lagos mahogany), *Entandrophragma* spp, *Lovoa trichilioides* (cedar) and *Gosweilerodendron balsamiferum* (agba) are characteristic of the rainforest area, whereas Sterculiaceae, Ulmaceae and Moraceae species such as *Nesogordonia papaverifera* (otutu), *Triplochiton scleroxylon* (obeche), *Celtis* spp and *Chlorophora excelsa* (iroko) characterize semi-deciduous forests. Riparian forests are the only closed forest in the savanna zone, characterized by species such as *Mitragyna ciliata* and *Uapaca* spp. Most of Nigeria's forests are so heavily degraded that in some areas secondary forest succession is impeded. *Elaeis guineensis* (oil palm) regenerates naturally in many degraded areas of the high-forest zone. Important secondary

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)*			
		Production		Protection	Total
		Natural	Planted		
9.7–13.5	4,456	2,720 ^d	375	1,010	4,105

* An estimated 2.7 million hectares of heavily degraded forest outside the forest reserves (so-called free areas) are also used for timber production (Okonofua 2005) but are not included here in the PFE

¹ Much of the information contained in this profile has been obtained from secondary sources (most notably FAO's 2003 country report for its African Forest Sector Outlook Study), supplemented by discussions with participants at an ITTO C&I workshop held in December 2005.

forest species in degraded forest and in unmanaged rubber and *Gmelina* plantations are *Trema guineensis*, *Pentaclethra macrophylla*, *Musanga cecropioides* and *Anthocleista* spp.

Dynamics of forest resource change. Forest area declined during the 1990s at an estimated annual rate of 2.6% (or 398,000 hectares per year) (FAO 2005a), caused by agricultural expansion, encroachment, over-harvesting, bush burning, illegal harvesting and de-reservations. The Federal Department of Forestry (FDF 2001) suggested that the annual depletion rate to be as high as 3.5%. A detailed analysis of the land-use dynamics of Nigeria shows that even forests contributing to flood-plain agriculture (fadama) and water resources development will eventually be depleted, with potentially catastrophic consequences. The FDF (ibid.) noted that the forest estate of Nigeria is highly depleted and that the Sahara Desert is encroaching southward at a rate of about one kilometre per year. Forest fires are common and caused by deliberate burning. It was estimated that only about 975,000 hectares of forest reserves are productive, while another 2.34 million hectares of free (non-reserve) areas are only partially productive.

Permanent forest estate. In the 1960s, the government set aside an area of 9.7 million hectares, about 10% of the country, as forest reserves. These are distributed over some 445 sites, 75% of which are in the savanna and 25% in the high forest. Since many of these forest reserves have been badly depleted of commercial and other timber species, not all can be included in the estimate of production PFE given in Table 1, which includes all FMUs allocated primarily for timber production. More than 60% of the initial forest reserve area had been lost by 2000, due to agricultural encroachment, illegal logging, planned agricultural development and urbanization^c. The estimate of protection PFE in Table 1 is taken from UNEP-WCMC (2004).

Planted forests. The estimated planted forest area of 375,000 hectares in 2000 (FAO 2001) was thought to comprise at least 110,000 hectares of *Gmelina arborea* and an area of about 160,000 hectares of different hardwood species, including 74,000 hectares of teak in forest reserves and in private plantations, an unknown area of other planted hardwood species such as

Terminalia ivorensis, *Nauclea diderrichii*, *Triplochiton sceroxylon*, acacias and eucalypts, and about 10,000 hectares of various pines (Okonofua 2005). There were also about 318,000 hectares of *Hevea* (rubber) plantations (FAO 2001), managed as an agricultural crop but used for both rubber and timber production. The annual planting rate in the recent past has been about 23,000 hectares, but there is a general belief that most of the planted area remains low in stock^c; a National Forestry Development Program designed to encourage community plantation development was extended to 2007 after failing to meet its four-year target in 2003.

Institutional arrangements

Forest tenure. In principle, local people own the forests; the management and control of forest reserves, which cover around three-quarters of the forest area, is vested in the state governments^c. However, dual ownership of natural forests by local and state governments still exists in some of the 17 northern states^c. Local governments are responsible for communal forest areas; state governments for forest reserves, game reserves and sanctuaries; and the federal government for national parks. A total of 16 states (Abia, Akwa Ibom, Anambra, Cross River, Delta, Edo, Enugu, Ebonyi, Imo, Lagos, Ogun, Ondo, Ekiti, Osun, River and Bayelsa) contain high forests and have special forest laws to administer their tenure^c.

SFM policy framework. Nigeria is a member of the ATO and, since 2001, ITTO. The C&I frameworks of these two organizations are therefore available for uptake in Nigeria and initial discussions were held in December 2005 to develop such a framework^c.

Forest policy and legislation. Nigeria has had forestry and natural-resource conservation laws since the first half of the 20th century. The first Forestry Act was enacted in 1937, which established a forest reserve system under the state governments. The government established a more comprehensive forest law in 1956, the Law for the Preservation and Control of Forests in Eastern Nigeria. It gives the designated minister responsibility for the protection, control and management of forest reserves and protected areas; at the same time it gives the minister the power to de-reserve forests (ie re-classify them for other uses). Some

states have enacted specific regulations to monitor and control the reserves, but the continuing high rate of deforestation suggests that overall control has not been effective.

Nigeria's National Agricultural Policy, adopted in 1988, sets forth the national policy on forest management and the sustainable use of forest resources. The goal is to achieve self-sufficiency in all aspects of forest production. Major goals are the expansion of the forest estate and its management for sustained yield, the promotion of forest regeneration at rates higher than harvesting, the protection of forest resources from fire and grazing, and the development of forest industry. To achieve these objectives, it aims to expand the forest estate from 10% to 20%. Nevertheless, de-reservation and deforestation have expanded over the past 15 years^c. As of the end of 2005, Nigeria has started a process of national hearings for a new national forest policy and a new national forest act^c. The draft policy includes provisions to increase the total area under SFM to 25% of the nation's land area; to develop principles, criteria and indicators for the sustainable management of forest resources; and to improve environmental services of forests for social and economic benefits^c.

Institutions involved in forests. The forestry sector is administered at the federal, state and local government levels; responsibilities, authority and resources are shared among these according to the 1999 constitution of Nigeria, which gives shared control over the development of natural resources to the local governments and the states. However, there is a lack of clarity in the respective mandates of these bodies (there are 36 state forestry departments – some of the states even have ministries of forests^c – and 774 local councils), which leads to inefficiencies. The FDF, created in 1970, is currently under the Ministry of Environment; it has no authority over forest management and is mainly responsible for international treaties and for providing policy guidelines to the forestry authorities of the states^c. The National Forestry Development Committee (NFDC) is the body responsible for formulating national forest policy and technical guidelines on forest management^c. In order to facilitate field operations the FDF fosters forestry and environmental development through six divisions: Forestry Management, Forest Resource Survey,

Forest Resources Utilization, Agroforestry, Support Services and Extension and Environmental Conservation. At the federal level, the Forestry Research Institute of Nigeria (FRIN) has the mandate for research and education on forestry and the utilization of forest products. Forest-sector development has been hindered by a lack of funds and frequent policy changes, despite (or perhaps partly because of) the extensive bureaucracy involved in overseeing the sector.

Several NGOs provide inputs to the management of forestry resources. Notable among these are the Nigerian Conservation Foundation, the Nigerian Environmental Study and Action Team, Savannah Conservation Nigeria, the Forestry Association of Nigeria and local initiatives such as the Ekuri Initiative in Cross River State. However, their influence on forest management, particularly in forest reserves, remains small^c.

Status of forest management

Forest for production

While many forest reserves were intensively managed in the past for timber production, a significant number have also been almost completely deforested while retaining the designation, leading to the apparent contradiction of non-forested forest reserves.

Timber concessions are awarded by state governments, which receive all timber royalties. In theory, a proportion of forest revenues should go to the local communal landowners and traditional institutions; in practice, however, the funds often get diverted^c. For this reason, local communities have little incentive to prevent illegal logging and often collude with illegal loggers because they derive greater benefits that way. According to Sanwo (2005), 70% of the total timber extracted in high-forest states in Nigeria is stolen, with no records kept. The state forestry departments have been unable to protect the forest estate adequately from extensive encroachment. Harvesting of industrial wood is done by mill operators, by independent registered loggers and, in many cases, by poachers^c. In the past, some operators were awarded five- to 20-year concessions by states, but this has recently been reduced to one to three years in most states to

Table 2 Some commonly harvested species for industrial roundwood^c

Timber species	Remarks
<i>Mansonia altissima</i> (ofun)	Used in sawmilling and veneer production
<i>Tectona grandis</i> (teak)	Valuable plantation species
<i>Terminalia superba</i> (afara)	Commercial species used as sawnwood
<i>Entandrophragma candollei</i> (omu)	All-purpose commercial species
<i>Triplochiton scleroxylon</i> (obeche)	Now the major harvested species for all purposes

improve control^c. As of December 2005 Nigeria has defined a total of 1,160 FMUs (both within and outside the reserve system), of which 154 currently are producing timber^c. The total area under forest production is estimated to be 1.06 million hectares (Okonofua 2005).

Silviculture and species selection. Initially, the forest resources in the high-forest zone were managed for timber production on a felling cycle of 100 years, with a specified minimum diameter limit for the different species of between 60 and 90 cm (FDF 1996). Forests in the southern and south-central regions were sub-divided into numbered mile-square compartments managed on the basis of working plans prepared by the FDF. In response to harvesting pressures, the felling cycle for natural forests was reduced to 50 years and has since been further lowered. Natural regeneration of the harvested forests was stimulated by the Tropical Shelterwood System (TSS). By the mid 1960s, a total area of 200,000 hectares in the western region of Nigeria was managed under the TSS system (Okonofua 2005). Owing to the low growth rates of the natural forest, the TSS was abandoned in the early 1970s in favour of artificial regeneration under the *taungya* system. The early *taungya* plantations led to subsequent major plantation schemes in the high-forest zone.

More than 300 tree species have been identified as possible timber species; about 40 species are harvested today. In addition to the five species listed in Table 2 and *Gmelina arborea* from planted forests, *Entandrophragma cylindricum* (sapele), *Gossweilerodendron balsamiferum* (agba), *Chlorophora excelsa* (iroko), *Terminalia ivorensis* (edo), *Brachystegia* spp and *Lophira alata* (ekki) are the main species harvested for timber.

Planted forest and trees outside the forest.

Despite its long forestry history, the large-scale development of planted forests has been recent in Nigeria. By the end of the 1960s, the management of forest reserves in the high-forest zone was assessed by the government and the World Bank to be economically unviable, and many natural stands have been converted to plantation projects, in particular with *Gmelina arborea*^c. Many other forest reserves, particularly in the Guinea savanna, have also been converted to planted forests of exotic (acacias and eucalypts) and indigenous species. Many of the planted forest areas are harvested today; nevertheless, few of them are adequately managed for long-term production^c. Trees outside the forest are mainly relics of the pre-existing forest cover, sacred forests, forest patches established by local villagers and home gardens.

Forest certification. The creation of a national working group on forest and timber certification has been proposed and discussed for a few years without result^c. No Nigerian forest has so far been certified.

Estimate of the area of forest sustainably managed for production. The lack of detailed information makes it difficult to assess the quality of forest management. Around 1.06 million hectares of forest reserves were allocated in mid 2005 to concessions and licences (Okonofua 2005). About 650,000 hectares of forest reserves are reported to be covered by management plans, including planted forests^c. No estimate of the area under SFM was possible (Table 3)^c.

Timber production and trade. The estimated total roundwood production in 2003 was 69.9 million m³, of which 60.4 million m³ (86%) was for fuelwood

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
2,720	1,060	650	0	n.d. ^c	375	175	0

(FAO 2005b). Nigeria's total production of industrial roundwood was an estimated 7.10 million m³ in 2003. It produced 2.0 million m³ of sawnwood and 55,000 m³ of plywood and exported about 100,000 m³ of logs and 41,000 m³ of sawnwood (ITTO 2005). The wood-processing sector is run-down; most mills are fully depreciated, obsolete and not properly maintained. The sector runs at 30–40% of installed capacity and recovery rates are generally low. There is also a critical shortage of raw material for the timber industry, which is unable to process small-dimension plantation materials. Once a significant exporter, Nigeria is now a net importer of primary forest products: in 2002 imports of forest products were valued at an estimated US\$123 million, compared to exports of US\$18.5 million (of which US\$14 million was accounted for by sawnwood) (FAO 2005b).

Non-wood forest products. Marketed NWFPs include *Acacia senegal* (gum arabic), rattan and fibres such as *Raphia* spp, *Garcinia afzelii* (chewsticks), and sheabutter from nuts of *Vitellaria paradoxa* (syn. *Butyrospermum parkii*). Many NWFPs are locally traded and consumed by rural communities, including leaves (eg *Abura* spp), fruit, bark, nuts, honey, mushrooms, resins, canes and medicinal plants such as *Garcinia* spp. Wild meat is perhaps the most important NWFP, providing a source of protein for the rural population in isolated high-forest areas and in the savanna zone^c. Some important plants providing edible products include: *Irvingia gabonensis*, the most important fruit tree in the forest zone; *Spondias mombin* and *Dacryodes edulis*; *Gnetum africanum* leaves as vegetables; the seeds of *Parkia biglobosa* (dawa-dawa); and the nuts of *Cola* spp. Fruits of oil palm and *Raphia* spp are used widely for palm wine. In 2005, *Alamblackia* seeds in degraded forest stands were collected for the first time in Cross River State for margarine production^c.

Forest for protection

Soil and water. Programs dealing with environmental management have been in constant flux, with negative consequences. For example, the Federal Ministry of Environment (2001) stated that efforts to combat desertification “have been adversely affected by frequent shifts in policy by government. Such policy shifts have been observed to be dictated by the country's economic fortune or misfortune.” No information on effective measures to conserve soil and water was available for this report.

Biological diversity. Thirty mammals, ten birds, four reptiles, 13 amphibians and 172 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 17 mammals, six birds, twelve amphibians and 69 plants are found in forests (IUCN 2004). *Gossweilerodendron balsamiferum*, a tree species that is endemic to the region and harvested in Nigeria, is listed as endangered on the IUCN red list due to over-harvesting and habitat loss (ibid.). Two plant species are listed in CITES Appendix I and 44 in Appendix II (CITES 2005).

Protective measures in production forests.

The principal constraints on conservation in the production PFE include poaching, over-harvesting, illegal burning, grazing and deforestation^c. Few protective measures are undertaken in many forest reserves^c.

Extent of protected areas. According to UNEP-WCMC (2004), 1.01 million hectares of forest are in protected areas conforming to IUCN protected-area categories I–IV, including about 418,000 hectares of lowland evergreen broadleaved rainforest and 512,000 hectares of unclassified forest. The federal government controls the eight national parks through the National Parks Service. Nature conservation laws include the 1916 Wild Animals Preservation

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
1,010	1,010	n.d.	n.d.	n.d.

Act (consequently modified and adopted by the states^c), the 1985 Endangered Species Decree and the 1976 Land Use Act. The first National Park, Kainji Lake, was established in 1973; the Chad Basin, Cross River, Gashaka-Gumti, Old Oyo and Yankari national parks in 1993; and the Kamuku and Okomu national parks in 1999. Five of these national parks are located close to borders with neighbouring countries, suggesting potential for transboundary conservation. Some national parks have been degraded due to illegal hunting and logging, the smuggling of primates, grazing and illegal burning.

Estimate of the area of forest sustainably managed for protection. According to state and federal officials^c, about 500,000 hectares of protection PFE could potentially be managed sustainably. However, due to a lack of clear information on what is happening in the field, the generally widespread problems of degradation, illegal logging, poaching and encroachment, and the lack of data on management plans and their implementation, the area of protection PFE currently being managed sustainably is not estimated here (Table 4).

Socioeconomic aspects

Economic aspects. The forest sector contributed only 0.5% to Nigeria's GDP in 2001 (FAO 2003). Although forests do provide a major part of domestic energy, food and medical supplies, these are not fully reflected in formal national accounts. A major problem facing Nigerian forestry is inadequate funding. In 1993, the federal government urged state governments to pay 10% of forestry revenues into a trust fund for forest management. However, only a few state governments have implemented this proposal^c. The setting and collection of forest revenues is at the discretion of state governments and sometimes local communities^c, so there are large variations in the fees charged in different regions; for instance, the stumpage rate

for *Mansonia altissima* varies from 1,000 Nigerian naira in the state of Ekiti to 225 naira in Kogi. This ad hoc administrative setting of royalties causes many problems in the Nigerian forest sector.

Livelihood values. Forest products, particularly NWFPs, support the subsistence of local communities. An estimated 25 million people are greatly dependent on forest resources for their livelihoods^c. Hunting and fishing are important activities. No information was available on the extent of sustainable rural-based programs to stabilize ecosystems and diversify products in order to meet the continuing needs and livelihoods of forest-dependent communities.

Social relations. The sharing of benefits from forestry activities between state governments and local communities varies from state to state. State governments are supposed to share a percentage of any revenues collected from forestry activities outside forest reserves (on average 25–40% in the savanna and 30–35% in the closed forest^c) with local communities, but this is often not done in practice. The continuing decline and degradation of forest resources in Nigeria suggest that the relationship between local communities and forest administrations is not conducive to forest conservation and SFM in most of the high-forest states of Nigeria^c.

Summary

There are several obstacles to SFM in Nigeria. These include the discretionary power of government to de-reserve or harvest the forests; the lack of a coherent forest policy; the prevalence of illegal logging and harvesting of NWFPs in most of the high-forest states; chronic under-resourcing of forestry programs and forest management; overlapping responsibilities among federal, state and local governments and excessive bureaucracy; the lack of inter-sectoral coordination; and the overall absence of reliable data on which to base forestry planning and development. Nigeria has a

long history of forest management and the formal goal is to achieve self-sufficiency in all aspects of forest production; however, the country, once a significant exporter, is now a net importer of primary forest products and considerable work must be done to achieve this goal.

Key points

- Nigeria has an estimated PFE of 4.11 million hectares, comprising 2.72 million hectares of natural production forest, 1.01 million hectares of protection forest and 375,000 hectares of planted forest. The PFE covers less than 5% of Nigeria's total land area.
- Data are generally weak and the federal government cannot confirm the accuracy of the data presented herein^c.
- A forest reserve system was created in 1937 covering 9.7 million hectares (10% of the land area), but much of this is no longer forested.
- The goal of the 1988 forest policy is to expand the forest estate from 10% to 20%, but this has not occurred.
- Insufficient information was available to estimate the area of PFE under SFM.
- The forestry sector is administered at the federal, state and local government levels according to the Nigerian constitution. However, there is a lack of clarity in the mandates of the three levels.
- The main concerns of the federal government are to provide an adequate policy framework for the states and to support afforestation and conservation programs.
- State governments are solely responsible for the management of forest resources and the coordination of forest development activities with local communities.
- Forest production has fallen, creating an imbalance between supply and demand. From its previous status as a significant exporter of forest products, Nigeria has become a net importer.
- The wood-processing industry is characterized by outdated technology, poor recovery and inefficiency.

- A National Forestry Development Program designed to encourage community plantation development is in place.
- A proportion of revenues from timber should go to local communal landowners but, in practice, funds are often diverted, reducing the incentive for local people to protect forests.

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TOGO



* For legend see page 58

Forest resources

Togo has a land area of 5.68 million hectares and a population of about 4.6 million people. It lies north of the Gulf of Guinea in West Africa between Ghana in the west and Benin in the east. There is a narrow coastal belt and an extensive inland plateau, rising from 60 m to 450 m towards the north. The Atakor Mountains stretch from southwest to northeast and cover much of western Togo. The highest peak (Mt Agou) reaches an altitude of 986 m. There is little forest in Togo. FAO (2005a) estimated the forest area at 510,000 hectares in 2000; the government of Togo estimated 1.09 million hectares of forest area^a, a large part of which is covered by bush and tree savanna. A third estimate (631,000 hectares) can be derived from the data for forest types given below (excluding savanna but including 'secondary forest and agricultural land').

Forest types. The scarcity of forest is due to both low precipitation and deforestation. Apart from a few fragments of closed semi-deciduous forests in the southwest, covering around 400 hectares, there are only a few small islands of moist and dry forests in the south and centre and gallery forests along watercourses. The majority of the forest area is savanna, which extends from the Guinean into the Sudanian vegetation zone. On the plateau, dense savanna forests are characterized by *Ceiba pentandra*, *Daniellia oliveri* and *Butyrospermum paradoxum*. Farther north, *Khaya senegalensis* and *Prosopis africana* predominate, along with the palm *Borassus aethiopum*. There are stands of semi-deciduous closed forest in the mountains, with *Antiaris africana* and *Chlorophora excelsa* among the most typical species. Areas of the main forest types are estimated as follows for 2003^c:

- semi-deciduous forests (*forêts denses semi-décidues*)
106,400 hectares
- montane forests (*forêts de montagne*)
46,500 hectares
- closed dry forests (*forêts denses sèches*)
25,500 hectares
- tree savanna (*savanes arborées*)
594,000 hectares
- secondary forests and agroforestry land
453,000 hectares

Dynamics of forest resource change. Deforestation is high relative to the total area of forest and is estimated to have been an average 21,000 hectares per year over the past 12 years^a. The highest deforestation rates have been observed in the more humid area, where forests are important in water-

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^d			
		Production		Protection	Total
		Natural	Planted		
0.51–1.09	272	41	14	313	368

shed protection. The major threats to the scarce remaining dense forests include uncontrolled bush-fires (the main cause of deforestation in non-PFE forested land), excessive fuelwood extraction, shifting cultivation for annual crops, and illegal cutting of the few remaining commercial tree species. Uncotrolled forest fires occur regularly at the end of the drier seasons and cause damage to already degraded forest areas. Over the past 30 years, the frontier of cotton plantations (in particular in the southern zone around the forest of Abdoulaye and in the western Tchilla-Monota forest area) has expanded at the expense of forest. Another reason for larger-scale conversion of forests is the introduction of new varieties of coffee adapted to local conditions.

Permanent forest estate. According to the government of Togo, there are 502,000 hectares of PFE, comprising 488,000 hectares of degraded closed natural forests and 14,000 hectares of planted forests^a. This PFE is mainly located within 83 forest reserves (*forêts classés et forêts sacrées*) with a total area of 773,811 hectares; these are encroached upon by local people to a varied degree^a. The forest reserves, mostly created in the colonial era (before 1960), now consist of heavily degraded primary forests, open secondary forests, planted forests and human-induced savanna dominated by *Ceiba pentandra*. The estimate in Table 1 is somewhat lower than the official estimate to allow for the additional deforestation that is believed to have taken place^c.

Planted forests. There are about 38,000 hectares of planted forests, 24,000 hectares being outside the PFE^a. Plantations are often located inside the forest reserves, but privately owned planted forest areas are now being developed.

Institutional arrangements

Forest tenure. There are two types of forest tenure: public forest and private forest. Closed forests and dense tree savanna are generally part of public forest reserves owned by the state. In all forest reserves, user rights for local communities exist according to the colonial forest code of 1938 (articles 12–18). The legal situation, however, remains unclear; because of this, perhaps, most forest reserves are increasingly threatened by conversion under shifting cultivation. Outside the reserves, all trees and plantations belong to local

communities and private citizens, with no strict control from the state, although such off-reserve forests provide most of the forest products sold locally.

SFM policy framework. Although Togo participated in the C&I processes of ITTO, Dry-zone Africa and ATO/ITTO, no adequate framework for SFM has yet been developed. No strategic plan or actions are foreseen beyond securing forest reserves from conversion and encroachment.

Forest policy and legislation. Forest use is regulated by the 1938 forest code and the environmental code of 1988. The 1938 code has been amended by subsequent regulations, such as Decree 84/86 of April 1984. A new forest code was submitted to the Legislative Assembly but as of the end of 2005 no decision had been taken on its implementation.

A new forest policy was elaborated at the beginning of 2000 and is based on the following principles: the involvement and empowerment of the people, the integration of forestry into rural development, and the rationalization and decentralization of forestry planning. There is a National Forestry Action Program (*Plan d'Action Forestier National – PAFN*) and a National Environmental Action Plan (*Plan National d'Action pour l'Environnement – PNAE*), the latter adopted in 2000. In addition, an environmental management plan derived from the latter includes rules for the management of forest ecosystems and guidelines for the conservation and use of biological diversity.

A law approved in 1998 (Law 98-006) and modified in 2001 stipulates the political commitment of Togo to decentralized management in rural areas. Communes, prefectures and regions have become territorial authorities (*collectivités territoriales*), with legal status and financial independence. These authorities have responsibilities for the management of the state domain and on environmental issues. Communes and prefectures have an important stake in the management of forest reserves. Villages adjacent to forest reserves generally have a forest committee (*Comité villageois de Développement – CVD*), which takes cares of local interests in the use of the forest reserves and is responsible for the management of committed forests. So far, however, overall responsibility for natural resource management has mostly remained with the central Ministry for Environment and Natural Resources

Table 2 Some commonly harvested species for industrial roundwood^c

Timber species	Remarks
<i>Tectona grandis</i> (teak)	From planted forests, production about 40,000 m ³ per year
<i>Khaya grandifoliola</i> (acajou)	From natural forests, less than 1,000 m ³ per year
<i>Chlorophora excelsa</i> (iroko)	From natural forests, less than 1,000 m ³ per year
<i>Antiaris africana</i> (ako)	From natural forests, less than 1,000 m ³ per year
<i>Triplochiton scleroxylon</i> (ayous)	And 12–15 other species, totalling under 40,000 m ³ per year

(Ministère de l'Environnement et des Ressources Forestières – MERF).

Institutions involved in forests. MERF is in charge of forests. Responsibilities were reorganized in 1996 and new institutional reforms proposed in 2001. According to the new scheme, there are five departments to administer the environment and forests: the Directorate for Administration, Finance and Planning (*Direction de l'Administration, des Finances et de la Planification*); the Directorate for the Environment (*Direction de l'Environnement*), responsible for overall environmental policies; the Directorate for Forests and Water (*Direction des Eaux et Forêts*), responsible for forest policy and law enforcement; the Directorate for Green Space (*Direction des Espaces Verts*), responsible for urban forestry; and the Directorate for Fauna and Hunting (*Direction de la Faune et de la Chasse*). A parastatal organization, the Office for Forest Development and Harvesting (*Office de Développement et d'Exploitation des Forêts – ODEF*), is responsible for the management of forest reserves, forestry extension, harvesting and reforestation activities^a. The only forestry training institute in the country (INFA in Tové), which has been closed since 1990 because of a shortage of funds, was expected to start forestry classes again in 2004. There is no forest research institute.

In 2002, 937 people were engaged in the forest administration, only eight of them with higher education in forestry and environmental management^a.

Some small national NGOs are concerned with local forestry development, but their resources are meagre. There has been a general trend towards wider public participation in the management of forests. Communities and NGOs are often involved in forest protection measures such as fire protection

(*brigades de feux de brousse*). There has also been some recent investment by the private sector in teak plantations.

Status of forest management

Forest for production

The rural population traditionally depends on forests and trees for fuelwood, fodder, timber and other forest products; this heavy dependence generates great pressure on forests. Most of the 83 remaining forest reserves are now threatened. They can be divided into five classes, as follows:

- (i) Class I: comprises 18 converted forest reserves that have been cleared and this land-use conversion is irreversible. The land will support agriculture or has become degraded;
- (ii) Class II: comprises six heavily degraded reserves that contain secondary forest or urbanized forest reserves;
- (iii) Class III: comprises eight forest reserves with planted areas that are either intact or degraded and heavily degraded natural forests;
- (iv) Class IV: comprises 48 reserves in which the forest is degraded and/or transformed into secondary forest and may also contain planted areas and natural forest; and
- (v) Class V: comprises three sacred forests with more-or-less intact forests^a.

A number of forest management plans have been prepared to secure the sustainable use of the main forest reserves, mainly through projects supported by international organizations including ITTO. There are no large-scale timber harvesting or forest concession areas. Cutting permits (*permis de*

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
41	41	5.5 ^a	0	5.5	14	1.2 ^a	0

coupe) are the only legal basis for small-scale timber harvesting and the cutting of single trees.

Silviculture and species selection. The most important commercial tree species is *Tectona grandis* (teak). Teak plantations were introduced in 1910 from Burma by the Germans and have become well adapted to the country. The species regenerates naturally and is widely used in agroforestry plantations, as street trees and in commercial planted forests. A silvicultural system to induce natural regeneration has been developed by ODEF and is practised in some of the older teak stands.

Timber harvesting takes place in some forest reserves, in savanna, in planted forests and among off-forest trees. Apart from teak, no species is used in large quantities. Besides those listed in Table 2, species harvested include: *Azelia africana*, *Lophira alata*, *Terminalia* spp, *Isobertinia doka*, *Daniellia oliveri*, *Dichostachys glomerata*, *Parkia biglobosa*, *Bauhinia* spp, *Pterocarpus erinaceus* and *Anogeissus leiocarpus*. In the future there may be an increased commercial use of trees outside reserves, in particular of *Ceiba pentandra* (fromager), *Cola gigantea* and *Albizia ferruginea*.

Planted forest and trees outside the forest. The main planted species is teak (18,000 hectares). The planned planting rate of teak is 300 hectares per year, mainly on agricultural land using the *taungya* system^c. This planting rate is generally considered inadequate to meet the timber needs of the country; a rate of 2,000 hectares per year of industrial plantations would be needed to meet domestic requirements for construction timber alone^c. Off-forest trees in the savanna, including teak, limba, ayous, ceiba and cola, are providing more and more of the raw material for local sawmills.

Forest certification. No forest has been certified. Teak plantations established by the private sector might have the potential and market prospects to justify certification, but no initiative has been taken yet.

Estimate of the area of forest sustainably managed for production. An estimated 17,500 hectares of production forest are covered by management plans, including 10,900 hectares of savanna, 5,500 hectares of dense natural forest and 1,200 hectares of plantations^a. A total of 4,600 hectares of teak and eucalypt plantations are harvested according to harvesting plans, but only 1,200 hectares of these have full management plans^a. The area of natural PFE managed sustainably is estimated to be at least 5,500 hectares, comprising the core areas of three forest reserves – Eto, Haho-Baloé and Missahoe – that have been especially enriched and managed with effective support from the local population^c and from ITTO projects (Table 3).

Timber production and trade. Total roundwood production was an estimated 5.85 million m³ in 2003, of which 5.65 million m³ was fuelwood (FAO 2005b). Traded fuelwood recently averaged 2 million m³ per year^a, to which should be added an estimated informal production^c of more than 6 million m³. Industrial roundwood production amounted to an estimated 208,000 m³ in 2003, down from 314,000 m³ in 1999 (ITTO 2004, 2005); most of this wood comes from planted forests. Timber products from neighbouring countries (mainly Ghana) are exported from the free port of Lomé. Private investors have recently developed small-dimension timber-processing units for teak^c.

Non-wood forest products. Wild meat is the most important NWFP from forest reserves. Another considerable source of income, though illegal, has been the collection of reptiles for export. Fruits, roots and medicinal plants are also collected. The remaining forests are heavily degraded and many NWFPs are no longer available in the required quantities or qualities.

At least 18 reptile species are produced in animal farms for export, in particular *Python regius* (royal python), but also chameleons (*Chamaeleo gracilis*

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil And water	With management plans	Sustainably managed
313	60.9	200	n.d.	n.d.

and *C. senegalensis*), big lizards (*Varanus niloticus* and *V. exanthematicus*), and turtles such as *Kinixys belliana*, *K. erosa* and *K. homeana*.

Forest for protection

Soil and water. An estimated 200,000 hectares of forest are managed primarily for the protection of soil and water^a. An estimated 5,713 hectares of protection plantations had been established by the end of 2002 in forest reserves – Kara, 362 hectares; Namon, 413 hectares; Asrama, 338 hectares; and Avétnou, 1,100 hectares^a.

Biological diversity. Togo is home to more than 1,450 forest-dependent plant species, more than 600 birds, 146 mammals, 138 reptiles and 42 amphibians^a. A national strategy for biological diversity was prepared in the late 1990s. It contains a catalogue of rare, endangered and endemic species; tree species listed include *Entandrophragma cylindricum*, *Terminalia superba*, *Terminalia ivorensis*, *Piptadeniastrum africanum*, *Khaya grandifoliola* and *Khaya ivorensis*^a. Eleven mammals, two birds, three reptiles, three amphibians and ten plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, eight mammals and three amphibians are found in forests (IUCN 2004). One plant species is listed in CITES Appendix I and seven in Appendix II (CITES 2005).

Protective measures in production forests. Provisions are made in the 1938 forest code and Decree 84/86 to prohibit logging on slopes susceptible to erosion as well as for the protection of streams, springs and watersheds.

Extent of protected areas. The government of Togo estimated that the area of forest in IUCN protected-area categories I-IV was 255,640 hectares, 192,000 hectares being semi-deciduous mountain forests and 63,640 hectares savanna^a. According to UNEP-WCMC (2004), 60,900 hectares of forest are in protected areas conforming to IUCN protected-area categories I-IV; the forest type for

most of this area is unclassified. No information is available on the area of protection PFE covered by management plans or the existence of effective protective measures to secure the areas from encroachment and degradation.

Estimate of the area of forest sustainably managed for protection. Insufficient data were available for an estimate to be made on the area of protection PFE under SFM.

Socioeconomic aspects

Economic aspects. Some socioeconomic measures have had negative side-effects on forest management. The devaluation of the regional currency (FCFA) in 1994 has tended to encourage the misuse of resources, while the privatization of profitable enterprises has limited the expansion of forest areas because of the reluctance of private operators to make long-term investments. It is not yet clear what the effects of decentralization and the hoped-for greater transparency will be. Since 2000, there has been some modest private investment in teak plantations on private land. The contribution of the forest sector to national GDP is very small, although the importance of informal activities (especially related to wood energy) is considerable. Private enterprises employ about 1,000 salaried full- and part-time workers. It is estimated that forestry provides about 90,000 jobs in the informal sector, 77% of them for women and children, many in commercial fuelwood collection and charcoal-making.

Livelihood values. The few existing forests are often considered by rural people to be under-utilized reserves of land; thus they are heavily encroached upon and claimed for subsistence production. Forest reserves provide an important source of protein for people living in rural areas. Forests also are a place of ritual and spiritual significance for many ethnic groups.

Social relations. The participation of local stakeholders in forestry decisions and management is not well developed.

Summary

The main difficulty in protecting and managing forests in Togo is the heavy pressure on them from an impoverished rural population. Indeed, pressure on the existing forest reserves is already high and the Ministry for Environment and Natural Resources, which is in charge of forests, is unable to secure their integrity. Capacity for forest management is low, and improvement is inhibited by a lack of means. This affects many forestry operations: for example, management plans are confined to a few teak plantations, scarcely 300 hectares of new plantations are established annually, and protection against fire is mostly ineffective. A process of decentralization has been initiated, whereby communes, prefectures and regions have responsibilities for the management of the state domain and on environmental issues, but the effects of this process on forest management are yet to be seen.

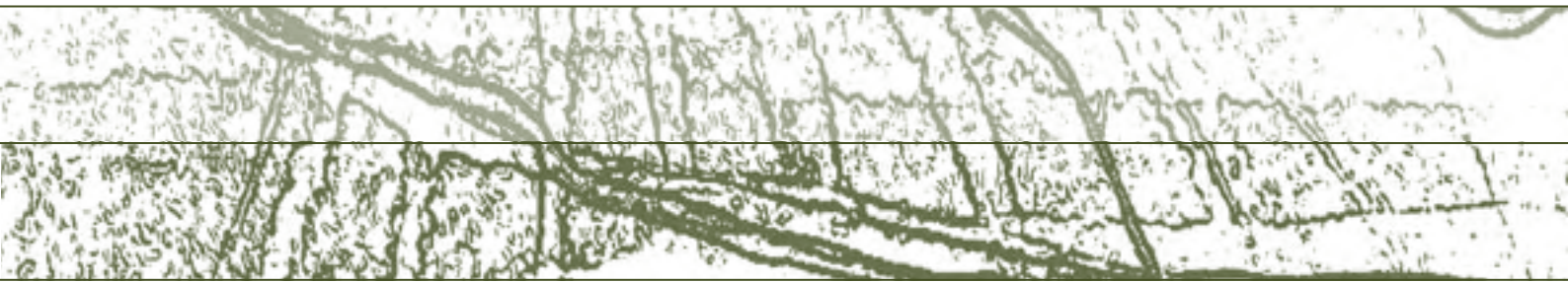
Key points

- Togo has an estimated PFE of 368,000 hectares, comprising 41,000 hectares of natural production forest, 313,000 hectares of protection forest and 14,000 hectares of plantations (and additional private plantations outside the PFE).
- At least 5,500 hectares of natural-forest production PFE are considered to be managed sustainably. Insufficient information was available for an estimate to be made of the area of protection PFE so managed.
- Forest reserves and protected areas are not effectively protected or managed, and many are heavily degraded and subject to uncontrolled encroachment, the illegal gathering of NWFPs, poaching and timber theft.
- Forestry training capacity is very limited, and fewer than ten personnel in the forestry administration have higher education in forestry or environmental management.
- There is a lack of a national SFM framework and of forest management standards for natural forests.

- Privately owned, planted forests are now being developed and will complement the teak and other plantations in the PFE.
- However, planted forests in the PFE are small and generally lack proper planning, monitoring and silvicultural follow-up.
- Many villages adjacent to forest reserves have forest committees to manage local interests in the use of forest reserves.

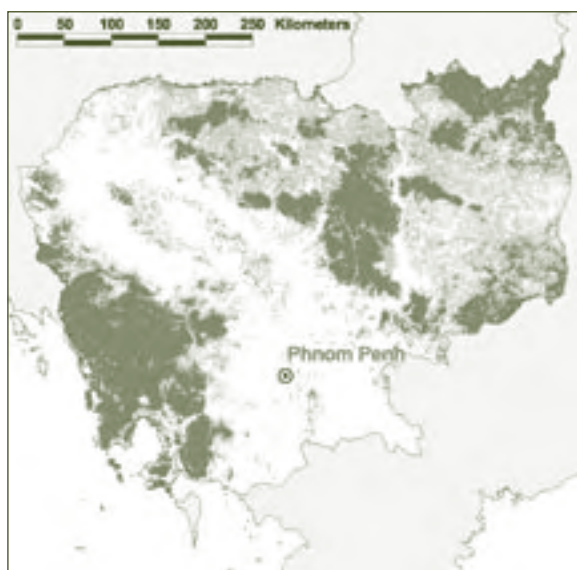
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ASIA & THE PACIFIC

CAMBODIA



* For legend see page 58

Forest resources

Cambodia has a land area of 18.1 million hectares and a population of 12.6 million people. The country is dominated by a large alluvial central plain, through which courses the Mekong River and in the centre of which lies Tonle Sap Lake. Mountains and plateaux surround the central plain except in the southeast. Only a few points exceed 1,000 m in elevation; these are located primarily in the extreme northeast of the country, the highest peak being Phnom Kchual (1,843 m). The climate is typically tropical and subject to monsoons. Cambodia has a relatively large forest resource: FAO (2005a) estimated forest cover at 9.33 million hectares; the estimate of the Forestry Administration (FA) of the Ministry of Agriculture, Forestry and Fisheries (MAFF) is 11.1 million hectares^b.

Forest types. Cambodia's lowland tropical moist forest covers the northeastern part of the country

bordering Laos and Thailand. This forest type is dominated by Dipterocarpaceae, with five species – *Shorea hypochra*, *Anisoptera costata*, *A. glabra*, *Dipterocarpus costatus* and *Hopea odorata* – almost always present; *Parkia streptocarpa*, *Heritiera javanica* and *Syzygium cinereum* are other common species. Medium-altitude closed forest is found in the hilly country around the Gulf of Thailand and east of the Mekong River. The dominant trees, which can reach a height of 20 m, include oaks such as *Lithocarpus* spp, *Quercus cambodiensis* and *Castanopsis cambodiana*. Closed deciduous forests and open forests are mixed and found in the northwestern part of the country; common species include *Lagerstroemia* spp, *Xylia dolabriformis*, *Vitex* spp, *Anogeissus pierrei*, *Grewia paniculata*, *Terminalia* spp, *Ceiba pentandra*, *Pterocarpus pedatus* and *Irvingia oliveri*. Closed semi-deciduous forests occur where the dry season lasts three to five months and vary considerably in appearance and floristic composition. Secondary forest formations include bamboos and trees such as species of *Diospyros*, *Lagerstroemia* and *Cratoxylon*, as well as *Grewia paniculata*, *Combretum quadrangulare* and *Dipterocarpus intricatus*.

Dynamics of forest resource change. The rate of deforestation in Cambodia between 1990 and 2000 was an estimated 56,000 hectares per year (FAO 2005a). A significant but unestimated area of forest has been degraded by shifting cultivation, encroachment, development of agro-industries, illegal logging, over-harvesting and forest fire, as well as by the use of chemicals during periods of war. Deforestation is expanding rapidly in the country's closed forest area and will have a major impact on efforts towards SFM^c. Fires during the drier months of the year have reportedly become more common in the past ten years^c.

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^d			
		Production		Protection	Total
		Natural	Planted		
9.33–11.1	5,500	3,460	17	4,620	8,097

Permanent forest estate. Cambodia's 2003 forest law (see below) establishes a comprehensive formal system for the designation of the PFE, but this is yet to be fully implemented, nor have the forests been clearly demarcated. Table 1 presents an ITTO estimate of the extent of the PFE. This varies from that provided by the FA, which puts the total PFE at 11.1 million hectares^b (the same as the estimated total forest area). The estimate of natural production PFE comprises the current attributed concession area.

Planted forests. Estimates of the area of planted forests vary. FAO (2005a) estimated 90,000 hectares and the Department of Forestry and Wildlife (DFW 2003) 82,000 hectares^a, while the government of Cambodia (2004) reported that 13,000 hectares of plantations had been established between 1985 and 2004 on bare and degraded land. The higher estimates may include rubber plantations, some of which are harvested for timber; these cover an estimated 29,000 hectares^b. In this report the area of planted forest is estimated to be 17,000 hectares^c.

Institutional arrangements

Forest tenure. According to Article 10 of the 2003 Law on Forestry, the PFE consists of permanent forest reserves (owned by the state) and private forests. Permanent forest reserves comprise three categories: production forests, protection forests and conversion forest lands; the latter are classified as permanent forest reserves until the government decides to use the land for other purposes. Private forests are to be maintained by their owners, who have the right to harvest and sell the products derived from such forests. Any individuals who plant trees on private land or on state forest land where they have been granted user rights have the right to maintain, develop, harvest and sell forest products (Article 46). For local communities, the state recognizes and ensures their user rights for the purpose of traditional customs, beliefs, religion and living (Article 40). In recent years, Cambodia has followed the global trend of favouring various forms of decentralized forest management. Numerous pilot projects are under way to strengthen the ability of local communities to manage forests. Many of

these build on a long tradition of local forest management by rural people. Other programs target communities who were displaced or whose traditional practices were disrupted during periods of armed conflict.

SFM policy framework. Cambodia's 2003 Law on Forestry incorporates a framework for SFM in its articles 8 and 9, which state that SFM will be conducted in a manner consistent with the National Forest Sector Policy and this 2003 law.

Forest policy and legislation. In October 1998, the National Assembly adopted the government's 'policy platform', which provided for specific actions to establish SFM, including the re-drafting of forest laws and guidelines. In January 1999, the National Assembly decided to crack down on illegal logging, banned the conversion of forest land for other purposes, and decided to retain 10–20% of the AAC from concession forests to meet the domestic demand for timber. In July 2002, the government adopted a national forest policy with the following objectives: (i) to conserve and sustainably manage the country's forest resources; (ii) to establish the remaining forest reserves as PFE; (iii) to promote the maximum involvement of the private sector and the participation of local people; (iv) to establish a coordinated multi-stakeholder process for forestry development; and (v) to promote programs of forestation on arable lands and farms.

The 2003 Law on Forestry replaced Decree No 35 of 1988; it defines the framework for management, harvesting, use, development, conservation and protection of the forest. The major objective is to ensure SFM and customary user rights of forest products for local communities. A number of guidelines and codes serve to regulate forest management, such as: the Cambodian code of practice for forest harvesting (1999), the construction code for forest engineering works, guidelines for SFM, and a planning manual for the management of forest concessions. Uncertainty over the best approaches to solving forest problems led to the undertaking of a major independent forest-sector review, which was completed in 2004. It made numerous recommendations, which the government is now considering. An ITTO diagnostic mission in 2004, which examined obstacles to the attainment of SFM in the country^b, also made a wide range of recommendations.

Meanwhile, the forest sector lingers in a state of uncertainty as the government continues to contemplate the future of industrial concessions and other issues relevant to the forest sector. A model forest concession agreement, prepared with the technical assistance of the World Bank and the Asian Development Bank (ADB), is being used in the renegotiation of contracts between the government and forest concessionaires. The forest-sector reforms, however, are very new and have not yet become effective; the enforcement of existing policies, laws and regulations is weak^b.

Institutions involved in forests. The FA was established in 2003 within MAFF, replacing the DFW. The FA is the sole agency responsible for managing the forest estate; however, national parks and equivalent reserves, including those containing forest, are under the jurisdiction of the Ministry of the Environment and there appears to be some overlap in responsibility. The system of provincial and district forest offices under the direct authority of provincial and district officials was abandoned in 2000. With the new structure operational in 2005, the government decentralized ministerial functions to lower authorities through four regional forest inspectorates^c. In addition, the Forest Research Institute has been re-established under the responsibility of the FA. Global Witness, an international NGO, was contracted to act as an independent monitor of the Forest Crime Monitoring Project; in 2003 this function was transferred to the Swiss-based company SGS and Global Witness officials were allegedly denied further entry to Cambodia (Global Witness 2005). A GIS unit within the FA has completed the Year 2000 Forest Resource Interpretation project. There are awareness programs for biodiversity conservation, reduced impact logging (RIL) and certification. A forestry training centre was inaugurated in 2003 and serves as the FA's vocational training centre.

The present reforms stipulate greater participation of grassroots organizations and of civil society generally in the forest sector. Wildlife and biodiversity conservation is being promoted by international conservation NGOs and community forestry programs by NGOs such as Concern and Oxfam. In 2003, the Cambodian Timber Industry Association was created to respond to these reforms and to assist member companies to attain the capacity to meet the stringent technical and regulatory requirements.

Status of forest management

Forest for production

Before 1970, the forests of Cambodia were managed in a very conservative manner. Forests were classified into forest reserves managed for specific objectives such as production, wildlife conservation, research and preservation. Subsequent political developments caused this system to disappear; in the early 1990s, a system of forest concessions was introduced. In Cambodia, harvesting intensity is expressed in terms of the volume of merchantable timber or the percentage of the standing merchantable volume to be removed. The rate of extraction in evergreen and mixed evergreen forest was set at 30% of the total volume available for harvest. Before 1993, felling was mainly done manually using axes and extraction by buffalo or elephant, but harvesting has been mechanized since the advent of logging concessions.

The hasty introduction of the concession system in 1994 caused widespread damage to the forest. Field inspections and observations indicated that "the state of the current concession forest management is alarmingly at odds with the goal of sustainability" (World Bank 2000). There was no reliable assessment of resources and the processing facilities set up had significant over-capacity. The period 1994–1998 was also one of uncontrolled illegal logging, and wood extraction soon reached unsustainable levels^b. Attempts to get the concessionaires to manage their forests sustainably and pay more taxes did not meet with success. Most companies continued to log high-value species as quickly as possible, without following the prescribed 25-year harvesting cycle (the nominal duration of the concession). The recommended level of harvest was an average of 10 m³ per hectare, but this would scarcely have been economically viable and concessionaires typically harvested four to five times that amount^c.

Between 1994 and 1997, the government granted 36 commercial forest concessions covering about 7 million hectares or around 70% of Cambodia's forests. In this way, the government sought to raise much-needed revenue for national development. Foreign timber companies started investing from late 1994, peaked in 1996, and the last concession was granted in 1997. In 1998, the government

Table 2 Some commonly harvested species for industrial roundwood (2002–2004)^{b,c}

Timber species	Remarks
<i>Dipterocarpus alatus</i> (chhoeuteal tan)	Sawnwood, veneer, plywood
<i>Anisoptera glabra</i> (mersawa, phdiek)	Sawnwood, veneer, plywood
<i>Hopea odorata</i> (koki)	Sawmilling, construction (bridges, boats)
<i>Shorea vulgaris</i> (choë(r) chông)	Sawmilling, construction (housing)
<i>Tarrietia javanica</i>	Sawnwood (decorative, furniture)

began to restructure the sector through the Forestry Reform Program supported by the World Bank. In 2000, the forest administration stipulated that no cutting permits would be issued until 100% inventories of current annual coupes had been completed, 5% inventories had been carried out for the next four annual coupes, and the companies had made the required minimum royalty payments. However, the stipulations were not adequately met. The total official harvest of industrial roundwood was reduced substantially to 123,000 m³ in 2001 compared to about 700,000 m³ in 1997 (ITTO 1999, 2005), although it is likely that much more than this was actually harvested.

In 2001, the government introduced additional legal requirements for concessions such as the preparation of long-term strategic forest management plans consistent with international standards, and the renegotiation of model forest concession investment agreements. In December 2001, the government issued a *Declaration on the Suspension of Forest Concession Logging Activities*, which suspended all logging activities in concessions starting from January 2002 until new forest concession management plans could be prepared and approved. The licences of 17 companies covering 3.50 million hectares in 24 concessions were cancelled and twelve concessions covering a total area of 3.37 million hectares were suspended. In addition the FA closed, and sometimes destroyed, 1,351 illegal sawmills and 653 small wood-processing plants^b. Some concessionaires have prepared new management plans according to the model. However, as of October 2005, all the concessions remained suspended because they were yet to conduct environmental and social impact assessments, which must be incorporated into the plans.

Silviculture and species selection. The model forest concession agreement and the SFM guidelines require that the forests be managed under a selective cutting system based on AAC and size specifications. The guidelines have elaborate provisions for the demarcation of area, inventory, tree-marking, stream buffers and conservation measures, roading standards, skid-trail alignment, directional felling, the location of log landings, post-logging operations, etc. However, little silvicultural effort is currently applied to regenerate previously logged forests (FAO 2005b). A full list of species extracted from natural forests and their respective share in the total is not available; this also varies depending on locality. An indicative list of important timber species is given in Table 2; others include *Pterocarpus pedatus*, *Shorea* spp, *Terminalia* spp, *Eugenia* spp, *Lagerstroemia* spp, *Irvingia* spp, *Xylia dolabriformis* and *Pentacme* spp.

Planted forest and trees outside the forest. Teak is the single most important planted species, covering 7,000 hectares, followed by 9,000 hectares of other broadleaved species (*Acacia auriculiformis*, *Hopea odorata*, *Eucalyptus camaldulensis* and *Dipterocarpus alatus*) and 1,000 hectares of *Pinus merkusii*^c.

Forest certification. No forests have yet been certified in Cambodia. As a first step, the government is considering certification as part of its package of measures to achieve SFM.

Estimate of the area of forest sustainably managed for production. No forests in Cambodia's natural-forest production PFE can be considered to be sustainably managed (Table 3). Since all logging is suspended, there is effectively no legal forest management in the production PFE, although there may be significant illegal logging^b.

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
3,460	3,370 (suspended)	150	0	0	17	7	0

Timber production and trade. Estimated total roundwood production in 2003 was 9.68 million m³, of which fuelwood accounted for 9.56 million m³ (FAO 2005b). In 1990, Cambodia's forest policy emphasized exports. Royalties and taxes on timber were reduced to encourage local processing for export. The legal export of logs was discontinued in 1996; at the same time, processing technology improved, the conversion factor reaching 0.6. Recorded wood production fell when forest concessions were cancelled or suspended; in 2003, industrial log production was an estimated 125,000 m³ compared to 291,000 m³ in 1999 (ITTO 2004, 2005). Some timber is still legally available from government-approved land conversion activities. However, an ITTO diagnostic mission in 2004 reported allegations that the granting of land-conversion permits, for example for rubber estates, had not followed legal procedures and had sometimes been motivated by the access it gave to the timber resources on the land to be cleared^b. The mission was informed that timber was still available in major towns and prices were reported to have remained stable. It was apparent, then, that the effect of the logging ban had been to stimulate a significant illegal timber industry^b. The decline in legal production is reflected in apparent trade: the export of sawnwood fell from 10,000 m³ in 1999 to 2,000 m³ in 2003, and that of plywood and veneer from 83,000 m³ to 20,000 m³ in the same period (ITTO 2004, 2005).

Non-wood forest products. Although many rural people depend on NWFPs to supplement subsistence needs and generate income, no data are available to quantify their economic importance. Potentially marketable products include *Aquilaria crassna*, the seeds of *Strychnos nux-vomica*, the fruits of *Cinnamomum* and *Diospyros*, resin and rattan. Bamboo shoots are eaten and wildlife is important as a protein source.

Forest for protection

Soil and water. There are laws, rules and regulations (eg the 2003 forest law, Royal decrees 1993 and 1999 and sub-decrees nos 75, 76 and 77 (2002)) addressing the role of forests in the protection of soil and water. The five-year National Environmental Action Plan (1998–2002) also had provisions in this regard. Nearly 40% (4.2 million hectares) of the designated PFE is intended to be managed primarily for the protection of soil and water^a.

Biological diversity. The government of Cambodia estimates that 125 species are endangered^a. Twenty-eight mammals, 26 birds, 15 reptiles, three amphibians and 32 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 21 mammals, 20 birds and three amphibians are found in forests (IUCN 2004). Three plants are listed in CITES Appendix I and 40 in Appendix II (CITES 2005).

Protective measures in production forests. Detailed guidelines have been developed for commercial forestry operations in order to protect watersheds and to prevent or minimize soil erosion and stream siltation. Regulations also provide for wildlife protection.

Extent of protected areas. According to UNEP-WCMC (2004), 3.36 million hectares of forest are in protected areas that conform to IUCN protected-area categories I–IV, including 1.20 million hectares of deciduous/semi-deciduous broadleaved forest and 897,000 hectares of lowland evergreen broadleaved rainforest. There are 23 protected areas in IUCN categories I and II and 71 in categories III and IV^a. Protected areas are of four main types: national parks, wildlife sanctuaries, protected landscapes and multiple-use areas.

Estimate of the area of forest sustainably managed for protection. No information was available for this report on the management status of the protection PFE (Table 4).

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
4,620	3,360	4,200	n.d.	n.d.

Socioeconomic aspects

Economic aspects. Badly shaken by decades of internal conflict, Cambodia's economy is gradually improving. The recorded contribution of forestry to GDP fell from 5.4% in 1998 to 2.1% in 2001; after the logging ban in 2002 it fell effectively to zero. These figures are misleading, however, because there is no accounting for illegal activities or subsistence and traditional uses. No recent information is available on employment, income, recreational facilities and other benefits.

Livelihood values. The recorded production of fuelwood is close to 10 million m³, but considerable quantities probably remain unrecorded. This applies to all forest products in subsistence use. No quantitative data are available on the role of NWFPs in maintaining livelihoods, although this role is considerable.

Social relations. The participation of indigenous people and local communities in forest management is recognized by law. The country's community forestry program has increased in scope and size since 1992. A sub-decree on community forestry provides for an increase in the number (and area) of community forests and encourages local communities to participate in SFM. An area of 64,900 hectares of forest has been set apart for local community use. There are 159 community forestry sites involving 34,100 families^a. The participation of indigenous people is also promoted by facilitating improved market access for their products.

Summary

Deforestation is expanding rapidly in Cambodia. Nevertheless, the country has a large forest resource with the potential to sustain a robust timber industry and contribute enormously to national development. But the recent history of Cambodian forestry has been turbulent, and the timber sector is in disarray. The concession system has been suspended, yet unauthorized timber

production apparently continues. The implementation of recent reforms, and increased law enforcement, are urgently required.

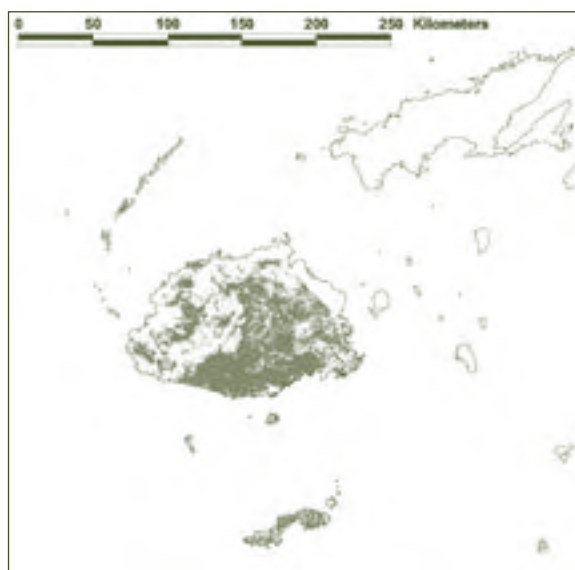
Key points

- Cambodia's significant reserves of high-value production forests present an important economic resource, the sustainable use of which would be of considerable benefit to the country.
- Cambodia has an estimated 8.10 million hectares of PFE, comprising 3.46 million hectares of natural production forest, 4.62 million hectares of protection forest and 17,000 hectares of industrial timber plantations. However, data on Cambodian forests are often inconsistent and unreliable.
- No part of the production PFE is considered to be under sustainable management; insufficient information was available to estimate the area of protection PFE so managed.
- A significant but unestimated area of forest has been degraded by shifting cultivation, encroachment, the development of agro-industries, illegal logging, over-harvesting and forest fire, as well as by the use of chemicals during war.
- The Forestry Administration was created in 2003, replacing the Department of Forestry and Wildlife; it has responsibility for managing the forest estate, although there may be some overlap in roles with the Ministry of Environment for forests in national parks and related reserves.
- Forest-sector reforms have been developed but are yet to be implemented effectively; the enforcement of existing policies, laws and regulations is weak.
- The management of forest concessions has been poor; the government cancelled some licences and, in 2002, suspended all remaining forest concessions until they fully complied with requirements. One apparent effect of this ban has been to stimulate a significant illegal timber industry.

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*For legend see page 58

Forest resources

Fiji has a population of about 900,000 people. It is located in the South Pacific and comprises more than 300 islands with a total land area of approximately 1.83 million hectares. The two largest islands, Viti Levu (1.02 million hectares) and Vanua Levu (556,000 hectares), make up 86% of the total land area; they are volcanic in origin and mountainous, rising to 1,323 m at Tomaniivi (Mt Victoria). The eastern sides of Viti Levu and Vanua Levu receive an annual rainfall of over 2,500 mm and support tropical rainforest, while the western portions receive less than 1,700 mm annually and support a higher proportion of (mainly secondary) grass and savanna. Estimates of total forest area (including planted forests) include 815,000 hectares (FAO 2005), 853,000 hectares (Jiko 2003) and 930,000 hectares^b.

Forest types. The predominant forest type is tropical moist forest, usually called rainforest in Fiji. Small areas of remnant rainforest occur in the grasslands, which themselves are mainly the result of repeated burning of the drier parts of tropical moist forests, leaving remnants of the original forest type and a fringe of deteriorating shrubland at the interface of the forest and grassland. There is also a significant area (around 42,000 hectares) of mangrove forest.

Dynamics of forest resource change. Most of the remaining natural forest in Fiji is on steep and broken mountainous country and difficult to access. During the 1990s, annual deforestation averaged 2,000 hectares, or 0.2% (FAO 2005), mainly in the drier parts of the two main islands. Forests are subject to periodic wind damage of varying intensity, including cyclonic; the existing forest structure can be partly attributed to this.

Permanent forest estate. There is no formally designated PFE in Fiji, and statistical information on forest area differs according to source and even within the same source. Some 240,650 hectares of natural forest have been described as protection forest (Jiko 2003), mainly on the grounds that these areas are too steep to log with present techniques. A classification into multiple-use natural forests, protection forests, nature and forest reserves, and plantation forest was being considered by the authorities in early 2005. The estimate of PFE contained in Table 1 comprises protection forests (as per Jiko 2003) and planted forests, as these are deemed to be effectively committed to permanent forest use. Another 331,000 hectares of logged natural forests could be considered for inclusion,

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
0.82–0.93	747	0 ^d	113 ^b	241	354

but the degree of 'permanence' of these forests is unclear. Thus, at present there is no natural-forest production PFE in Fiji.

Planted forests. Fiji has a successful plantation program. The large-scale planting of pine and hardwoods by government began in the 1960s and, by now, some 13% of the country's forests are planted. In 2003, there were an estimated 52,900 hectares of hardwood plantations (mainly *Swietenia macrophylla* – mahogany), 46,300 hectares of pine and 14,300 hectares of mixed plantations^{b,d}.

Institutional arrangements

Forest tenure. Communal groups (*mataqali*) own 89% of the unexploited forests and 84% of all Fijian forests, including planted forests; the remaining 16% of forests are privately or state-owned. The Native Land Trust Board (NLTB), which was set up in 1940, deals with local resource management and administers all customary land with the consent of landowning units. The Board is chaired by the Minister for Fijian Affairs and its members are nominated by the Great Council of Chiefs; it also includes one or two government representatives.

SFM policy framework. Fiji's commitment to SFM is demonstrated by its adherence to the Forest Principles of the 1992 Earth Summit and membership of ITTO.

Forest policy and legislation. The forest policy of Fiji was enacted in 1950 by the then Legislative Council. The sawmilling policy, formulated in the 1960s, was amended in 1995 to support the modernization of the industry. The Forest Decree of 1992 updated the Forest Act of 1953. A review of the forest policy has just been completed; its findings will now be the subject of stakeholder consultations with a view to arriving at a more broad-based policy.

The National Forestry Action Plan (NFAP) prepared in 1989 was a classic investment plan. It led to the identification of 29 projects that were presented to donors in May 1990; 25 have been, or are being, implemented. The Strategic Forestry Plan, 2002–2005, which supplements the NFAP, has the following objectives: (i) to provide an appropriate institutional and physical infrastructure to support the development of the forestry sector; (ii) to ensure the sustainable development and management of

forest resources; (iii) to promote community-owned and -managed forest-processing and value-adding facilities based on indigenous forests and community-owned plantations; and (iv) to promote the production and export of value-added timber products.

Institutions involved in forests. There are four governmental/quasi-governmental institutions responsible for or otherwise involved in forest management. These are: the NLTB, for the leasing of native land for forestry purposes; the Forestry Department, for the licensing of timber harvesting, transport and export, policy and planning, and research, training and overall forest management, including extension plantations and timber production statistics; Fiji Pine Limited (FPL), a public company wholly owned by government and landowners which is responsible for pine plantation establishment, management, utilization and marketing; and the Fiji Hardwood Corporation Limited (FHCL), a government-owned subsidiary responsible for the hardwood plantations in the process of becoming a government-landowner company similar to FPL. The potentially high value of the mahogany resource and disputes over ownership and control of the FHCL were contributing factors in a military coup that took place in Fiji in 2000. The Forestry Extension Division of the Forestry Department provides landowners with technical advice and assistance in the implementation of SFM.

Regional and global NGOs play a role in developing, applying and disseminating forest-related information to the community because of their networking strength at the local level. Such organizations include the South Pacific Action Committee for Human Ecology and the Environment (SPACHEE), the Foundation for the Peoples of the South Pacific (FSP), Greenpeace, WWF and the Wainimate Group.

Status of forest management

Forest for production

Logging on native land is allowed only with the consent of both the *mataqali* and the NLTB. Timber-cutting rights are negotiated between concessionaires or licensees and the NLTB, which authorizes the Forestry Department to issue logging licences and to administer concession agreements. Around 0.29 million hectares, which is about 40% of the total natural forest area, has been allocated

Table 2 Some commonly harvested species for industrial roundwood (2002–2004)^b

Timber species	Remarks
<i>Swietenia macrophylla</i> (mahogany)	From planted forests, popular and versatile decorative timber
<i>Pinus caribaea</i> (Caribbean pine)	From planted forests, bulk of it used to make woodchips
<i>Myristica</i> spp (kaudamu)	Natural forest species, used in sawmilling
<i>Endospermum macrophyllum</i> (kauvula)	Construction and joinery timber
<i>Agathis vitiensis</i> (dakua makadre)	Decorative timber, also for veneers and plywood

to concessions and long-term licences^b (see below). Each licence applies to gross areas of land that include a mosaic of production, non-commercial and protection forest^b. Royalties are collected by the Forestry Department and passed on in full to the landowners, except for an administration levy deducted by the NLTB. The Forestry Department also levies fees on the licence-holders for log-scaling, regeneration costs and so on. To further the sustainable management of its forests, the Fiji government has formulated a national code of logging practice to give practical guidance to those involved in logging; this prescribes operational, safety and environmental standards. The code is now being revised to include RIL and other silvicultural practices designed to enhance forest regeneration.

To harvest timber on any land, 'forestry right licences' are required. These are of four kinds: timber concessions (10–30 years), long-term licences (ten years), annual licences and other licences and pre-payment licences (usually for land-clearing). One important government initiative was the development of a natural forest management pilot project to assess the effect of different intensities of logging on the regenerative capacity of the forests. It was aimed at maintaining the composition and structure of the natural forest and stimulating growth and natural regeneration while ensuring the active participation of landowners. The results will now be applied in a much bigger forest area to test the initiative's commercial applicability. The Forest Department organizes training in logging to improve skills and techniques, reduce environmental damage and improve efficiency. However, the forest-sector workforce is currently too small and lacks the necessary skills and support to implement SFM^b.

Silviculture and species selection. Logging in natural forests is based in most cases on a selection system. The normal diameter limit for felling is 35 cm at breast height. Twenty-two species are included in an 'obligatory list' and these must be felled irrespective of market demand. Despite the provisions in the licence agreements, pre- and post-harvest silvicultural prescriptions do not receive proper attention^b. Also often neglected are enrichment and rehabilitation planting in logged-over forests and compensatory afforestation to make up for land transfers. Most of the larger sawmills have their own logging areas and logging operations, but they carry out almost no planting.

More species than the obligatory 22 are used in production and trade. The most readily available and commercially valuable indigenous timbers are retailed directly under their own local names or in mixtures called 'Fiji hardwood' or 'mixed hardwood'. The main commercial species from natural forests are *Agathis vitiensis* (kauri or dakua makadre), *Myristica* spp (kaudamu), *Endospermum macrophyllum* (kauvula), *Calophyllum* spp (damanu), *Palaquium* spp (sacau) and *Intsia bijuga* (vesi). Table 2 shows the main species harvested, including from plantations.

Planted forest and trees outside the forest. The main softwood plantation species is *Pinus caribaea* var. *hondurensis* (Caribbean pine), mostly under the management of FPL and located mainly in the drier zones of Viti Levu and Vanua Levu. There are about 45,000 hectares of this species in plantations; the target is 75,000 hectares. Forestry Department plantings of Caribbean pine began on a small scale around 1950 and, by 1972 (when the expanded 'pine scheme' began), had grown to about 12,000

Table 3 Management of the production PFE ('000 hectares)

Total	Natural				Planted		
	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
0	n.a.	n.a.	n.a.	n.a.	113	90	0

hectares. The ownership of what are now the Fiji Pine Trust plantations has had a chequered history. Cyclone damage was almost the only one of the many problems that plagued the scheme that did not originate in disputes over land tenure^b. The main planted hardwood species, mahogany, is managed by FHCL. Mahogany plantations also began in the early 1950s and the expansion of establishment had grown to around 1,000 hectares a year by the mid 1960s. However, the program virtually stopped in 1971 because of widespread attack by the ambrosia stem borer. It resumed after a few years with the development of successful containment measures, and annual planting rates climbed to around 3,000 hectares. By now there are about 53,000 hectares of plantations of this species; the aim is to establish a total estate of about 100,000 hectares^b.

Forest certification. No forest has so far been certified in Fiji, but the 66,981 hectares of forest plantations managed by FHCL are currently undergoing assessment by the Rainforest Alliance SmartWood program for certification under the FSC umbrella.

Estimate of the area of forest sustainably managed for production. No natural forest is contained in the nominal production PFE; moreover, none of the concessions in natural forest are thought to be sustainably managed^b. Of the 113,000 hectares of planted forest in the nominal PFE, about 90,000 hectares are considered intact^b. Most of these forests have management plans, and at least 5,000 hectares, consisting of part of one concession, are being operated under a reasonable degree of sustained-yield management^b.

Timber production and trade. In 2004, there were 26 licensed sawmills, 18 of which were operating (only one of which was large); there were also two small veneer and plywood mills and one woodchip

plant integrated with the large sawmill. Conversion efficiency is thought to be around 50%^b. Industrial roundwood production in 2003 was 380,000 m³, of which 260,000 m³ was softwood from pine plantations (ITTO 2005); this was down somewhat from 470,000 m³ total industrial roundwood production in 1999 (ITTO 2004). In 2003, Fiji produced 84,000 m³ of sawnwood (up from 64,000 m³ in 1999), 8,000 m³ of veneer and 8,000 m³ of plywood, and it exported 9,000 m³ of sawnwood, 2,000 m³ of veneer and 6,000 m³ of plywood (ITTO 2004, 2005). As with most other aspects of forestry, Fiji's wood-processing industries are comparatively more advanced than those in other Pacific Island nations. Despite the increasing role of plantations, two-thirds of processed products (sawnwood and plywood/veneer) are still based on raw material from natural forests. No data are available on the production and trade of mahogany, since harvesting only began in 2003.

In 2001, pine woodchips accounted for 58% of forest products' export earnings, followed by sawnwood and wood-based panels. A small amount of high-quality furniture is also exported, along with small quantities of sandalwood and logs and slabs of *Samanea saman* (rain tree). According to an ITTO diagnostic mission, Fiji is a timber-surplus country and export markets are the key to the sustainability of the forestry sector^b.

Non-wood forest products. NWFPs are of great importance, especially to rural communities. Many plants are used as foods, medicines, construction and roofing materials, artisanal products and dyes, and in ceremonials and rituals. Wildlife, especially pigs, is a valuable source of food. Mud crabs, lobster and shellfish are harvested from the mangrove forests. Stems of tree ferns are collected from forest areas and made into ornamental posts, which are widely used. Some plants, such as *Piper*

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
241	3	18	37	55 ^d

methisticum (yaqona), from which the mild narcotic beverage kava is made, are now largely cultivated, but others are still collected from the wild. A few are marketed, such as *Morinda citrifolia* (nono), which is widely and increasingly used as a medicinal plant with huge potential in international markets, and *Santalum yasi* (sandalwood). Along with tuber crops, *Artocarpus utilissimus* (bread fruit) is a staple food. Another item of ceremonial and niche-market significance is bark-cloth made from the bark of *Broussonetia papyrifera* using natural dyes such as those from *Elaeocarpus pyriformis* and *Aleurites triloba*.

Forest for protection

Soil and water. Land-use practices pay attention to the need for soil and water conservation. Some 241,000 hectares of forest are classified as protection forests, mainly located on steep land with slopes over 30 degrees and with shallow unstable soils.

Biological diversity. There are an estimated 455 species of amphibians, birds, ferns, mammals, palms, reptiles and trees in Fiji (FAO 2001). Five mammals, 14 birds, six reptiles, one amphibian and 66 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, two mammals, eleven birds and one amphibian are found in forests (IUCN 2004). Forty-one plants are listed in CITES Appendix II (CITES 2005). *Santalum yasi* is the most endangered tree species in dry forests, being limited to a small relict population. Little political attention has so far been paid to the protection of forests for their biological diversity, but the rural land-use policy for Fiji now being considered by government may address the issue.

Protective measures in production forests. The prevention of soil erosion has long been a national priority because of the risk of flooding, siltation and damage to coastal ecosystems. Nevertheless,

present forest extraction techniques still damage the soil. Policy and codes of practice are exemplary; implementation is seriously at fault^b.

Extent of protected areas. The total extent of the protection PFE is an estimated 241,000 hectares, although only a fraction of this is formally designated as protected area. According to UNEP-WCMC (2004), about 3,000 hectares of forest are in protected areas that conform to IUCN protected-area categories I-IV, 900 hectares of which are lowland evergreen broadleaved rainforest. Environmental management is integrated into planning and development. The main concerns in conservation areas are the control of encroachment and the maintenance of boundaries. Issues in new conservation sites include conflicts of interest among landowning units and the payment of adequate financial compensation to landowners.

Estimate of the area of forest sustainably managed for protection. The estimated area of protection PFE under SFM is at least 55,000 hectares (Table 4). This comprises 37,000 hectares of legally designated protected areas, all of which have management plans, and 18,000 hectares of mangrove forests that were set aside in 1999 as soil and water protection forest.

Socioeconomic aspects

Economic aspects. Timber is Fiji's third-largest export commodity, accounting for 2.5% of GDP (ADB 2003) and providing employment for about 3,000 people^b. In 2003, the export of sawnwood, plywood and veneer was worth an estimated US\$7 million; significant export income was also earned from woodchips and a small quantity of value-added products (ITTO 2005). The mahogany plantations have enormous value-adding potential. The forest sector is an important generator of government revenue, and the royalties paid to customary owners provide a significant proportion of rural income.

Livelihood values. The culture and livelihoods of traditional landowning communities are closely linked to their forest resources. It is difficult to quantify this value.

Social relations. The system of land tenure in Fiji was introduced in colonial times, based on a local traditional system, and continues to be fraught with difficulty. For example, in developing leasehold arrangements with potential forest developers, a majority of individual members of a *mataqali* must agree to the proposal to the satisfaction of the NLTB^b. The government is promoting community participation in the development of woodlots by landowners; about 100 hectares of woodlots are developed each year. Work in landowner awareness by the Forestry Department is being complemented by an ITTO project on landowner training and education in SFM. There have been tensions over control of the mahogany resource.

Summary

Timber is Fiji's third-largest export commodity and the sector still has considerable growth potential. However, land-use conflicts arising from the pattern of ownership have contributed to the degradation of the forest resource, particularly in natural forest, and have often been viewed as a major constraint to SFM. Other constraints include a lack of convincing evidence for the financial potential of the natural resource (and therefore the continued conversion of forests to various types of non-forest use), an inability to control the standards of logging in natural forests, and inadequate product supply and market research. Fiji's substantial mahogany plantation estate, if well managed and marketed, will be a significant driver of development.

Key points

- Because of the special conditions of land ownership there is no formal PFE, but some forests have equivalent status; an estimated 354,000 hectares may be regarded as a nominal PFE.
- None of the natural production forest (none of which is considered part of the PFE) is considered to be sustainably managed.
- Generally, the standard of logging is low. At least 55,000 hectares of protection PFE are estimated to be managed sustainably.
- Fiji has 55,000 hectares of plantation of the high-value species *Swietenia macrophylla* (mahogany) and there are plans to continue to expand this estate. Harvesting began in 2003; how the mahogany resource is managed and marketed will have a large bearing on the future success of the Fijian timber industry.
- Fiji also has a significant softwood plantation resource, which currently supplies about two-thirds of industrial timber.
- With some additions, Fiji continues to use its forest policy developed in 1950 as the basis of forestry, but implementation is guided by the priority now given to forest development based on exports. A review of the policy was completed recently.
- Apart from the conservation and expansion of forest cover, the forest policy focuses mainly on the efficient processing and manufacture of value-added products and training in forest industries.
- Fiji is a net exporter of wood products, including pine chips, sawnwood and wood-based panels. There is a small export trade of high-value finished products. The expansion of the export of these could make a significant contribution to the economy, particularly when mahogany timber is put on the international market.
- The forest area designated as 'protected' within IUCN categories I–IV is 3,000 hectares, although an area of 241,000 hectares has been broadly described as protection forest.

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INDIA



* For legend see page 58

Forest resources

India has the world's second-largest population, with about 1.1 billion people, and a land area of 316 million hectares. Over 40% of the population lives below the poverty line as defined by the World Bank (with an income of US\$2 per day or less). Systematic, consistent and accurate information on the geographic extent and physical condition of the country's tropical forest is lacking. According to FAO (2005a), the area under effective forest cover in India is 64.1 million hectares (20% of the land area), of which 31.5 million hectares (49%) is under natural forest cover and agroforestry. On the other hand, FSI (2003) estimated the forest area at 76.8 million hectares, although this probably includes significant areas with no forest cover. These estimates include substantial areas of forest north of the Tropic of Cancer and, therefore, not tropical by the ITTO definition.

India was the only country for which information was not available for this report through at least one of a C&I report, an ITTO mission and/or a national workshop on the ITTO C&I, although both a mission and workshop are planned for 2006. Much of the information contained in this profile has therefore been obtained from secondary sources and personal communications.

Forest types. About 60% of India's forest estate is categorized as closed and 40% as open (FAO 2001). Tropical moist forests account for about 13% of the total forest area. Tropical wet evergreen forests occur in the south, the northeast and in the Andaman and Nicobar islands. The most widely distributed genera are *Dipterocarpus*, *Hopea*, *Callophyllum* and *Syzygium*, and the families Lauraceae and Myrtaceae are also well represented. Tropical moist deciduous forests occur in areas with monsoonal rainfall; some of these are characterized by *Tectona grandis* (teak) and others by *Shorea robusta* (sal). Mangrove and swamp forests are common in southern India.

Dynamics of forest resource change. During the 1970s, India's annual rate of deforestation was 1.3 million hectares (IIFM 2002). In the 1990s, the situation is said to have changed to one of net gain through extensive afforestation. According to FAO (2001), while natural forest was lost at an annual rate of 1.90 million hectares during the 1990s, the area under planted forest increased at an annual rate of 1.93 million hectares. The net gain shown in forest area is somewhat artificial, however, because of the inclusion of rubber plantations, farm woodlots and home gardens as forests, which hitherto were considered to be outside the definition of forest. Continuing deforestation and the practice of moving the boundaries of government forests have made the security of forest resources tenuous.

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural tropical forest ('000 hectares) Source: derived from FAO 2001	PFE ('000 hectares) ^{d, *}			
		Production		Protection	Total
		Natural	Planted		
64.1–76.8 *	22,500	13,500	32,600	25,600	71,700

* Tropical and non-tropical

Permanent forest estate. According to the Ministry of Environment and Forests (MOEF 1999), 13.5 million hectares of India's forests are categorized as production forest, 10 million hectares as protection forest, 15.6 million hectares as national parks and wildlife sanctuaries, and 25 million hectares as social forest. The area of natural-forest PFE is therefore estimated to be 39.1 million hectares, comprising 25.6 million hectares of protection forest and 13.5 million hectares of production forest^d. Separate data for the tropical forest PFE are not available; the estimate of PFE in Table 1, therefore, covers India's entire forest estate, including subtropical and temperate forests.

Planted forests. In 2000, there were an estimated 32.6 million hectares of planted forests (FAO 2005). About 25% of all plantations (8 million hectares) are in private, communal and non-forest public land (MOEF 1999). Fifty per cent of plantations established since 1980 are in an agroforestry environment, with varying intensities of management (ibid.). The planting rate in 1990–2000 was estimated to be 1.51 million hectares per year (FAO 2001). Private planting is believed to exceed public planting. India also has an estimated 560,000 hectares of rubber plantations (ibid.).

Institutional arrangements

Forest tenure. All legally constituted forests are under the ownership and control of state governments. With farmers and households increasingly engaged in tree-growing, a new and important category of private forest owners (of farm forests, home gardens and agro-industrial plantations) is emerging.

SFM policy framework. India has not yet established a comprehensive SFM framework for the different kinds of forestry taking place in the country. A set of C&I for sustainably managing the dry-zone forests of India has been developed under the Bhopal-India Process initiated by the Indian Institute of Forest Management in 1998, and a similar process is under way for tropical forests under an ITTO project (PD 37/00).

Forest policy and legislation. The national forest policy dates from 1988 and there have been no major changes since. The policy stresses: the

maintenance of environmental stability and the restoration of ecological balance; the conservation of the country's natural heritage and biodiversity; improved soil and water conservation; increasing forest cover through massive afforestation and social forestry programs; providing for the basic needs of rural and tribal populations; increasing forest productivity; improving the efficiency of forest product utilization; and minimizing the pressure on existing forests. The policy stipulates that industrial wood needs should be met increasingly by farm forestry. In tune with these policy objectives, India formulated a national forestry action program (MOEF 1999), but this has not yet been put into full operation.

The guiding legislation still current in India is the Indian Forest Act of 1927 (amended in 1951). While policies have undergone changes, the legislation has not changed correspondingly and it continues to focus on the prevention of offences. Other national legislation relevant to forestry includes: the Mines Act of 1952; the Wildlife (Protection) Act of 1972, which has been recently amended; the Forest Conservation Act of 2003; the Environmental Protection Act of 1986; and the Biological Diversity Act (2002).

Within the country's federal structure, forestry is a 'concurrent subject'; both state and national governments are jointly responsible for the sustainable management of the forest resource. State governments generally have the freedom to manage the forest resources on the basis of forest management plans. However, under the Forest Conservation Act of 2003 (Paragraph 6), state governments must obtain prior approval from the national government for any forest clearance for non-forestry purposes.

Institutions involved in forests. At the national level, forestry falls under the purview of the MOEF; there are also forest departments at the national and state levels with defined functions and responsibilities. While at the national level the role of the Forest Department is mostly the provision of advice and guidance, the state forest departments are custodians of the public forest resource and act as the forest authorities. Often they also perform an enterprise function, becoming involved in production, processing and trade. All the forested states of

India have set up forest development corporations, which are responsible for production within the public forest estate. These corporations are meant to operate as autonomous business entities, but, in effect, most of them function as extensions of the forest departments. A number of specialized institutions are linked directly to the MOEF. These include the Indian Council of Forestry Research and Education the Indian Institute of Forest Management the Indira Gandhi National Forest Academy, the Wildlife Institute of India and the Forest Survey of India.

The National Afforestation Programme (NAP), initiated in 2000, amalgamates all the previous centrally sponsored forest programs except parks and wildlife conservation. The NAP is implemented in a decentralized manner through forest development agencies (FDAs). FDAs, which are different entities to the forest development corporations referred to above, are autonomous entities at the level of forest divisions in which all the village forest committees (VFCs) within the respective forest division are represented. The central government transfers funds directly to the FDAs. FDAs are thus an institutional arrangement to implement the NAP on the basis of micro-plans developed for that purpose. The program of the NAP has effectively been taken up in all states of India since 2002.

Joint forest management (JFM), which was formally introduced by the 1988 national forest policy, is implemented through the involvement of local communities at the village level and through FDAs at the district level. JFM is a forest management strategy by which the forest department and a village community enter into an agreement to jointly protect and manage forest land adjoining villages and to share responsibilities and benefits. JFM has spread throughout the country, covering over 17 million hectares of forest (IIFM 2002). Around 63,000 VFCs in 27 states are engaged in the protection and regeneration of degraded forests in return for certain usufructuary rights and other benefits. Constitutional Amendment No 73 provided for the transfer of ownership of NWFPs to *Gram Sabhas/Panchayats* (village assemblies) in states with sizeable tribal populations. One criticism of JFM was that it covered only the protection and

maintenance of degraded forests. To correct this, in January 2000 the government of India issued a circular concerning the extension of JFM to better-stocked forests. Moreover, it provided for the mandatory (50%) involvement of women in JFM activities.

India has many national- and state-level NGOs involved in forestry, wildlife conservation, environmental protection and community development. They play a crucial role in capacity-building and in the implementation of JFM. A number of forest-related international NGOs are also active in India.

Status of forest management

Forest for production

India follows a system of preparation and periodical revision of working plans or management plans for established forest divisions or FMUs. It has been reported that 72% of all India's forests were under prescriptions of working plans in 2000, up from 54% in 1980 (FAO 2001). Nearly 10 million hectares of the production PFE are thought to be currently under such plans, almost half of which have been so managed for more than 30 years^d.

The management of government forest land is the direct responsibility of the public forest administrations. All or most technical operations are undertaken by the state forest departments, employing a permanent or temporary labour force, or through specific job contracts or partnership arrangements. In some cases, industrial units are allowed to extract trees marked under a selection system. There are no long-term timber concessions of the kind practised in Southeast Asian countries. In recent years, logging in natural forests has been discouraged and, in several cases, locally banned. The resulting wood scarcity has provided impetus for the development of farm forestry, homestead forestry and agroforestry. Ninety per cent of forest-based products are manufactured in the private sector. During the last 30 years, several innovative arrangements for greater community participation have been introduced, including JFM, community forestry, out-grower tree-farming, company-community partnerships and cooperative enterprises.

Table 2 Some commonly harvested tropical timber species for industrial roundwood (2002–2004)*

Timber species	Remarks
<i>Eucalyptus</i> spp	For pulp, board and cheap timber
<i>Acacia</i> spp	Pulp and rural construction timber
<i>Dalbergia sissoo</i>	Average quality timber used in woodworking
<i>Tectona grandis</i>	High-quality, high-price timber
<i>Shorea robusta</i>	Quality construction wood

* Source: ITTO 2004a, 2004b

Illegal logging, forest encroachment, the poaching of animals and other illegal activities thrive due to weaknesses in control (Ahmed 1997). Policy and legal instruments are not supported by effective enforcement. Logging is banned in many natural forests, but there are no adequate measures to enforce the ban, thus leading to further forest degradation (ibid.).

Silviculture and species selection. Several different silvicultural systems are followed in India, including a selection system, a shelterwood system, clearfelling and artificial regeneration with valuable species, coppicing, afforestation with exotics to reclaim grasslands, line and block plantations in farms, and agroforestry systems. Table 2 shows five important tropical timber species in production and trade. Other common species include *Hevea brasiliensis* (rubber), *Terminalia paniculata*, *T. tomentosa*, *Grewia* spp, *Xylia xylocarpa*, *Adina cordifolia*, *Artocarpus integrifolius*, *Pterocarpus* spp, *Gmelina arborea* and *Lagerstroemia lanceolata*.

Planted forest and trees outside the forest. Of the estimated planted forest area of 32.6 million hectares, nearly 45% is accounted for by fast-growing (and short-rotation) species of *Eucalyptus* (*E. grandis*, *E. tereticornis*) and *Acacia* (*A. auriculiformis*, *A. mearnsii*, *A. nilitica*) (FAO 2001). Teak accounts for about 8%; other common hardwood species are *Albizia* spp, *Azadirachta indica*, *Casuarina equisetifolia*, *Dalbergia sissoo* and *Gmelina arborea*. Pines and other conifers make up about 10% of the planted forest estate and the remainder are other broadleaved species. While impressive in area, the performance of forest plantations in terms of survival,

growth and yield has often been poor due to inadequacies in site selection and site-species matching, poor planting stock and a lack of maintenance and protection (Saigal et al. 2002).

Since the mid 1980s, most of the plantations have been established under social forestry schemes on community and private land outside the forest area. In recent years, the national forest policy has directed the forest-based industry to obtain their raw material from local private sources. This has prompted some large pulp-and-paper companies to promote farm forestry through the extension of technology for establishing clonal plantations, and a buyback guarantee for the pulpwood produced (outgrowing schemes). A large number of tree-farming and agroforestry enterprises have sprung up all over the country. Private tree-planting now covers an area of over 6 million hectares (Saigal et al. 2002).

Forest certification. There are no formal bodies or systems for forest certification. The certification of products manufactured with wood from non-forest sources (eg rubberwood) by external certification bodies/agencies is reportedly taking place, but details are not available.

Estimate of the area of forest sustainably managed for production. Close to 10 million hectares of the production PFE are being managed under regular working plans, of which at least 4.8 million hectares can be considered to be sustainably managed^d. This area comprises forest reserves that have been managed according to working plans for more than 30 years. In addition, an area of about 8.15 million hectares of planted forests are intensively managed for timber production.

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
13,500	13,500	9,720	0	4,800 ^d	32,600	8,150	0

Timber production and trade. About 50% of India's wood supply is provided by non-forest sources. The rest is accounted for by imports and supply from public forests, mainly forest plantations. India's official total roundwood production in 2003 was 296 million m³, of which 277 million m³ (94%) was fuelwood (FAO 2005b). Total production of tropical logs was an estimated 14.0 million m³ in 1999 and 13.5 million m³ in 2003 (ITTO 2004a, 2005). Tropical sawnwood production declined by an estimated 12% in the period 1999–2003, from 6.8 to 6.0 million m³, while the production of tropical veneer jumped from 15,000 m³ in 1999 to 246,000 m³ in 2003, and tropical plywood from 300,000 m³ to 1.76 million m³ (ITTO 2004a, 2005).

India is the world's third-largest importer of (particularly tropical) logs, importing 2.69 million m³ in 2003, up from 1.98 million m³ in 1999 (ITTO 2004a, 2005). These logs come mainly from Malaysia, Myanmar and, increasingly, from Africa. The value of imports of all primary forest-based products in 2003 was US\$596 million, of which US\$567 million was tropical (ITTO 2005). According to a recent report (ITTO 2004b), the Indian timber market is highly disorganized, reducing timber's competitiveness against substitute products.

Non-wood forest products. NWFPs such as bamboo (eg *Melocanna baccifera* – muli), thatching materials and medicinal plants are essential components of the livelihoods of many local communities. Some NWFPs, such as latex, bamboo, gums, sandalwood, resins and aroma chemicals, support value-added processing, niche marketing and export trade. NWFPs contribute over 75% of total forest export revenue in India and add significantly to the income of about 30% of rural people. Recently a national bamboo mission was launched to establish about 5 million hectares of bamboo plantations. A national

medicinal plant board and state medicinal plant boards have been set up to promote the sustainable management and trade of medicinal plants.

Forest for protection

Soil and water. The federal government emphasizes the environmental protection and conservation roles of forest in preference to their economic role. Measures are being taken to protect upland watersheds through forest conservation and afforestation. Data on the extent of forests managed primarily for soil and water protection are not available.

Biological diversity. India is one of the twelve mega-biodiverse countries, hosting 7% of the world's biodiversity and supporting 16% of major forest types. Eighty-nine mammals, 83 birds, 26 reptiles, 66 amphibians and 247 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 56 mammals, 48 birds, one reptile, 62 amphibians and two plants are found in forests (IUCN 2004). Thirteen plants are listed in CITES Appendix I and 484 in Appendix II (CITES 2005).

Protective measures in production forests. India's 1988 national forest policy requires that production forests are managed in ways that are consistent with environmental conservation, and this stipulation must be reflected in the prescriptions and practice of working and management plans.

Extent of protected areas. Protected areas in India cover about 15.6 million hectares, comprising 83 national parks, 447 wildlife sanctuaries and 23 tiger reserves (Ahmed 1997). The condition of several protected areas is poor because of fire, grazing and inadequate management; most are not covered by management plans (MOEF 1999). The straying of some animals from protected areas – notably tigers, elephants and some grazing mammals – causes

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
25,600	3,060	n.d.	n.d.	n.d.

tensions in communities living adjacent to such protected areas. According to UNEP-WCMC (2004), 3.06 million hectares of tropical forests are in protected areas that conform to IUCN protected-area categories I-IV, of which deciduous/semi-deciduous broadleaved forest accounts for 1.72 million hectares and lowland evergreen broadleaved rainforest 334,000 hectares.

Estimate of the area of forest sustainably managed for protection. Insufficient information was available to estimate the extent of the protection PFE managed sustainably.

Socioeconomic aspects

Economic aspects. Forestry's contribution to GDP fell from about 2.9% in 1981 to 1.7% in 1991 and to around 1% in 2001 (FSI 2003). This figure excludes the contributions of forest-based industries (which are counted under manufacturing). It is estimated that about 7.5 million people, mostly in rural and tribal settings, are in forest-related employment (ibid.).

The lack of a system of forest resource accounting is a major deficiency. For example, the value of forest-provided benefits – including wood products, fuelwood and charcoal, non-wood construction material, forest grazing and forest fodder, food and medicinal plants – was estimated to be US\$43.8 billion annually in the 1990s (National Forestry Action Plan, reported in FSI 1999), against a reported GNP share of forestry of US\$2.9 billion in 1993.

Livelihood values. About 400 million people in India live below the poverty line. Many live in mountain, upland and ecologically fragile areas, and forestry is often one of the main sources of employment and income. A new concept (initiated in the states of Madhya Pradesh and Chhattisgarh) is the 'people's protected area' (PPA). PPAs are based on a sustainable livelihood approach allied with biodiversity conservation and involve conservation and development

combined with the non-destructive and sustainable harvesting of NWFPs.

Social relations. Local rights govern the use of forest resources by rural and tribal communities living in and near the forests. The plight of most of these communities is one of great hardship and requires the settling of tenure issues and the rationalization of the system of people's participation in forestry. JFM is India's flagship program in people's participation and it has the support of the national forest policy. But the program has several constraints that call for attention. For example, a general complaint is that government officials still play an overpowering role in decision-making and their dominance in the governing bodies makes people's participation less effective (Saigal et al. 2002).

Summary

In India, state forest departments are custodians of the public forest resource and act as the forest authorities. Timber production is shifting away from natural forests, stimulating the development of community-based approaches. All forest states have set up forest development corporations, which are responsible for production within the public forest estate. Increasingly, some responsibilities for and benefits from the forests are being shared with local communities. For example, joint forest management, which usually involves an agreement between the forest department and a village to jointly protect and manage forest land, has become widespread. Moreover, farmers are becoming more involved in tree-growing, the private sector is participating more in forest management, and partnerships between forest-product manufacturing companies and local farmers are developing. However, several components of SFM are still missing, including an accurate inventory of resources, the classification of land by capability and function, efficient utilization and sustained investment.

Key points

- The estimated 39.1 million hectares of India's natural-forest PFE comprises 13.5 million hectares of production forest and 25.6 million hectares of protection forest. Not all of this PFE is tropical.
- There are also 32.6 million hectares of planted forest in the PFE.
- While there was a net positive change in the area of forest during the 1990s, natural forest continues to be lost or degraded.
- In production forests, India follows a system of preparation and periodic revision of working plans.
- Information on the extent and management of forests is fragmentary at best, and often unreliable.
- Nevertheless, it is estimated that at least 4.80 million hectares of natural-forest production PFE (tropical and non-tropical) are being managed sustainably; insufficient information was available to estimate the area of protection PFE so managed.
- The condition of several of the protected areas is poor because of fire, grazing and inadequate management.
- Forest management is becoming increasingly decentralized and community-based approaches are becoming more common.
- A national afforestation program was initiated in 2000 and operates at the level of forest divisions within states through forest development agencies and village forest committees.
- India's wood-based industries face a serious scarcity of raw materials and, increasingly, they depend on non-forest and external sources. The country has become a major importer of tropical timber, particularly logs.

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INDONESIA



*For legend see page 58

Forest resources

Indonesia is a 5,200-km-long chain of some 17,000 islands straddling the equator in the heart of Southeast Asia. Its 220 million people live on a land area of about 188 million hectares. Indonesia is very diverse in geology and biology and the home of many cultures. It also has a considerable range of climates, from equatorial – with rainfall evenly distributed throughout the year – in Kalimantan, Sumatra and West Irian, to those with a pronounced dry season (such as in Java and the Moluccas). Soils range from the rich volcanic soils of Java and Madura to the leached lateritic soils of Kalimantan. Equally varied are population densities, land-uses and forest practices. In Java, for example, with 950 persons per km², home gardens and trees outside forests supply a significant portion of wood demand. In Kalimantan, on the other hand, the population is sparser, and large-scale commercial forestry in

natural forest is often the norm. Estimates of forest area range from 105 million hectares (FAO 2005a) to 120 million hectares^a; given the political, social, economic and environmental changes that have taken place in Indonesia in recent years it is likely that both these over-estimate the current extent of forest in the country.

Forest types. About 88% of forest cover is classified as tropical moist forest. For the purposes of management, six types are distinguished: mixed hill forests, sub-montane/montane and alpine forests, savanna/bamboo/deciduous/monsoon forests, peat swamp forests, fresh water swamp forests, and tidal forests (mangroves). Mixed hill forests account for about 65% of the natural forests and are the most important for timber production.

Dynamics of forest resource change. There has been a rapid loss of forest cover in the last 40 years; the average annual loss between 1990 and 2000 was an estimated 1.3 million hectares (1.2%) (FAO 2005a).

In the last 20 years, periodic serious fires have affected large areas of forest, especially in Kalimantan and parts of Sumatra. These have been partly influenced by the El Niño/Southern Oscillation phenomenon and aggravated by land clearance, the accumulation of combustible matter after logging, disputes over land tenure and the presence of burning coal seams in the surface strata.

Permanent forest estate. The forests of Indonesia have been classified by function as production, protection and conservation forests; forests earmarked for conversion are available for wood production until converted to other uses. About 44% of the forest area is reported to be production forest, 27% protection, 8% conversion and 21% conservation. According to official sources^a (see also Chrystanto & Justianto 2002), the area of PFE is

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^d			
		Production		Protection	Total
		Natural	Planted		
105–120	100,382	46,000	2,500	22,500	71,000

112.2 million hectares, comprising 109.7 million hectares of natural forests (protection forest 33.5 million hectares, conservation forest 20.5 million hectares and production forest 55.7 million hectares) and 2.5 million hectares of plantations. However, these figures are probably based on old records and represent the area allocated to the PFE but not necessarily the extent of forest within that area. Table 1 shows an ITTO estimate of the current PFE. An estimated 81% of the external boundaries of the official PFE have been demarcated^a.

Planted forests. The area of planted forests in 2000 was estimated by FAO (2001) to be about 6.4 million hectares, but only 2.5 million hectares of these appear to be productive timber plantations^{a,b}. The total area is classified as: industrial forest plantations (*hutan tanamaan industri* – HTI), non-industrial (protective) forest plantations, social forestry, and enrichment planting. There are also plantations of agro-industrial crops that may become increasingly important in timber supply, including 3.48 million hectares of rubber (FAO 2001).

Institutional arrangements

Forest tenure. Article 5 of the 1999 Forest Law (see below) sets out two types of forest tenure: state and titled. A titled forest is a forest located on land on which the land title is registered. Traditional community rights (*adat*) to forest resources are also widely recognized based on the Customary Act of 1999. In the past, land settlement and the designation of forest were arbitrary, leaving unsettled a large number of claims by individuals and communities over traditional rights, ancestral domains and tenure.

SFM policy framework. Indonesia demonstrates its commitment to establishing SFM through its membership of many international organizations and its adherence to all relevant major international conventions. It has established its own C&I, developed national standards for forest certification and introduced the mandatory verification of SFM^a.

Forest policy and legislation. For many years, the legal and policy framework of Indonesia's forestry was provided by the Basic Forestry Law of 1967 (5/1967). This was replaced by Forestry Law 41/1999, which is now the primary source of authority and guidance on forest stewardship,

forest ownership and forest management. It also provides for forestry decentralization and community participation. Other relevant policy and legal instruments include: Law No 5/1990 on the conservation of natural living resources and their ecosystems, Law No 24/1992 on spatial planning and Law No 23/1997 on environmental management. The Forest Strategic Plan (*Renstra*) (2001–2005) aims to: (i) improve the quality and productivity of the forest resource; (ii) reduce the rate of forest resource degradation; (iii) implement SFM; and (iv) increase the contribution of the forest resource to the national economy and to community prosperity.

In 2001, Indonesia established a working group to develop a national forest program. It has engaged in wide consultations but has not yet adopted a common program for the management and conservation of its forests.

Institutions involved in forests. Forest management is generally undertaken by private companies, although six state enterprises currently operate about 12% of the country's concession area. Before decentralization, the Ministry of Forestry (MoF) in Jakarta was responsible for the management and control of forests and the conservation of natural resources. At the provincial level there were two different forestry offices: regional forestry offices (*kanwil kehutanan*) and provincial forestry offices (*dinas kehutanan propinsi*). The former, as an extension of the MoF, coordinated all technical aspects of forestry in the provinces. At the district level there were also two agencies dealing with forestry; one was responsible to the district government and the other was a sub-office of the provincial forest service. This dual control system came to an end in 1999 with the enactment of laws 22 and 25; MoF now has a much reduced role in the field, and authority over forest management is vested in the provinces and particularly the districts (*kabupaten*). Several national-level departments also have a forestry role, such as the departments of trade and industry, agriculture, transmigration and forest settlement, and mines and energy. An Inter-departmental Committee on Forestry was established in October 2000 to coordinate long-term policy and planning.

Decentralization in forestry covers forest production, the servicing of forestry businesses and the protection of forests dedicated to ecosystem and

biodiversity conservation. All forest land except national parks and nature reserves are to be managed by the *kabupaten* governments. Under Law No 22/1999, there is no hierarchical relationship between the central departments, the provincial forest services and the district forest services.

For many years, international NGOs have pressed for forest policy reform; this role has largely been assumed and greatly expanded by Indonesian NGOs. Networks link many hundreds of NGOs; prominent are WAHLI (Indonesian Forum of Environmental NGOs), KPSHK (Community Forest System Development Group), JKPP (Participatory Mapping Network), WWF Indonesia and the Association of Indonesian Forest Concessionaires, an industry body.

Status of forest management

Forest for production

All production forests within the PFE are covered by management plans^a. However, efforts to manage these forests sustainably are undermined by (among other things) the large discrepancy between the timber requirements of the existing wood industry and the estimated sustainable timber supply. At a policy level, the national AAC was reduced from 22 million m³ in the 1990s to 5.6 million m³ in 2004, but much timber still comes from illegal sources^{a,b}. Any reduction of timber production will further widen the divergence between timber supply and demand.

In order to open up the huge and valuable forest resource outside Java, Indonesia enacted legislation in 1967 to encourage the participation of private investors. The natural forests began to be harvested on a large scale in 1969 once the government began issuing forest concessions. Under the concession system, the management and extraction of public forest resources can be undertaken by state companies, companies owned by regional administrations, national private companies, cooperatives or foreign private companies with Indonesian legal status. The concession system is also used for raising and managing forest plantations (HTIs) and for other forestry enterprises. There are two categories of concessions for logging in natural forests: forest concession rights (*hak pengusaha hutan* – HPH), and forest products collection rights (*hak pemungutan hasil hutan* – HPHH); the latter ceased to be

issued after July 1989. HPH rights are for large concessions and run for periods of up to 20 years, recently increased to 55 years for natural forests and 100 years for plantations under Governmental Regulation No 34 (2002). After decentralization, HPHHs were revived in the form of log exploitation permits (*izin pemanfaatan kayu* – IPK). By the early 1990s, the number of HPHs had reached 584, with a total area of about 68 million hectares. The recorded production of industrial wood increased from 5 million m³ in 1965 to about 47 million m³ in 1990, a trend which led to the development of forest industries based on ‘supply-push’^b. In 2001, there were 354 HPHs and 102 HTIs covering 39.3 million hectares^a.

In general, Indonesian forest management needs urgent strengthening. Many of the concessions do not have clearly demarcated boundaries, and forest fires, illegal land clearance and shifting cultivation are widespread. Illegal logging is now recognized as one of the most critical problems of forestry and the forest industry in Indonesia^a; according to some reports, the volume of illegal logging exceeds legal production^b.

Under the concession system, the value of timber harvested by the concessionaires is realized by the government as stumpage/royalty and other charges or levies. For the whole of Indonesia the rent capture (often a reflection of efficiency) in logging concessions during 1997–98 was 24–36% (average 30%), leaving 64%–76% to the concessionaires^b. Because log exports have been prohibited since 1985 and rough-sawn timber exports since 1992, the main avenue for timber companies to capture rent is through the export of plywood. The same top five companies that dominate in concession holdings have obtained a similar market share in the plywood factories.

Decentralization has tended to add to the confusion surrounding Indonesian forest management. For example, many local governments do not fully recognize nationally designated land-uses such as concession areas. Instances have been reported in which small-scale operators have been granted forest concessions that overlap concessions designated by the national government; moreover, the capacity of local government to administer forest policies is often limited (Rukmantara 2003).

Table 2 Some commonly harvested species for industrial roundwood (2001–03)^{b,d}

Timber species	Remarks
<i>Shorea</i> spp (meranti)	Dipterocarpaceae, used for sawn timber and plywood
<i>Dipterocarpus</i> spp (keruing)	Dipterocarpaceae, used for sawn timber and plywood
<i>Dryobalanops</i> spp (kapur)	Dipterocarpaceae, used for sawn timber and plywood
<i>Anisoptera</i> spp (mersawa)	Dipterocarpaceae, used for sawn timber and plywood
<i>Tectona grandis</i> (teak)	From planted forests

Silviculture and species selection. Indonesia's forests contain about 4,000 tree species, 267 of which are traded^a. The most important are trees of the Dipterocarpaceae family. Table 2 shows five of the most important harvested species; others include species of *Koompassia*, *Palaquium*, *Dyera*, *Calophyllum inophyllum* and *Octomeles sumatrana*. *Gonystylus bancanus* (ramin), a highly priced wood which was extensively logged in the past, is now listed in CITES Appendix II. The silvicultural system originally prescribed for logging in concession areas was 'Indonesian selective cutting' (*Tebang Pilih Indonesia* – TPI). Only mature and overmature trees conforming to prescribed conditions were to be removed. It was later realized that the concessionaires were only complying with the minimum felling diameter limit and ignoring the other requirements of the system (eg residual stand inventory, post-harvest tending and enrichment planting)^b. In 1989, MoF introduced the Indonesian Selective Cutting and Planting System (*Tebang Pilih Tanam Indonesia* – TPTI), which placed greater importance on natural regeneration and enrichment planting. A further modification, the Selective Cutting and Strip Planting System (*Tebang Pilih Tanam Jalur* – TPTJ), was introduced in the 1990s. It is thought that the TPTJ should be able to deliver both increased wood production and enhanced environmental conservation if properly implemented.

Planted forest and trees outside the forest. Important planted species are teak (1.47 million hectares), *Pinus merkusii* and other pines (0.77 million hectares), *Acacia* spp (0.64 million hectares), *Eucalyptus* spp (0.13 million hectares), and other broadleaved species (3.39 million hectares) including *Gmelina arborea*, *Albizia* and *Melaleuca*. Many species are also planted in homesteads and farms.

There is an apparent discrepancy in information on the extent of concessions allocated in plantations. According to one source there were 176 approved HTI concessions in 2000 with a land allocation of 7.76 million hectares^b, while another reported that the 102 HTIs in 2001 covered an area of 2.50 million hectares^a. The overall performance of HTIs has not been satisfactory, although of a higher standard in the case of pulpwood^b. A recent evaluation of 65 HTIs recommended the continuation of only 30 (MoF 2003).

Forest certification. A system of timber certification has been developed through the Indonesian Ecolabelling Institute (*Lembaga Ekolabel Indonesia* – LEI). Established in 1993, LEI has devised C&I for the auditing of forest management in logging concessions and the ecolabelling of products from these concessions. LEI has also recently developed chain-of-custody certification and a log audit system in an effort to stamp out illegal logging and related irregularities. This system is to be implemented through accredited certification bodies. LEI has also developed C&I for planted forests, community-based forest management (CBFM) and 'legal origin verification'. In addition, LEI has developed a joint certification program (JCP) with the FSC. As of October 2005, an area of 274,598 hectares of mostly natural forest had been certified under JCP and the FSC (FSC 2005). Under the certification scheme for CBFM, two forests were certified as of October 2005 and three others were under assessment, although the area of forest covered by these was unreported^a. One forest-based business (PT Uniseraya) had gained a chain-of-custody certificate under the LEI scheme and 29 under the FSC^a. Certificates of legal origin verification, which use a log-tracking system to verify the source of timber, had been awarded to two companies in Riau^a.

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
46,000	43,200*	18,400	275	2,940	2,500	2,500	0.152

* 94% of production forests are allocated to concessions, although a considerable number of concessions were under suspension at the end of 2004

Estimate of the area of forest sustainably managed for production. MoF is undertaking a review of concessions and their compliance with the Indonesian C&I. During 2002–2004, 38 HPHs covering 4.20 million hectares were assessed and 25 of these covering 2.94 million hectares evaluated to have good to very good compliance; a further 53 HPHs were being assessed in 2005, but results were not available for this report (MoF 2005). To avoid possible double-counting, all the certified forest concessions are assumed here to be included in the figure of 2.94 million hectares and are therefore not added to the estimate of sustainably managed forest given in Table 3. The 98,000-hectare PT Hutanindo concession in Central Kalimantan, which is working with the Tropical Forest Trust (with ITTO support) to achieve a 'sustainable standard of forestry' and the 1.52-million-hectare Malinau (Bulungan) forest are considered to be well managed; however, these are also excluded from the estimate of sustainably managed forest in Table 3 because of the possibility of double-counting. If the assessment that 70% of concessions surveyed showed good to very good compliance to the Indonesian C&I was extrapolated to the entire production PFE, about 32 million hectares would be thus assessed.

Timber production and trade. Total wood production in 2003 was estimated to be about 120 million m³, consisting of 34 million m³ of industrial wood and 86 million m³ of fuelwood (FAO 2005b). ITTO (2004, 2006 in prep.) gives the total industrial log production in 2003 as 25.0 million m³, down from 33.2 million m³ in 1999; however, the volume of illegal logging may exceed the official cut^b. The annual area allocated for timber production is 367,450 hectares, comprising 252,780 hectares (69%) of natural forest and 114,670 hectares (31%) of plantations, contributing 85% and 15% respectively to log production^a.

In 2000, the wood-based industry contained 4,400 sawmills (installed capacity 19 million m³), 120 plywood mills (installed capacity 11.1 million m³), 39 particleboard mills, 102 blockboard mills, 13 chipmills, two MDF units, 81 pulp and paper mills (installed capacity 5.23 million tonnes of pulp and 9.12 million tonnes of paper), and a large number of secondary processing units^b. The output of wood-based primary processing industries in 2003 was: wood residues – 388,000 m³; sawnwood – 6.25 million m³; wood-based panel products – 7.33 million m³; wood pulp – 5.48 million tonnes; and paper and paperboard – 6.99 million tonnes (FAO 2005b). Indonesia is a net exporter of forest products. In 2003, the recorded export value of primary wood products (logs, sawnwood, veneer and plywood) alone was about US\$1.8 billion, down from US\$2.9 billion in 1999 (ITTO 2002, 2005). Exports are mainly directed towards Japan, Taiwan Province of China, China and South Korea; Japan is the main importer of Indonesian plywood. The wood-industry sector in Indonesia is undergoing restructuring. It suffers from over-capacity, a wood-supply deficit, unsustainable forest harvesting, a low level of capacity utilization, low efficiency and low competitiveness, among other problems^b.

Non-wood forest products. A wide range of NWFPs are produced in Indonesia – rattan, bamboo, *Nipa* fronds, *Metroxylon* spp (sago starch), resin from *Pinus merkusii*, *Shorea javanica* (damar mata kucing), copal, *Melaleuca* (kaya putih oil), *Santalum album* (cendana), *Aquilaria malaccensis* (agarwood), medicinal plants, fibres and fruits such as *Durio zibethinus* (durian). Wood-carving for souvenirs is important, using woods such as *Hibiscus tiliacculus*, *Manilkara kauki* (sawo kecik), *Artocarpus heterophyllus* (jackfruit), teak, sandalwood and ebony. One important forest service among many is carbon storage: the total carbon stored in the forests of Indonesia is estimated to be 92.5 billion tonnes^a.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
22,500	14,400	16,000	5,000 ^a	1,360 ^d

Forest for protection

Soil and water. Indonesia pursues integrated watershed management; some 28% of the total forest area is managed primarily for the protection of soil and water^a. Forest concession agreements have conditions covering the establishment of buffer strips along streams and protective belts along roads.

Biological diversity. With about 1.3% of the earth's land surface, Indonesia contains an estimated 10% of the world's plant species, 12% of mammals, 16% of reptiles and amphibians, and 17% of birds. Some 58,175 species have been identified^a. One hundred and forty-six mammals, 122 birds, 28 reptiles, 33 amphibians and 387 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 61 mammals, 113 birds, 31 amphibians and 16 plants are found in forests (IUCN 2004). Thirty plants are listed in CITES Appendix I and 1,023 in Appendix II (CITES 2005).

Protective measures in production forests.

In addition to stipulations for conservation measures contained in forest concession agreements, elaborate guidelines are set out in various forest regulations such as the forest law and Decree No 32 (1990) concerning the management of protected areas. Regulations include specifications for road construction, protective belts along the margins of streams/rivers and roads, the alignment of skid trails, directional felling, and enrichment and protective planting.

Extent of protected areas. Some 400 protected areas covering about 22.5 million hectares of forest (12.4% of land area) have been designated and gazetted as nature reserves, national parks, wildlife sanctuaries, forest parks, etc. Many of the protected areas are thought to be degraded, due largely to illegal activities^b. According to UNEP-WCMC (2004), 14.4 million hectares of forest are in protected areas that conform to IUCN protected-area categories I-IV, including 4.05 million hectares of lowland

evergreen broadleaved rainforest, 2.84 million hectares of upper montane forest, 2.13 million hectares of freshwater swamp forest, and a sizeable 3.03 million hectares of unclassified forest.

Estimate of the area of forest sustainably managed for protection. The management of the area of the protection PFE (Table 4) is, for the most part, problematic. Management plans have been prepared for the Betung Kerihun and Kayan Mentarang national parks on Borneo, which together cover about 2.18 million hectares of forest, and their management is being greatly strengthened under two ITTO projects implemented by WWF Indonesia and MOF's Directorate General of Forest Protection and Nature Conservation; a recent evaluation of the Kayan Mentarang project reported considerable progress and a positive outlook for the park. Management plans have also been prepared for some other national parks and efforts made to implement them (WWF Indonesia, pers. comm.). However, in general there is little information on the management status of the protection PFE. Therefore, the estimate given in Table 4, which comprises the Kayan Mentarang National Park only, is probably conservative^d.

Socioeconomic aspects

Economic aspects. Forests and forest industries make a substantial contribution to Indonesia's socioeconomic development. About 0.61% of the labour force (nearly 500,000 people) is directly employed in the forestry sector^a. In 2000, forestry contributed 1.17% of GDP (about US\$15 billion)^a, although this figure may not include the downstream-processing sector.

Livelihood values. An estimated 36 million people make use of forests and forestry for their livelihoods, some 4 million of whom are tribal families who depend entirely on natural forests for their income^a. Rural poverty is an important cause of illegal logging and unsustainable use.

Social relations. In many cases forest concessionaires have neglected or rejected the traditional rights of local communities; in some areas this has prompted such communities to collaborate with illegal loggers and/or to take revenge by damaging the forest^b. Some concessionaires are working towards repairing relations with local communities in an effort to improve acceptance of their activities^b. Decentralization has often complicated disputes over land and usufruct rights but in the long run could provide mechanisms for resolving them.

Summary

Indonesia's forest resource base is still vast, but it faces many threats that put its long-term sustainability in jeopardy. These include illegal logging; forest fires; deforestation through land encroachment; wasteful logging and processing; structural deficiencies and inefficiencies in forest industries; the indebtedness of forestry enterprises; unsettled land claims; inefficiencies in public forest administration, in particular in the process of decentralization; an inadequate base of human resources; inadequate monitoring and evaluation; and a lack of effective governance. On the other hand, significant progress has been made in the establishment of certification systems and information on the management of concessions is becoming increasingly available.

Key points

- The estimated 68.5 million hectares of Indonesia's natural-forest PFE comprises 46.0 million hectares of production forest and 22.5 million hectares of protection forest. There are also about 2.50 million hectares of productive timber plantations.
- The security and integrity of the PFE are affected by several factors, of which forest fire and encroachment are among the most important.
- Illegal logging in the PFE (both production and protection) is widely held to be a major problem.
- The Ministry of Forestry is undertaking a review of concessions and their compliance with the Indonesian C&I. This process has shed light on the status of management in the production PFE.

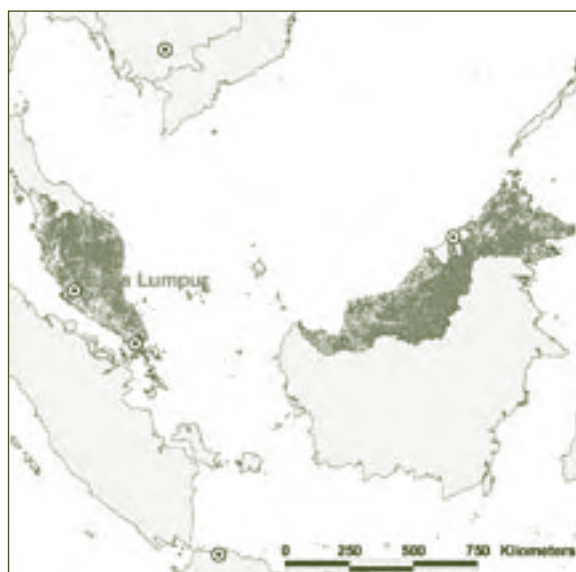
- It is estimated that at least 2.94 million hectares of natural-forest production PFE and 1.36 million hectares of protection PFE are being managed sustainably.
- Some 12% of the land area of Indonesia has been designated as protected areas. However, information on the management of a large part of the protection PFE is scarce.
- Forestry is undergoing a process of decentralization that has proven difficult partly because of a lack of capacity at the decentralized levels of administration and partly because of disharmony in the policies of central and local governments.
- C&I for SFM have been developed for the country and a certification regime designed. About 275,000 hectares have so far been certified.
- The prescriptions for the management of production forests are conceptually sound but implementation has been weak. Over-capacity and structural imbalances in the wood-processing sector have exacerbated the situation.

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MALAYSIA



*For legend see page 58

Status of forest resources

Malaysia has a land area of 32.9 million hectares and a population of about 25 million people. It is a federation of 13 states and comprises two distinct regions – Peninsular Malaysia, with eleven states, and the states of Sarawak and Sabah (East Malaysia) in Borneo. Estimates of the total natural forest area include 19.3 million hectares (FAO 2001) and 19.5 million hectares^a. Sarawak is the most forested state, with 75% forest cover; Sabah has 60% and Peninsular Malaysia 45%. With the inclusion of tree crops such as rubber, oil palm and coconut, the percentage of tree cover in Malaysia is 75.5%^a.

Forest types. Malaysia's forests are generally moist tropical forests, those in the lowlands and lower parts of the hills being dominated by Dipterocarpaceae. Of the estimated 17.1 million hectares of dipterocarp forests, 5.40 million hectares are in Peninsular Malaysia, 7.92 million hectares in Sarawak and

3.83 million hectares in Sabah^a. There are also 1.54 million hectares of peat swamp forest, 1.12 million hectares of which are in Sarawak. Mangrove forests cover about 567,000 hectares; more than half are in Sabah^a.

Dynamics of forest resource change. The average annual loss of forest during the 1990s was an estimated 237,000 hectares (1.2%) (FAO 2005), largely attributable to planned land-use change^a.

Wildfire damaged an estimated 164,000 hectares of forest in the five-year period to 2003; data on damage caused by encroachment, shifting agriculture or premature re-entry to logged areas were unavailable for this report^a.

Permanent forest estate. In 2003, the area of natural-forest PFE was 14.39 million hectares (44% of land area), comprising 3.21 million hectares (22.3%) of protection forest and 11.18 million hectares (77.8%) of production forest (Table 1). These forest lands are gazetted in accordance with the National Forest Act 1984 in Peninsular Malaysia and the relevant state forest ordinance/enactment in the states of Sabah and Sarawak. Peninsular Malaysia contains 4.85 million hectares (34%) of the PFE, Sabah 3.6 million hectares (25%) and Sarawak 6.0 million hectares (41%)^a. The area of gazetted PFE increased from 12.6 million hectares in 1990 to 14.4 million hectares today^a. Strong measures of surveillance, enforcement and deterrent punishment are in place to ensure the integrity and security of the PFE. Some 79% of the PFE boundaries have been surveyed and demarcated and are being maintained^a.

Planted forests. At the end of 2003, the total area of planted forest for marketable timber amounted to 263,000 hectares, of which 183,000 are inside the PFE^a. There are also about 5.27 million

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^a			
		Production		Protection	Total
		Natural	Planted		
19.3–19.5	19,148	11,200	183	3,210	14,593

hectares of commercial agricultural plantations – including oil palm, rubber, cocoa and coconut (MTC 2004). Many of these, especially rubber, are used for wood production in addition to agricultural use.

Institutional arrangements

Forest tenure. An estimated 98% of natural forest and 69.2% of forest plantations are state-owned; the remaining area is privately owned^a. The special rights of indigenous communities are provided in the Aboriginal Peoples Act 1954. In Sarawak, forests cleared by native communities for agriculture before 1958 are recognized as Native Customary Rights Land.

SFM policy framework. A national forestry policy (NFP) was adopted in 1978 as a framework for SFM; this was revised in 1992 in response to growing concern for the conservation of biological diversity, the sustainable utilization of genetic resources and the participation of local communities in forestry. The Malaysian C&I for SFM were developed in 2000 based on the ITTO C&I.

Forest policy and legislation. Under the federal constitution, land-use falls within the jurisdiction of the states. Each state is empowered to enact laws, formulate its forest policy and manage its forests. The federal National Forestry Act (1984) establishes the general rules on forestry and each state is empowered to enact laws and regulations in line with those rules. The federal government also provides advice and technical assistance, maintains experimental stations and funds research and training. The National Forestry Council (NFC), established in 1971, serves as a forum for coordination between the federal and state governments to discuss and resolve problems and issues relating to forest policy, administration and management, including the determination of the annual timber harvest. There is a commitment in the NFP that: sufficient land strategically located throughout the country be dedicated as PFE; the permanent forests be managed in accordance with the principles of sound forest management; and the efficient harvesting and utilization of forest products and the development of forest industries be promoted.

The legislative framework is defined in the National Forestry Act (1984) and the Wood-based Industries Act (1984). The National Forestry Act was amended

in 1993 to include more stringent penalties for certain forest offences, particularly illegal logging. Provision was also made for the police and armed forces to enforce the act. The National Forestry Act is adopted for implementation by all the states and is complemented by relevant laws dealing with land and water conservation, environmental quality, wildlife protection, the management of national parks, biodiversity conservation, and the rights of indigenous communities.

New incentives were introduced in 2002 and 2003 to attract investment by the private sector and encourage its greater involvement in SFM. These included: pioneer status to private plantation ventures with 100% exemption from income tax for ten years; incentives to concessionaires to carry out R&D and the development of human resources; a reduction in royalty rates for RIL, enrichment planting and fire management; and differential royalty rates for lesser-known species.

Institutions involved in forests. The forestry departments are responsible for the planning, management and administration of forest resources. The Forestry Department Headquarters, Peninsular Malaysia, is responsible for forestry-sector planning, forest management, forest development and operational studies, the provision of technical advice and services, and staff training. The state forestry departments in Peninsular Malaysia and Sabah are responsible for the administration, management and development of forest resources, the regulation of forest harvesting, the collection of forest revenue, and the planning and coordination of the development of wood-based industries in their respective states. In Sarawak, these functions are carried out by the Sarawak Forestry Corporation, while the Forestry Department is vested with regulatory functions. Apart from the forestry departments there are a number of specialized institutions such as the Forest Research Institute of Malaysia (FRIM), the Malaysian Timber Industry Board (MTIB), the Malaysian Timber Certification Council (MTCC), and university forestry faculties.

Responsibility for forestry and timber at the federal level resided with the Ministry of Primary Industries until March 2004. Following the most recent general election, the Forestry Department, FRIM and the departments of Environment and Wildlife

were placed under the new Ministry of Natural Resources and Environment (NRE). Consequently, the implementation of the NFP, the National Policy on Biological Diversity (1998) and matters relating to the upstream activities of the forest sector are placed under the jurisdiction of NRE. Timber and other downstream activities of the sector, including processing, manufacturing, marketing, trade, exports and international cooperation (including ITTO) are under the responsibility of the Ministry of Plantation Industries and Commodities, which replaced the Ministry of Primary Industries. This division of responsibilities poses a coordination challenge.

Within each state the consultative committees at the village, *Mukim* and district levels strengthen the participation and involvement of local communities.

The public is well aware of the importance of wildlife and environmental quality. Stakeholders including environmental NGOs, social groups and forest-worker movements are active in forestry and forest-related initiatives. The forest industry is also strongly involved at both federal and state levels through, for example, the MTIB, the Malaysian Timber Council, the Sarawak Timber Industry Development Corporation, the Sabah Timber Association, the Sarawak Timber Association and other associations.

Status of forest management

Forest for production

Malaysian forest policy emphasizes the sustainable management of forests and the balance between protection and production. The silvicultural and harvesting regulations for the different forest types specify the detailed steps to be followed. These include codes of forest practice, forest harvesting guidelines and standard road specifications. RIL and helicopter logging are being conducted with emphasis on reducing environmental impact and (for the latter) on timber harvesting in terrain and conditions that preclude ground-based systems; in Sabah some 2,000 personnel from both the Forestry Department and the private sector have received training in RIL operations^a. Peninsular Malaysia has adopted a Forest Management Policy and Strategy, and Sarawak and Sabah have policies of managing their forests sustainably. Forest divisional management plans are regularly prepared to run for about 10–15 years.

At present, 14 million hectares, representing 73% of all forests in Malaysia, including all peat swamp forests, 81% of the inland forests and 23% of the mangrove forests, are covered by forest management plans (up from 2.5 million hectares in 1980)^a.

Forest management implementation. All timber harvesting and related management operations are carried out by contractors operating on the basis of either a long-term logging agreement or a short-term licence. Large concessions are normally granted under legally binding agreements. These concessions are often tied to wood-based industries and some of them cover periods of up to 30 years. Logging is controlled by the respective state forestry department through its local offices; a total of 8,344 forestry-related personnel were employed in the public sector in 2000^a. Size limits, intensity of extraction, logging sequence, methods of treatment, transport routes, standards of road construction, etc are generally stipulated in the logging licences. In Sabah, new opportunities for joint activities between government and the private sector have been made possible through a recent initiative under which the state government established 27 FMUs to be managed sustainably. Each FMU is about 100,000 hectares in size and management agreements with private companies offer secure tenure for 100 years. The FMUs are generally in forests that have been logged or are being logged. The private sector is invited to participate in the management of these FMUs according to scientifically based management plans approved by the Sabah Forestry Department. Data on the total number of active logging concessions and their sizes were not made available for this report. The Matang mangrove forests in Peninsular Malaysia have been managed sustainably for more than 100 years.

Silviculture and species selection. The silvicultural system used for managing Malaysian dipterocarp forests has changed over the years. Regeneration improvement felling was replaced by the Malayan Uniform System in the 1950s; these two mainly applied to lowland forest. The Selective Management System (SMS) was introduced in 1978 as logging moved into the hill dipterocarp forests and as advances in the technology of wood-processing rendered marketable many species that were previously not so. This allows harvesting to be carried out on a 25-year cycle; the minimum

Table 2 Some commonly harvested species for industrial roundwood (2001-2003)*

Timber species	Remarks
<i>Shorea</i> spp (meranti)	Used in sawmilling and plywood
<i>Anisoptera</i> spp (mersawa)	Used in sawmilling and plywood
<i>Dipterocarpus</i> spp (keruing)	Used in sawmilling and plywood
<i>Dryobalanops</i> spp (kapur)	Used in sawmilling and plywood
<i>Hevea brasiliensis</i> ('Malaysian oak')	From rubber plantations. Much is exported as finished products

* With the exception of *H. brasiliensis*, each of these is made up of a group of species with similar timber characteristics

cutting size prescribed is 60 cm diameter for dipterocarps and 45 cm for non-dipterocarps. Only merchantable trees (up to about ten trees per hectare) are allowed to be harvested. Post-harvest treatments concentrate on: (i) assessing the condition of the crop after logging; and (ii) measures for rehabilitation/enhancement of the crop determined according to its condition at the time. By the end of 2003, 2.1 million hectares of logged-over forests had been treated silviculturally and 50,000 hectares more had been enriched with native species.

More than 120 species are used for timber production. Besides those listed in Table 2 these include, from native forests, *Hopea* spp (merawan), *Gonystylus bancanus* (ramin), *Intsia palembanica* (merbau), kedondong (*Canarium* spp, *Santiria* spp), *Pterocarpus* spp (angsana), *Terminalia* spp (talasai), and, from planted forests, *Acacia mangium*, *Tectona grandis* (teak), *Toona ciliata* and *Gmelina arborea*.

Planted forest and trees outside the forest. The establishment of significant-sized forest plantations started in 1957 with teak, which was only successful in areas with a distinct dry season. Since then the program has been widened to include other fast-growing species such as *A. mangium*, *G. arborea*, *Paraserianthes falcataria*, *Eucalyptus deglupta*, *Pinus* spp and *Araucaria* spp. FAO (2001) estimated the area of plantations to be: *Acacia* – 180,000 hectares, *Eucalyptus* – 19,000 hectares, teak – 12,000 hectares, other broadleaved species – 12,000 hectares, and conifers – 47,000 hectares. In the past ten years, rubber has been planted for latex and timber, particularly in Peninsular Malaysia, and finished products of rubberwood have captured

a lucrative export market. Rubber plantations are managed on a rotation of about 25 years; about 20,000 hectares are currently being replanted annually. In Sarawak, 1.0 million hectares have been set aside since 1998 as licences for planted forests for the development for forest plantations of exotic and native tree species. Trees are also widely planted in orchards, urban areas, recreational areas and along highways.

Forest certification. The MTCC was established as an independent body in 1998; it develops and implements standards for timber certification through multi-stakeholder consultations, establishes and implements a system to oversee and monitor the certification scheme, establishes networks and cooperates with other national and international bodies concerned with timber certification, and facilitates arrangements for mutual recognition. By 2004, the forests of eight states covering 4.67 million hectares in Peninsular Malaysia (including 171,000 hectares of plantations) and 60,000 hectares in Sarawak had been independently assessed and awarded the national certificate of forest management. Another 650,000 hectares are being examined for possible certification^a. In addition, as of October 2005 the FSC had certified three FMUs totalling 77,242 hectares, of which 64,808 hectares are natural forests and 12,434 hectares are planted forests (FSC 2005). The MTCC is actively cooperating with the FSC and the PEFC to seek their endorsement.

Estimate of the area of forest sustainably managed for production. The entire PFE allocated for timber production is covered by forest management plans^a.

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
11,200	6,790 ^a	11,200	4,620	4,790 ^d	183	183	183

Of the harvested PFE, management guidelines were implemented on an estimated 3.96 million hectares in Sarawak and Peninsular Malaysia over the five-year period to 2001, although post-harvest surveys had been conducted on only 201,000 hectares of that area^a. In the absence of a comprehensive evaluation of the extent to which such management plans are being implemented effectively, the area of natural-forest production PFE being managed sustainably is estimated to be at least 4.78 million hectares^d, corresponding to the total area certified by the MTCC and the FSC and the 162,000-hectare Bintulu Model Forest in Sarawak (Table 3).

Timber production and trade. Total Malaysian industrial log production was 21.5 million m³ in 2003, down slightly from 22.2 million m³ in 1999 (ITTO 2004, 2005); in 1990 the estimated total industrial log production was 39.1 million m³ (ITTO 1995). Log exports fell from 6.74 million m³ in 1999 to 5.47 million m³ in 2003 (ITTO 2004, 2005), continuing the downward trend evident since 1990, when exports were an estimated 20.3 million m³ (ITTO 1995). Sawnwood production fell from 5.24 million m³ in 1999 to 4.77 million m³ in 2003 (ITTO 2004, 2005).

The main wood-based industries are sawmilling, wood-based panel products, wood moulding and furniture manufacture. Others include secondary and tertiary processing industries such as timber treatment, the prefabrication of wooden houses, and furniture and parquet manufacture. The government aims to make Malaysia a major producer of high value-added, wood-based products in the world market. The supply of raw materials at competitive prices, relatively low labour costs and strong international prices have created favourable conditions for the growth of forest industries in Malaysia over the past ten years.

Malaysia earned US\$2.47 billion from the export of primary wood products in 2003; plywood accounted for 43% of this, followed by sawnwood (27%) and logs (21%) (ITTO 2005). In the last few years, the average annual traded value (international and domestic) of all wood products has reached about US\$4.5 billion^a. The share of furniture and woodworking in international trade has also been increasing; it reportedly reached about 35% of the total of all forest product exports in 2002^a.

Non-wood forest products. Malaysia has given priority to the development of commercial NWFPs. Small-scale, rural-based industries using forest produce such as rattan and bamboo are common. Besides rattan and bamboo, marketed NWFPs include damar and copal gum, *Dyera costulata* (jelutong latex), nipah sugar, *Aquilaria* spp (gharu wood), illipe nuts and oil, and *Palaquium* spp (gutta percha). More recent is the development of aromatic plants, health products and medicines based on plant and animal species from natural forests.

Forest for protection

Soil and water. The forest area managed for the protection of soil and water is about 4.21 million hectares, or about 13% of the land area^a, of which about 3.21 million hectares fall within the PFE; this latter number comprises forest managed primarily for biodiversity and environmental conservation and is the total area of the protection PFE. No logging is allowed in sensitive and catchment areas.

Biological diversity. Malaysia is one of the twelve mega-diverse countries. It is estimated to have 12,500 species of flowering plants and more than 1,100 species of ferns. In Peninsular Malaysia, 26% of tree species are endemic. Sabah and Sarawak are key areas of endemism. The fauna is considered even richer than the flora: it includes 300 mammals, 750 birds, 350 reptiles, 165 amphibians, more

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
3,210 ^a	1,400 ^a	3,210	3,210 ^d	3,210 ^d

than 300 freshwater fish and 1,200 butterflies. Of Malaysia's estimated 19,335 forest-dependent species, 72 mammals, 542 birds, seven amphibians and 29 butterflies are considered endangered^a. Fifty-one mammals, 45 birds, 22 reptiles, 45 amphibians and 688 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 30 mammals, 42 birds, 45 amphibians and 15 plants are found in forests (IUCN 2004). Twenty-three plants are listed in CITES Appendix I and 889 in Appendix II, including ramin (CITES 2005). There are both *in situ* and *ex situ* conservation measures to protect endangered species.

Protective measures in production forests. In areas under selective logging, elaborate standards have been specified for the protection of water courses, construction of bridges and water crossings, establishment of stream buffers, and the alignment of skid trails, etc. The use of chemicals for the poison girdling of trees has been discontinued^a.

Extent of protected areas. Of the total PFE, 3.21 million hectares are classified as protection forest. Outside the PFE, other protected areas that have been gazetted/proposed as national parks and wildlife and bird sanctuaries contain forest amounting to an estimated 2.15 million hectares, making a potential total protected forest area of 5.36 million hectares (16.3% of Malaysia's total land area). According to UNEP-WCMC (2004) 1.40 million hectares of forest are in reserves classified in IUCN protected-area categories I-IV, including 730,900 hectares of lowland evergreen broadleaved rainforest, 174,000 hectares of lower montane forest and 29,600 hectares of freshwater swamp forest. Seven hundred thousand hectares of forest protected areas are located in Sarawak; the two largest areas are supported by ITTO projects (Lanjak-Entimau Wildlife Sanctuary with 187,000 hectares and the extended Pulong Tau National Park covering 165,000 hectares). The long-established 434,000-hectare Taman

Negara National Park straddling the states of Pahang, Terengganu and Kelantan in Peninsular Malaysia is also worth citing. Additionally, there are 135 virgin jungle reserves with a total area of 115,000 hectares scattered within the PFE to preserve samples of the full range of forest types.

Estimate of the area of forest sustainably managed for protection. The area of protection PFE under sustainable management is estimated to be 3.21 million hectares (Table 4), the total area of protection PFE. Protected forest areas outside the PFE may also be so managed but data were not available for this report.

Socioeconomic aspects

Economic aspects. Forests and forest industries play an important role in the Malaysian economy, although there has recently been a decline in their contribution to GDP, from 5.3% in 1996 to 4.4% in 2000^a. About 337,000 people (3.3% of the labour force) were directly employed in the forest-based sector in 2003^a, up from 177,000 in 1990. Much of this increase can be attributed to the expansion of the secondary processing industry.

Livelihood values. Forests are still important for the livelihoods of many indigenous communities, particularly tribal communities in Sarawak and Sabah. De Beer and McDermott (1996) estimated that about 700,000 people in Sarawak and Sabah obtained at least part of their livelihood from the forest; some Penan were still nomadic and almost entirely dependent on forest produce. The rights of indigenous communities for the subsistence use of forest products are officially recognized. Sago palm (*Eugeissona utilis* and *Metroxylon* spp), meat, fish, wild honey and mushrooms are regularly collected, as are medicinal plants, dart poison, birds' nests, rattan and bamboo.

Social relations. The rights of local people regarding the use of forest resources are recognized by the 1957 Land Code, the 1956 Land Ordinance and

other laws. Logging in forest areas claimed by indigenous communities has sometimes created conflicts between timber operators and local communities, particularly in Sarawak and particularly for the nomadic Penan people. These claims are being addressed through the legal system but remain one of the obstacles to mutual recognition between the MTCC and FSC certification schemes.

Summary

Malaysia's forests are generally well managed, although there are differences between Peninsular Malaysia, which has the strongest approach, and Sabah and Sarawak; however, all regional forestry administrations are committed to achieving SFM. The forest sector plays an important role in the Malaysian economy and is a significant employer. Already a major producer of value-added, wood-based products in the world market, this part of the sector is likely to continue to grow. A large part of its furniture manufacturing is based on rubberwood, which is grown in plantations, while much of the harvest from natural forests is still exported as plywood, sawnwood and logs. Well-organized and resourced forestry administrations at both federal and state levels have the capacity to ensure that concessionaires adhere to prescribed practices and to oversee the long-term management of the resource.

Key points

- Malaysia's PFE comprises 11.2 million hectares of natural production forest, 183,000 hectares of plantations and 3.21 million hectares of protection forest.
- At least 4.79 million hectares of natural-forest production PFE are estimated to be under SFM; the estimated area of protection PFE so managed is 3.21 million hectares.
- Deforestation within the PFE is insignificant, but there is degradation in some forest areas.
- Malaysia is a federation and forestry is under the jurisdiction of the states. Thus, the implementation of the national forest policy requires a cooperative approach by the state and federal authorities, which is done primarily through the National Forestry Council.

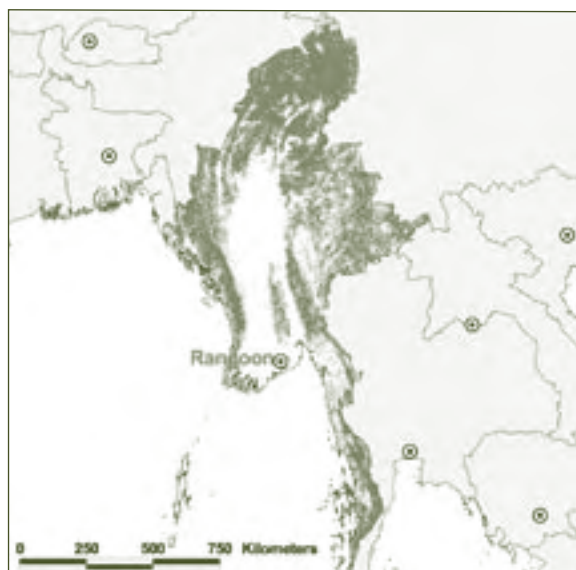
- At the federal level, the division of responsibilities between the Ministry of Natural Resources and Environment and the Ministry of Plantation Industries and Commodities poses a coordination challenge.
- Managing relations between indigenous communities and concession companies needs further attention.
- All timber harvesting and related management operations are carried out by contractors operating on the basis of either a long-term logging agreement (concession) or a short-term licence.
- In Sabah, FMUs of 100,000 hectares each have been established and 100-year forest management agreements offered to forestry companies.
- Certification of forest management is well advanced in Peninsular Malaysia and is expected to increase in Sabah and Sarawak.
- There is a well-established protected-area system in place covering 16.3% of the total land area. Nevertheless, there is a need to establish better coordination between the federal government and the states in wildlife management and environmental conservation.

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MYANMAR



*For legend see page 58

Forest resources

Myanmar has a land area of 67.7 million hectares and a population of 49.5 million people. It lies between India and Bangladesh to the west and Thailand and China to the east and stretches from a latitude of 7° north in the Kra Isthmus to 20° north and the peak of Hkakabo Razi (5,881 m) in the Himalayas. Rainfall varies from 500 to 5,000 mm and there is a marked dry season. The total forest area in Myanmar is estimated to be 34.4 million hectares (^a, FAO 2005a).

Forest types. Because of its wide geographical spread, Myanmar's forests are very varied. Important forest types are: evergreen (16% of total forest cover), mixed deciduous forest (40%), dry forest (10%), deciduous dipterocarp forest (5%), hill and temperate evergreen forest (26%) and tidal swamp forest (4%)^a. Some of Myanmar's forests lie outside the tropics.

Table 1 Tropical PFE

Estimated total forest area (million hectares)	Total closed natural tropical forest ('000 hectares) Source: derived from FAO 2001	PFE ('000 hectares) ^{a, *}			
		Production		Protection	Total
		Natural	Planted		
34.4	32,700	9,700	710	3,300	13,710

* Excludes Myanmar's non-tropical forest

Dynamics of forest resource change. Myanmar lost an estimated 5.2 million hectares of forest between 1990 and 2000, an annual deforestation rate of 520,000 hectares (1.4%) (FAO 2005a). There has also been apparent degradation of remaining forests; the average volume of woody material in the growing stock fell from 145 m³ per hectare in 1990 to 33 m³ per hectare in 2000, and the quantity of above-ground biomass fell from 217 tonnes per hectare to 57 tonnes per hectare during the same period (FAO 2001).

Permanent forest estate. The natural-forest PFE comprises an estimated 13.0 million hectares (Table 1); 62% of the PFE's boundaries have been demarcated^a. Within the PFE, 9.7 million hectares are designated as production forest, 8.3 million hectares being mixed deciduous and 1.4 million hectares evergreen forests^a.

Planted forests. The area of planted forests in 2000 was an estimated 710,000 hectares, 35% of which (291,000 hectares) was teak (*Tectona grandis*) (FAO 2001). Agro-industrial plantations include 110,000 hectares of rubber (*Hevea brasiliensis*) (ibid.).

Institutional arrangements

Forest tenure. All forests are owned by the state; nevertheless, private and communal tenure systems also exist (FAO 2001). They are designated as reserved forests and public or unclassified forests; commercial timber and non-timber products are extracted from both classes. Particular rights apply to teak; according to the 1992 Forest Law (Chapter III), "a standing teak tree wherever situated in the state is owned by the state".

SFM policy framework. Myanmar has undertaken some actions to define a framework for SFM. For example, it developed C&I for SFM in 1996 based on the ITTO C&I.

Forest policy and legislation. Myanmar, formerly known as Burma, was once a province of British India, and the 1894 Indian Forest Policy guided forest management until the Burma Forest Act was enacted in 1902. This was in use until 1992, when a new forest law was promulgated; this emphasizes the importance of the participation of people in the conservation and sustainable utilization of forest resources. Other regulations such as the Forest Rules, 1995, and the National Code of Practice for Forest Harvesting, 1998, also help guide forest management. A new national forest policy was developed in 1995; it emphasizes the need to adopt SFM, establish protected areas for wildlife protection and biodiversity conservation, undertake sound land-use planning, privatize the wood-based industry, and promote people's participation and community forestry.

The mobilization of funds for forestry development is mainly the responsibility of government. Despite having a long-term national forest action plan and district forest management plans, few resources have been allocated to enable programs to be implemented. Official overseas development assistance is low: US\$126 million in 2003 (UNDP 2005).

Institutions involved in forests. The Ministry of Forestry has the primary responsibility for implementing the forest policy, for the administration and management of the forestry sector and, since January 2005, for environmental protection (Global Witness 2005). The minister may constitute the following categories of reserved forest by demarcation on land at the disposal of government: commercial extraction reserve forest, local supply reserved forest, watershed or catchment reserved forest, environment and biodiversity conservation reserved forest, and other categories of reserved forest. The Minister may also declare specific areas as protected public forest. Various government agencies and government-sponsored NGOs play a role in forest management: the Planning and Statistics Department; the Forest Department; the Myanmar Timber Enterprise (MTE); the Dry Zone Greening Department; the National Commission on Environment Affairs; the Forest

Resource, Environment, Development and Conservation Association; the Forest Joint Venture Corporation Ltd; and the Timber Merchants' Association. The adoption of a market economy was first announced in September 1988, and many private timber companies became involved in timber industries. For teak, however, the MTE has a monopoly on harvesting, processing and export, and the private sector is not permitted to export logs of any species. With a view to stepping up the manufacture of forest products and to promote internal and external distribution, the Forest Products Joint Venture Corporation Ltd was established by the MTE, the Forest Department and private enterprises. In January 1995, the government formed a privatization commission to oversee the process of privatization and to ensure its successful implementation.

The level of decentralization is low and confined to the delegation of powers to parallel and vertical institutions. Privatization and private-sector involvement are still meagre.

Participation by civil society takes place through government-sponsored NGOs such as those listed above. Others, such as farmers' and women's income generation groups are being formed. This last initiative aims to benefit social well-being by raising off-farm incomes and helping advance SFM. International environmental NGOs are not active in Myanmar, nor are independent national advocacy NGOs.

Status of forest management

Forests for production

The total number of FMUs in Myanmar is 62, out of which 41 are dedicated to timber production. Thirty-four FMUs are actively managed for teak and other hardwoods covering an area of about 470,000 hectares^c. In the natural teak forest, mature teak trees selected for harvesting are normally girdled and left standing for three years before felling and extraction. This is done to season the timber and make it buoyant, as logs are normally transported by floating them down rivers; in more accessible areas, mature teak trees are sometimes felled and extracted green. The Forest Department selects mature trees for harvesting while the MTE

Table 2 Some commonly harvested tropical timber species for industrial roundwood (2001–03)^a

Timber species	Remarks
<i>Tectona grandis</i> (teak)	30–40% of logs produced
<i>Xylia dolabriformis</i> , <i>X. kerri</i> (pyinkado)	Associate of teak, found in varying proportions
<i>Pterocarpus macrocarpus</i> (padauk)	Associate of teak
<i>Terminalia tomentosa</i> (htauk kyant)	Associate of teak, found in varying proportions
<i>Millettia pendula</i>	From planted forests

is responsible for the actual harvesting of both teak and other hardwoods. The MTE operates 38 extraction and rafting agencies throughout the country. Most log-skidding is done by elephants^a; they have been shown to do less damage to the forest than machines, and wastage is less. Mechanical extraction is not favoured as it is not considered economically feasible under the Myanmar Selection System (see below); it is only used in limited areas. So far, heavy equipment has been used mainly for road construction, the loading and unloading of logs, and for transportation.

The area harvested annually has, over the past five years, averaged about 411,000 hectares; 52% of logging areas are under management plans or harvesting schemes^a. Logging is guided by the National Code of Practice for Forest Harvesting, which includes detailed guidelines for work such as: the alignment and construction of extraction roads, skid trails and stream crossings; the mapping of tree positions; climber cutting before felling; and the directional felling of selectively marked trees.

Forest management in general and teak management in particular have various constraints and problems. At present, timber extraction is concentrated on only a few species. This 'creaming' of the forest, if unabated, will lead to the devaluation of the forests in the long run through a decrease of valuable species. Other problems are: timber theft and the illegal logging of trees for commercial use; the extension of pasture land and swidden agriculture; and over-harvesting for firewood and charcoal. The political situation in remote areas creates an environment that allows wasteful and unplanned logging and possible illegal cross-border trade. The Forest Department is undertaking remedial

measures to conserve the natural forests – such as updating district-level forest management plans, surveys, boundary demarcation, fire protection, logging codes, forest reservation, and establishment of a PFE and community involvement, but lacks adequate resources, particularly to exercise control in remote areas (Global Witness 2003). Logging in Kachin state, on the border with China (and outside the tropics) has reportedly had serious environmental impacts (Global Witness 2005).

Silviculture and species selection. Silvicultural management of the natural forests dates back to 1856, when the Myanmar Selection System, a selection system for harvesting teak and other valuable hardwoods, was devised. If the prescriptions of this system were followed, trees of harvesting size would be marked selectively within the limits of the AAC calculated for each felling series according to the principles of sustained yield management. In accordance with the prescriptions of the system, various silvicultural treatments such as improvement felling, natural regeneration felling, thinnings in natural regeneration of teak, climber cutting, fire protection, etc are carried out in order to improve the naturally regenerating teak forests, protect the immature stock and assist it to attain a healthy maturity. Silvicultural tending is necessary to guarantee the sustainability of teak in Myanmar's multi-species and complex teak-bearing forests; in the absence of such tending, bamboo and light-demanding species will suppress teak regeneration. The extent to which such tending is carried out is not reported^a.

Of 1,286 recorded tree species, 70 are commercially valuable (Global Witness 2005). In addition to the species listed in Table 2, commonly used timber

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
9,700	n.a.	9,700 ^a	0	291 *	710	0	0

* Semi-natural teak forests

species include *Adina cordifolia*, *Anogeissus* spp, *Bridelia retusa*, *Dalbergia oliveri*, *Dipterocarpus* spp, *Homalium tomentosum* and *Lagerstroemia flos-reginae*.

Planted forest and trees outside the forest.

Myanmar has a long tradition of raising planted forests; teak plantations were introduced in 1856 under a *taungya* system, and teak remains the main planted species in commercial timber plantations. Other commercial planted species include: *Xylia kerri* (pyinkado), *Gmelina arborea*, *Pterocarpus macrocarpus* (padauk), pines, acacias and eucalypts. The annual forest plantation program is now fixed at around 37,000 hectares (Forest Department 1999); Myanmar's 1995 forest policy stipulates that natural forests will not be cleared to make way for plantations, only supplemented by them. Tree-planting on a moderate scale is done to enrich degraded forest areas and there is some planting to complement natural regeneration. Since 1997, joint-venture and foreign companies have been allowed to establish their own plantations to meet the needs of their industries (ibid.). Timber from farm trees, home gardens and rubber plantations is also important in domestic timber supply.

Forest certification. So far no forests have been certified in Myanmar. There is a committee for timber certification, but information on its status and activities was not available for this report.

Estimate of the area of forest sustainably managed for production. All the production PFE is covered by management plans formulated by the Forest Department in cooperation with the MTE^a, but information on the extent to which these management plans are implemented was not available. In mid 2005, 470,000 hectares of FMUs were actively managed for timber production^c.

Insufficient information was available to estimate the area of natural-forest PFE being sustainably managed, but the 291,000 hectares of semi-natural planted teak that are considered to be so managed are treated as natural forest in Table 3.

Timber production and trade. Roundwood production in 2003 was an estimated 39.8 million m³, of which 35.6 million m³ (90%) was fuelwood (FAO 2005b). Production statistics indicate an increase in the harvesting of Myanmar's forests. ITTO (1999, 2004, 2006 in prep.) estimated the total industrial tropical log production in 2003 at 4.24 million m³, up from 3.35 million m³ in 1999 and 2.30 million m³ in 1994. An estimated 1.0 million m³ of sawnwood was produced in 2003, up from 298,000 m³ in 1999. An estimated 1.28 million m³ of logs were exported in 2003, up from 980,000 m³ in 1999 and 602,000 m³ in 1994 (ibid.). Major export destinations are China, Thailand and India (ITTO 2006 in prep.).

The value of Myanmar's exports of primary timber products amounted to US\$345 million in 2003, of which logs contributed US\$269 million (78%) (ITTO 2005). According to import data for China (ITTO 2003), 514,000 m³ of tropical logs were imported from Myanmar in 2001, although Myanmar reported an export volume to China of 3,240 m³ in the same year. Myanmar's policy is to reduce log exports gradually so as to promote downstream processing. However, due to a lack of infrastructure and appropriate technology, a complete ban on log exports is not likely for quite some time. Myanmar also exports downstream-processed, value-added products such as parquet and furniture.

Non-wood forest products. Many NWFPs are used locally and marketed. The most important are bamboo and rattan; others, such as cutch tree (extracted

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
3,300 ^a	195	6,560 ^a	n.d.	n.d.

from *Acacia catechu*), tannin, honey and beeswax, pine resin and birds' nests, are also widely used. Forest recreation and ecotourism are important: eleven areas are set apart as recreation forest^a.

Forest for protection

Soil and water. The estimated area of forest managed primarily for soil and water conservation is 6.56 million hectares^a. The catchments of 123 dams are protected; tree-planting has been carried out in some of these to prevent land degradation^a. Local people are involved in protection works.

Biological diversity. Myanmar is one of the most biologically diverse countries in mainland Southeast Asia, with 7,000 plant species, 1,347 large tree species, 96 bamboo species and 841 identified species of orchid (Forest Department 2000). Forty mammals, 49 birds, 26 reptiles and 38 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 26 mammals, 37 birds and one plant are found in forests (IUCN 2004). Nine plants are listed in CITES Appendix I and 182 in Appendix II (CITES 2005).

The 1992 forest law and the 1995 national forest policy both emphasize a balanced approach to conservation and development and highlight environmental and biodiversity conservation. Consequently the old Wildlife Protection Act (1936) was replaced by the Protection of Wildlife, Wild Plants and Natural Areas Law in June 1994 in order to carry out biodiversity and environmental conservation more effectively. Further, Myanmar Agenda 21 has incorporated *ex situ* and *in situ* measures to protect biodiversity, including endangered species of flora and fauna^a.

Protective measures in production forests. Protective measures in production forests are provided for in the guidelines for logging, road construction, pre- and post-logging operations, and the protection of river banks and road margins.

Extent of protected areas. The total area of protection PFE is an estimated 3.30 million hectares^a. According to UNEP-WCMC (2004), 195,600 hectares of forest are in protected areas that conform to IUCN protected-area categories I-IV. The national forest policy has set a short-term goal of increasing the coverage of protected areas to 5% of the land area and a long-term goal of 10% (Global Witness 2005).

Estimate of the area of forest sustainably managed for protection. No details are available about the management status of the protection PFE (Table 4).

Socioeconomic aspects

Economic aspects. About 30,600 people are employed by the government in the forest sector, including 1,400 professionals and 29,200 technical staff. Of these staff, 11,000 are in the Forest Department, 19,300 in MTE and about 300 in the Dry Zone Greening Department^a. Overall, some 500,000 people are thought to be dependent on the forestry sector for employment; the contribution of forestry to GDP was an estimated 1% in 1997-98^a.

Livelihood values. Some 38 million people are dependent on the forest for at least part of their livelihood; they have access to about 6.7 million hectares made available through the 'local supply working circle'^a.

Social relations. In order to promote and facilitate community participation in managing the forests, 'community forestry instructions' were issued in late 1995. These emphasized the management of forests by rural communities through the protection of natural forest and the establishment of forest nurseries and forest plantations so as to enable such communities to meet their needs for fuelwood and small-diameter timber. The instructions also focus on the flow of benefits to those communities participating in forest management. More than 259 agreements have been made between the Forest Department and social groups^a. However,

community forestry has a number of problems – especially with regards to tenure and the security of agreements reached with government agencies. Cross-border illegal timber trade has reportedly fueled ethnic tensions, entrenched power structures and created conditions under which local warlords can thrive (Global Witness 2005). The control of teak-planting by government also limits the profitability of community forestry.

Summary

Myanmar once boasted an exemplary system of forest management, particularly in its large area of teak forests, but in recent decades there has been significant deforestation and forest degradation. Timber production almost doubled in the ten years to 2003, and the Forest Department lacks sufficient resources to fully implement the silvicultural system or enforce regulations, particularly in remote border areas. Community forestry also faces a number of challenges, such as the lack of decentralization in forestry administration. Nevertheless, about half the country is still forested and SFM remains within reach, given the surmounting of political, administrative and economic obstacles.

Key points

- Myanmar has an estimated 13.0 million hectares of natural tropical forest in its PFE, of which 9.70 million are designated for production and 3.30 million for protection. Myanmar also has about 710,000 hectares of planted forests, 35% of which are teak.
- Many of Myanmar's forests are becoming degraded, exacerbated by a lack of law enforcement, particularly in remote regions.
- At least 290,000 hectares of semi-natural teak forest in the production PFE are being managed sustainably, but insufficient information was available to assess the management of the bulk of the production PFE. Nor could an estimate be made of the extent to which the protection PFE is so managed.
- A well-tested silvicultural system exists for Myanmar's teak forests, but the extent to which it is being implemented is unclear.

- The Ministry of Forestry has primary responsibility for implementing the national forest policy, which was instituted in 1995.
- Some of the most significant obstacles in the way of implementing SFM are institutional. These include chronic budget shortages affecting the Forest Department, very limited private-sector involvement, insufficient well-trained personnel, and a lack of effective participatory processes.
- Total production of industrial roundwood was an estimated 4.24 million m³ in 2003.
- Myanmar has established protected areas and prepared plans for expanding the protected area system and for improving biodiversity conservation, but no information was available on implementation.

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PAPUA NEW GUINEA



* For legend see page 58

Forest resources

Papua New Guinea (PNG) has a land area of 46.3 million hectares and a population of 5.5 million people. It consists of over 600 islands and atolls in four major groups: the eastern half of the island of New Guinea, New Britain, New Ireland and Bougainville. The western half of the island of New Guinea is a province of Indonesia; to the south it is separated from Australia by the Torres Strait. A spine of mountains, the Owen Stanley Range, runs east to west; the country's highest peak is Mt Wilhelm, rising to 4,510 m above sea level. On both sides of the mountain chain are fertile plains, flooded deltas, mangrove swamps and broad sandy beaches.

PNG's forest area was an estimated 30.6 million hectares in 2000, which is 67.6% of the total land

area (FAO 2005a), evenly distributed across the country. PNG has the largest area of forest among the island countries of the South Pacific.

Forest types. The forests are varied, stretching from sea-level to the tree line at an altitude of over 4,000 m. Forests can be broadly classified into: rainforest (80%), moist forest (4%), savanna and woodland (5%) and montane forest (11%)^a. The rainforests may be sub-divided into coastal, lowland and hill forests. Typical tree species are: in the coastal-littoral forests, *Terminalia* spp, *Melaleuca* spp and *Pterocarpus* spp; in the lowland rainforest, species of *Alstonia*, *Calophyllum* and *Pometia*; in the hill rainforests, species of *Canarium*, *Celtis* and *Hopea*; and in the mountains, species of *Araucaria*, *Agathis*, *Lithocarpus* (oaks) and *Nothofagus* (southern beech). Another important species is *Eucalyptus deglupta*.

Dynamics of forest resource change. Forest cover declined at an estimated annual rate of 113,000 hectares (0.4%) between 1990 and 2000 (FAO 2005a).

Permanent forest estate. The determination of a PFE is difficult under the customary land ownership that applies in PNG. The estimates given in Table 1 are based on the areas set aside by the government for timber development or reserved for protection^a.

Planted forests. The area of forest plantations at the end of 1999 was an estimated 58,000 hectares, comprising government plantations of 22,800 hectares and private plantations of 35,200 hectares (PNG Forest Authority 2002). Given that the present rate of planting is an estimated 4,000 hectares per year^a, the current total area might be about 80,000 hectares. There are also about 20,000 hectares of *Hevea brasiliensis* (rubber) (FAO 2001).

Table 1 PFE

Estimated total forest area (million hectares)	Total closed natural tropical forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
30.6	30,150	8,700 ^a	80 ^d	1,700 ^a	10,480

Institutional arrangements

Forest tenure. Customary land ownership is guaranteed by the PNG constitution and is the key factor influencing the use of the forest. Ninety-seven per cent of the land is held as communal or clan commons; there is also individual/private ownership of land. There are a large number of clans and tribes, speaking more than 800 languages. Customary rights include rights to all natural resources, with the exception of minerals, petroleum, water and genetic resources. Landowner groups are legally entitled to be involved actively in decisions concerning the management of their forest land.

SFM policy framework. PNG's national forest policy was approved in 1991. The country has also adopted ITTO's C&I as a monitoring tool for SFM.

Forest policy and legislation. The main objectives of the national forest policy are: (i) the management and protection of the nation's forest resources as a renewable natural asset; and (ii) the utilization of the nation's forest resources to achieve economic growth, employment, greater Papua New Guinean participation in industry, and increased viable onshore processing. Parallel to the development of this policy, the National Forests and Conservation Action Plan was prepared and officially approved in 1996. Three sub-policies linked to the national forest policy were released in 2003: an ecoforestry policy; a reforestation policy; and a downstream-processing policy.

The legal authority for the various recommendations of the national forest policy and the measures to achieve them are contained in the following instruments: the Forestry Act (1991, as amended in 2000); the National Forestry Development Guidelines (1993); the Planning, Monitoring and Control Procedures for Natural Forest Logging Operations (1995); the Key Standards for Selection Logging in Papua New Guinea (1995); the PNG Logging Code of Practice (1996); the National Forestry Plan (1996); Procedures for Exporting Logs (1996); and Forestry Regulation (1998). PNG has established a number of regulatory instruments to support SFM; there are, however, some gaps in implementation. Other legal instruments relevant to forestry are: the Land Groups Incorporation Act (1974); the PNG Labour Law (1990); and the Environmental Act (2000).

Institutions involved in forests. The PNG Forest Authority was created in 1991 under the provisions of the Forestry Act. It succeeded the former Department of Forests, the 19 provincial forest divisions and the Forest Industry Council and was established as a statutory corporation with regulatory and administrative responsibility for the management of the forest sector throughout the country. In 2001, it had a total staff of over 600, including about 430 with diplomas or university degrees^a. The Forest Authority comprises the National Forest Board (NFB) and the National Forest Service (NFS), and a number of regulatory and administrative responsibilities have been delegated to the provincial level. The Board operates through a system of specialist advisory committees and provincial forest management committees which are serviced by the NFS. The PNG Forest Research Institute is a specialized agency falling under the purview of the PNG Forest Authority. The PNG Forest Industries Association is an incorporated national association representing and promoting the interests of the PNG forest industry. Monitoring and surveillance of the log trade is carried out under contract by SGS of Switzerland. The Department of Environment and Conservation is responsible for the administration of protected areas and also has a monitoring role with respect to adherence to environmental regulations.

A 'landowner company' (LOC) concept was developed as part of the national forest policy in order to increase national participation in forestry. However, many of the LOCs have been plagued by mismanagement and in-fighting between different landowner factions, with the result that many have become alienated from the people they were supposed to represent. LOCs, as licence holders, contract foreign companies to conduct logging. It was expected that these companies would train the landowners and make them capable of running their own businesses, but such a development has not yet taken place. The main problems are the lack of education and business knowledge on the part of most landowners, difficulties in successfully structuring the LOCs due to the complex land tenure system, and the proliferation of landowner groups (Filer & Sekhran 1998).

A number of international NGOs (eg WWF, Conservation International, The Nature Conservancy) and national NGOs and religious bodies are active in the area of social welfare *vis-à-vis* forestry. National and international NGOs have taken a lead in the development of ecoforestry initiatives. They also have programs to train landowners in SFM.

Status of forest management

Forest for production

According to the 1991 Forestry Act (Section 56) the government may acquire timber rights from customary owners pursuant to a forest management agreement (FMA) between the customary owners and the government. The National Forest Development Guidelines issued in 1993 specify that the customary land over which an FMA has been negotiated and a timber permit issued should be managed so as to maintain or improve the forest's capacity to produce timber and other commercial forest products on a sustained-yield basis, subject to environmental protection standards, and with opportunities provided for meaningful participation by the customary owners, while maintaining future development options. The PNG Logging Code of Practice and Key Standards for Selective Logging in PNG also provide specifications and prescriptions for reducing the impact of logging.

Before the promulgation of the Forestry Act, timber rights were acquired by a process referred to as timber rights purchase. The rights acquired under this system were only for the harvesting of merchantable timber and did not transfer to the state or concessionaires the responsibility of forest management. The national forest policy confirmed the government's intention to proceed with the acquisition of timber rights and to provide for their long-term management. Through an FMA the PNG Forest Authority secures a commitment from the resource owners to follow recommended forest management practices while simultaneously offering investors access to the forest for a minimum of 35 years. Implementation may involve the state in issuing a timber permit, under which it manages the forest on behalf of the customary owners for the duration of the FMA. The management roles of the state, including timber harvest and construction

of infrastructure, can be implemented through an investor with the consent of the customary owners through an FMA. Management responsibility can also be delegated to legally established LOCs. The FMA should specify the returns due to the landowner.

As of 2003, the PNG government had acquired timber rights from the customary owners for about 5.0 million hectares of forest (generally through 50-year timber lease arrangements)^a. The rights acquired are normally allocated to foreign developers who have the necessary financial capabilities.

There are, however, concerns about the manner in which timber concessions are awarded and controlled, particularly about area approval, resource inventory, the determination of the appropriate cutting cycle, the management of fragile forests and conservation set-asides, and the treatment of landholder involvement^c. It is difficult to ensure the integrity and security of the PFE, since landowning (and land-claiming) communities do not recognize rigid boundaries and controls. Local villagers are expanding their shifting cultivation into natural forest, including parts subjected to logging or opened up by the construction of new roads. All state-acquired timber concessions are supposed to be implemented according to RIL prescriptions, but post-harvest surveys have not been carried out in the majority of these forests, and the remoteness of many operations means that monitoring is often lacking^a. In general, a lack of resources is constraining the achievement of SFM by limiting the extent of field visits that can be made for monitoring purposes and also by reducing staff in the Forest Authority and the Department of Conservation and Environment^a.

Silviculture and species selection. The silvicultural system prescribed for natural forests is selective logging, involving the removal of mature and over-mature trees to allow the remaining crop to grow naturally to maturity. Even though the pre-FMA (prior to 1991) system was also described as selective logging, all trees above the prescribed limit in a management unit were cut over within 10–20 years (ie less than the planned felling cycle), thus consuming the resource faster than could be sustained. From 1991–92 onwards, all new forestry operations have had an assigned cutting cycle of 35 years. Bringing projects started

Table 2 Some commonly harvested species for industrial roundwood (2001–02)^c

Timber species	Remarks
<i>Pometia pinnata</i> (taun)	The relative abundance of the species varies from locality to locality. No data are readily available about their relative importance at the national level.
<i>Intsia bijuga</i> (kwila)	
<i>Eucalyptus deglupta</i>	
<i>Calophyllum</i> spp	
<i>Anisoptera thurifera</i>	

before 1991 into line with the new requirements will require a substantial reduction in the permitted harvest levels and smaller projects to be consolidated into larger, economically sustainable projects.

The tropical forests of PNG consist of a heterogeneous mixture of some 200 tree species. Based on quality and market acceptability, these species have been categorized into four groups for fixing royalties and charges. In addition to those listed in Table 2, important species harvested include *Intsia bijuga* (kwila), *Pometia pinnata* (taun), *Pterocarpus indicus* (rosewood), *Calophyllum* spp, *Celtis* spp, *Canarium indicum*, *Dillenia papuana*, *Terminalia* spp, *Buchanania* spp, *Palaquium* spp and *Homalium foetidum* (Table 2).

Planted forest and trees outside the forest.

Eucalyptus deglupta, an indigenous species, is the main planted tree, along with *E. grandis*, *Acacia mangium*, *Tectona grandis*, *Terminalia brassii*, *Pinus caribaea*, *P. patula*, *Ochroma lagopus* and *Octomeles sumatrana*.

Forest certification. PNG has a national FSC working group and has developed national certification standards. The extent of FSC-certified forest area in PNG so far is one area of 19,215 hectares consisting of semi-natural and mixed plantation forest, and natural forest (FSC 2005).

Estimate of the area of forest sustainably managed for production. Management plans have been prepared for an estimated area of just under 5 million hectares of production forest^a, at least 1.5 million hectares of which are considered managed sustainably and are expected to undergo certification in the near future^c (Table 3).

Timber production and trade. In 2003, PNG produced an estimated 7.2 million m³ of roundwood, of which about 76% (5.5 million m³) was fuelwood

for domestic use (FAO 2005b). Total industrial tropical log production was an estimated 2.30 million m³ in 2003, up from 2.10 million m³ in 1999 (ITTO 2004, 2005) and well below the estimated sustainable yield^a of 4.7 million m³. The forest industry is predominantly based on log exports; an estimated 2.02 million m³ of tropical logs were exported in 2003 (up from 1.98 million m³ in 1999) (ITTO 2004, 2005), which makes PNG the world's second-largest exporter of tropical logs after Malaysia. PNG earned US\$126 million in 2003 from exports of tropical timber, US\$109 million of which were from logs (ITTO 2005).

The national forest policy anticipates increased domestic processing of forest products to create employment, facilitate the transfer of technology and promote the export of value-added products. However, little progress has been made so far in this regard. The principal export markets for logs in 2003 were China (62% of all log exports), Japan (20%) and Korea (9%) (ITTO 2005).

Non-wood forest products. The people of PNG make use of many NWFPs for their livelihoods and consume wild meat, wild tubers, medicinal plants and other produce on a daily basis. Butterflies, live birds, eagle wood, *Santalum* (sandalwood) and rattan products are important sources of local income. An average 13 tonnes of sandalwood are exported each year^a. Despite the significant value of and community dependence on NWFPs, there appear to be no firm government policies towards them.

Forest for protection

Soil and water. PNG's rugged terrain and steep slopes mean that soil and water conservation will always be important. The Logging Code of Practice, which is applied to state-acquired concession areas, includes measures for the protection of water and

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
8,700	5,600	4,980 ^a	19 *	1,500 ^c	80	n.d.	0 *

* The single area of mixed semi-natural, plantation and natural forests has been counted as 'natural' here

soil resources, but these are not always strictly followed. No data are available on the extent of catchment protection forests.

Biological diversity. New Guinea is one of the most floristically rich islands on the planet. An estimated 20,000 species of higher plants have been found – about 7.5% of the world's total number of higher plant species. The world's greatest diversity of orchids (over 2,000 species) and a similar number of fern species occur there. PNG also contains important representatives of the flora of the ancient super-continent Gondwanaland, including a large contingent of southern conifer species and *Nothofagus* (southern beech). Fifty-eight mammals, 33 birds, ten reptiles, ten amphibians and 142 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 22 mammals, 29 birds, ten amphibians and one plant are found in forests (IUCN 2004). Seven plants are listed in CITES Appendix I and 254 in Appendix II (CITES 2005).

Protective measures in production forests. There are regulations for commercial forestry operations in order to protect catchments and prevent soil erosion. As noted earlier, however, the enforcement of these is often problematic.

Extent of protected areas. At present there are 33 government-declared protected areas in wildlife management areas, national parks and nature reserves^a. According to UNEP-WCMC (2004), 362,200 hectares of forest are in protected areas that conform to IUCN protected-area categories I–IV, including 322,000 hectares of lowland evergreen broadleaved rainforest.

Estimate of the area of forest sustainably managed for protection. Details are scanty about the system of protected areas and their condition.

Insufficient information was available for an estimate to be made of the area of protection PFE managed sustainably.

Socioeconomic aspects

Economic aspects. Forestry contributed US\$334 million to PNG's GDP in 2001^a, which was about 76% of total GDP. Recent information on employment provided by the forestry sector was not available for this report^a. The government collects revenues from a log export tax and a reforestation levy, while resource owners receive a royalty on timber harvested (10 kina per m³) and other levies and premiums^a. However, it has been observed that many of the benefits of forestry operations have generally not filtered through to landowners, and income has not been saved or invested to ensure long-term development (PNG Forest Authority 2002).

Livelihood values. About 80% of the PNG population is rural and uses forests to meet a wide range of subsistence needs, including food, fuel, shelter, medicines and cultural aspects, as well as to supply land that is used in shifting agricultural systems. No quantitative information was made available for this report.

Social relations. Customary landowners participate in the processes by which the Forest Authority purchases timber rights but are not much involved in the subsequent management and development of the resources^a. The purchase of rights usually involves payments or royalties and levies to landowner groups, which has led to conflicts and tensions within such groups. The presence of logging camps (and the associated disruptions to social and cultural environments) has also created tensions in some communities^c.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I–IV	Allocated for soil and water	With management plans	Managed sustainably
1,700	362	n.d.	n.d.	n.d.

Summary

Two-thirds of PNG is under forest cover and the official timber harvest is well below the estimated national sustainable timber yield. On average, each citizen has rights over about 6.4 hectares of forest. However, the majority of people still live in extreme poverty. The challenges are substantial if SFM is to be achieved. Key among them would appear to be: reducing the social and cultural disruption of logging; increasing the benefits to local development of forest management; and increasing the allocation of resources to the monitoring of logging activities and the implementation of forest policies at the national level.

Key points

- Customary land ownership is guaranteed by the PNG constitution and is the key factor influencing the use of the forests; 97% of the land is held as communal or clan commons.
- The determination of a PFE is difficult in PNG given its land-tenure system. Nevertheless, ITTO estimates that the country has about 10.5 million hectares of forest that might be considered permanent; these include 8.7 million hectares of forest over which timber rights have been acquired (production PFE), 1.7 million hectares allocated for protection and about 80,000 hectares of timber plantations.
- At least 1.5 million hectares of natural-forest production PFE are estimated to be managed sustainably. No estimate could be made of the extent to which the protection PFE is so managed.
- The PNG Forest Authority was established in 1991 by the Forestry Act as a statutory corporation with regulatory and administrative responsibility for the management of the country's forests.

- A 'landowner company' concept was developed as part of the 1979 national forest policy in order to increase national participation in forestry. However, this has not been wholly successful.
- PNG is a major exporter of tropical logs, shipping out an estimated 2.02 million m³ in 2003 to China, Japan and other mostly Asian destinations.
- The government collects revenues from a log export tax and a reforestation levy, while resource owners receive a royalty on timber harvested (10 kina per m³) and other levies and premiums.
- Customary landowners participate in the processes by which the Forest Authority purchases timber rights but are not much involved in the subsequent management and development of the resources.

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PHILIPPINES



*For legend see page 58

Forest resources

The Republic of the Philippines lies to the east of continental Asia between the South China Sea and the Philippine Sea, extending from 5° to 20° north of the equator and comprising over 7,000 islands. It has a land area of 30 million hectares and a population of 82 million people. Most of the land in the Philippines is mountainous; 53% of the country is classified as uplands, being 18% or more in slope. While close to 16 million hectares of the land is categorized as forest land, estimates of the actual forested area in the country include 5.4 million hectares^a, 5.79 million (FAO 2005) and 7.2 million hectares^a, of which 0.8 million hectares might be regarded as primary forest^a.

Forest types. The Philippines has two broad biogeographical regions: the east, which remains wet throughout the year, and the west, which has a dry season. The forests have been classified by

climate and altitude into evergreen rainforest (81%), semi-evergreen forest (10%) and mountain forest (9%). On the basis of vegetational characteristics, forests have been further classified as various types of dipterocarp forest (61%), mossy forest (18%), pine forest (5%) and others including beach forest and mangrove (15%)^a.

Dynamics of forest resource change.

Deforestation occurred at an annual rate of about 316,000 hectares in the 1980s, caused by land conversion, shifting cultivation, forest fires and over-logging^a. Deforestation decreased somewhat to about 89,000 hectares (1.4%) annually during the 1990s (FAO 2005). Much of the remaining forest is heavily fragmented.

The forests of the Philippines are subject to typhoons and other wind damage. Floods have caused widespread damage and large numbers of casualties in recent years. Regular fires occur in many forest areas.

Permanent forest estate. The country's land resources are classified into forest lands and alienable and disposable (A&D) lands. All lands in the public domain of 18% in slope or greater are classified as forest lands. The Department of Environment and Natural Resources (DENR) reported in 2005 that the extent of the PFE was 15.9 million hectares, comprising areas above the stipulated 18% slope limit; however, based on an interpretation of LANDSAT images from 2001–2003 only an estimated 6.24 million hectares of these are actually forested^a, including an estimated 1.54 million hectares in protected areas and about 4.7 million hectares in production forests (Table 1).

Under the present land classification system, the information available on forest land and A&D land is often confusing. Also, land statistics in the

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001a	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
5.4–7.2	5,288	4,700	274	1,540	6,514

Philippines tend to be imprecise and changeable, as new ways of estimation supersede older ones. Most forests are found on forest land, and most cropland on A&D land, but these land-uses are not always consistent with the legal classes. Of the area presently classified as A&D land, 30–35% has slopes greater than 18%. Conversely, as much as 28% of forest lands have slopes less than 18%. Loopholes in the existing system of land laws, the lack of demarcation of the PFE and other categories of land, and the status of extensive stretches of land as open access have affected the integrity and security of the forest. Forty-five per cent of the external boundaries of the PFE are reportedly demarcated^a.

Planted forests. No clear figures on the extent of planted forests are available; estimates range from 274,000 hectares^a to 753,000 hectares (FAO 2005). An estimated 25,600 hectares were established in 2002, of which 4,900 hectares were planted by the private sector^b. There are an estimated 97,000 hectares of rubber plantations (FAO 2001a).

Institutional arrangements

Forest tenure. The government holds title to a large part of the forest land; data on the actual extent were not available for this report. Considerable portions of the forests (excluding protected areas) are also held by the private sector, communities and people's organizations, and by indigenous people with various kinds of tenure. A 1995 Presidential Executive Order granted tenure and user rights over certain denuded forest lands and forests to communities; in recent years, the allocation of forest resource user rights has changed significantly (see 'Forest for production').

SFM policy framework. The 1987 constitution, which reflected a general reorientation of natural resource management policies in favour of co-production, installed CBFM as the main framework for forest resource management. Today, communities are the main implementers of SFM strategies and programs.

Forest policy and legislation. The foundation of forest policy is Presidential Decree 705 of 1975, as amended; it is known as the Revised Forestry Code of the Philippines. According to this code (Section 2), the components of forest policy are the multiple-use

of forests, the systemization of land classification, the establishment of wood-processing plants, and the protection, development and rehabilitation of forest lands. The code was drawn up when the major thrust was on the massive commercial harvesting of the vast state-owned natural forests by large corporations. Now, the focus has shifted towards small-scale CBFM, covering planted forests as well as natural forests. The drafts of a new national land-use code and an SFM act have been due to be considered by the legislature for several years. The current code and subsequent laws and regulations have not been fully harmonized. Some recent forestry-related laws and administrative instructions include the Republic Act 7586/1992 on a National Integrated Protected Area System; Executive Order 263/1995 on Community-Based Forest Management as a National Strategy for Sustainable Development of the Country's Forests; the Indigenous People's Rights Act 1997 (Republic Act 8371); and Executive Order 318/2004 on Promoting Sustainable Forest Management in the Philippines (which provides guidelines on how to harmonize and implement forestry reforms).

A Master Plan for Forestry Development (MPFD) was prepared in 1990 but not really implemented. It was reviewed, revised and updated in 2003 with the support of UNDP/FAO. The government is now in a position to take appropriate action to implement the revised MPFD and create an environment to attract investment for forestry development.

Institutions involved in forests. DENR is the government agency responsible for the management of forests and protected areas. From 1904 to 1987, the Bureau of Forestry (BFD) was responsible under different departments. With the issue of Executive Order 192 of 1987, most regulatory functions of the BFD were devolved to field offices known as environment and natural resources offices (ENROs), and BFD became the Forest Management Bureau (FMB), a bureau of DENR with recommendatory powers. There are two other forestry-related bureaux within DENR: the Protected Areas and Wildlife Bureau and the Ecosystem Research and Development Bureau.

In respect to decentralization, the Philippines Local Government Code of 1991 conferred certain central government powers relating to taxation, budgeting, planning and management on local government units.

In forestry, DENR devolved some of its functions to the regional level and reassigned some 1,000 staff members to local authorities. DENR was also expected to transfer budgets, assets and records for the Department's devolved functions and programs, but there has been only limited progress in this regard (Ferguson & Chandrasekharan 2005).

Many elements of Philippine civil society participate in forest management and development. A number of international and national NGOs are involved in forestry, particularly in CBFM and environmental conservation. Some of the national NGOs involved in forestry are: Tanggol Kalikasan, the Philippines Association for Inter-cultural Development, HARIBON, and Environmental Science for Social Change.

Status of forest management

Forest for production

The administration of forest lands is principally the responsibility of the state. The private sector began to be involved in forestry in the late 1920s, extracting and exporting Philippine mahogany (dipterocarp species) worldwide. At the height of these operations in the 1970s, the private sector held more than two-thirds of the public forest lands for timber extraction in concessions.

No other Asia-Pacific country was deforested as extensively as the Philippines in the period after World War II. Even though timber licence agreements (TLAs), the system for allocating logging rights, stipulated that logging operations should be conducted according to a system of selective logging, and there were detailed guidelines for forest management, these were hardly ever applied. Many of the problems associated with the large-scale destruction of the forest resource can be linked to a combination of land and concession tenure issues and the lack of ability or will to enforce the conditions of the concessions. In order to prevent the loss of old-growth forests, Decree 24/1991 imposed a ban on old-growth (or primary-forest) logging from January 1992 and shifted logging to second-growth (residual) forests. Silvicultural prescriptions were not followed. Today, the control of illegal activities remains a major challenge and is considered one of the main obstacles to SFM^b.

The legal basis of the TLA system changed under the 1987 constitution, resulting in some dramatic reductions in the awarding of concessions. However, TLA holders were allowed to continue to operate until the expiry date indicated in the original agreement, subject to certain requirements. The policy implemented over the past 15 years has been to reduce, phase out or cancel the areas under TLAs in favour of awarding forest harvesting rights embodied in timber production sharing agreements (TPSAs). The TPSA system increased government revenues, but these revenues did not generally go back into forest management as originally intended. An important element in the new policies was the encouragement of private-sector participation in forest plantations. TPSAs then evolved into 'industrial forest management agreements' (IFMAs), 'socialized industrial forest management agreements' (SIFMAs) and community-based forest management agreements (CBFMAs), all of which encourage investment in maintaining the forest growing stock through a performance bond. These new instruments take into account the provisions of the Indigenous People's Rights Act, according to which indigenous people have the right to title over their ancestral lands. It also means that they have a say in the management of these lands. TLAs will all be phased out by 2006 and CBFM arrangements are becoming the norm.

Under CBFM, organized communities operate within allowable-cut limits set by the government. They harvest timber and other forest products to sell, use for their own needs, or process. The sale of timber, rattan, bamboo and other forest products has provided additional income for upland communities. As of December 2003, CBFM projects covered 5.97 million hectares (FMB 2005); the 13 active TLAs covered 544,000 hectares in February 2005. Forestland grazing management agreements covered 473,000 hectares in December 2003, SIFMAs 35,400 hectares and agroforestry lease agreements 147,000 hectares (*ibid.*).

Silviculture and species selection. TLAs for logging in natural forest follow a system of selective cutting, while forest plantations follow a system of clearfelling and artificial regeneration. Many species are used, and it is difficult to determine which are the most commercially important. Species from natural forests not listed in Table 2 but of commercial importance

Table 2 Some commonly harvested species for industrial roundwood (2001–03)^c

Timber species	Remarks
<i>Shorea squamata</i> (mayapis)	Used in the sawmilling and plywood industries
<i>Parashorea plicata</i> (bagtikan)	Used in the sawmilling and plywood industries
<i>Calophyllum</i> spp (bitanghol)	Used in the sawmilling and plywood industries
<i>Albizia falcataria</i>	From secondary forest stands and planted forests
<i>Gmelina arborea</i>	From planted forests

include *Dipterocarpus grandiflorus* (apitong), *Cleistocalyx operculatus* (malaruhut), *Pterocarpus indicus* (narra), *Shorea polysperma* (tangile) and *Ficus nota* (tibig). Natural hardwoods are in short supply and plantation woods such as *Gmelina arborea*, *Eucalyptus* spp and *Acacia mangium*, along with imported timber, are increasingly being used.

Planted forest and trees outside the forest.

Species most commonly used in plantations are *Eucalyptus* spp, which account for 25% of all plantations, and *Tectona grandis* (teak) (5%). Forest plantations include those developed by the government in regular reforestation projects, by communities in CBFM projects, and by industrial concerns through IFMAs, as well as tree farms developed by small landholders on private lands. No recent, aggregated information is available on the survival, growth or yield of the plantations, but it is thought to be low. Corporate-sector involvement in the growing of industrial plantations is being encouraged through IFMAs for the development of integrated industrial forest plantations. An IFMA is a production-sharing contract entered into between DENR and a qualified applicant for a period of 25 years; the period may be renewed for another 25 years, consistent with the principle of sustainable development and in accordance with an approved comprehensive development and management plan. In December 2003, there were 201 IFMAs and industrial tree plantation lease agreements covering a total area of 714,000 hectares (FMB 2005). In addition, trees are raised in farms, homesteads, road margins and in agroforestry systems.

Forest certification. No forest in the Philippines is known to be independently certified as well managed.

Estimate of the area of forest sustainably managed for production.

Given the uncertainties that the phasing out of TLAs is bringing, the extent of SFM is difficult to gauge. Certainly, some of the TLAs have been active for more than 30 years and the forests are now in their third cut, and some CBFM arrangements also show promise. The total area of PFE under management plans is 910,000 hectares^a; in general, however, data on the quality of management are lacking. The area of natural forest managed sustainably is estimated by ITTO to be at least 76,000 hectares, comprising a forest concession managed with ITTO assistance in Surigao del Sur.

Timber production and trade. The production of industrial roundwood in the Philippines peaked at 11.2 million m³ in 1974 (FAO 2001b); in 1977 there were some 325 sawmills and 70 wood-based panel manufacturing units (ibid.). By 2003, tropical industrial roundwood production had fallen to 503,000 m³ (ITTO 2005). Correspondingly, the number of processing units and their production has also fallen: in 2003 there were 31 active regular sawmills with an annual log requirement of 539,000 m³ and 50 plywood and veneer manufacturing units (FMB 2005). Many of the functioning mills have retooled and modified their operations to suit present conditions. Sawmills and woodworking mills mostly rely on plantation wood of *Gmelina arborea*, *Eucalyptus deglupta*, *Albizia falcataria*, *Pinus radiata* and *Pinus caribaea*. The first three of these are mostly produced locally and the last two are mostly imported.

The Philippines imports a significant volume of timber – 356,000 m³ of logs, 338,000 m³ of sawnwood and 93,000 m³ of veneer in 2003 (ITTO 2005).

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
4,700	n.d. *	910	0	76	274	274	0

* Recent and continuing changes in the forest allocation system mean that even recent figures may be out of date

Non-wood forest products. No reliable figures on the production and trade of NWFPs were available for this report. NWFPs produced and marketed in the Philippines include resins, tannin, honey, medicinal plants, bamboo, rattan, nipa shingles, *Agathis celebica* (almaciga), etc. The allowable cut for rattan was 21.0 million linear metres in 2003 (FMB 2005). Much raw material for the NWFP industry is imported from other Southeast Asian countries and is further processed in the Philippines.

Forest for protection

Soil and water. The Revised Forestry Law (Chapter III) and the Philippine Environment Code (Chapter III and Chapter VI) have provisions on watershed and ecosystem management, including procedures for the protection and management of sensitive areas for soil and water conservation. The area of forest managed primarily for soil and water conservation is not known^a.

Biological diversity. The Philippines is rich in biodiversity, containing an estimated 24,300 forest-dependent species of mammals, birds, reptiles, amphibians and fish^a. A total of 50 mammals, 72 birds, eight reptiles, 48 amphibians and 215 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 31 mammals, 65 birds, 48 amphibians and 21 plants are found in forests (IUCN 2004). Thirteen plants are listed in CITES Appendix I and 196 in Appendix II (CITES 2005).

Protective measures in production forests. Wood production from natural forests is progressively being reduced and efforts are being made to increase the area under planted forest.

Extent of protected areas. To conserve the diversity of ecosystems and species, 327 protected areas have been established with a total area of 6.85 million hectares (not all of which are forested)^a. According to UNEP-WCMC (2004), 1.54 million hectares of forest are in protected areas that conform to IUCN protected-area categories I–IV, including 246,000 hectares of lowland evergreen broadleaved rainforest and 825,000 hectares of unclassified forest.

Estimate of the area of forest sustainably managed for protection. Insufficient data were available to estimate the area of the protection PFE being managed sustainably.

Socioeconomic aspects

Economic aspects. The contribution of the forest sector to GDP was 1.6% in 1975, 0.14% in 1999 and 0.05% in 2002^a. An estimated 23,400 people are employed in forest-related government positions, 22,500 of whom have university degrees^a; no reliable data on the total forest-sector workforce were available for this report.

Livelihood values. An estimated 18–20 million people are dependent on 7.2 million hectares of forest lands (not all of which are forested) for subsistence uses and traditional and customary lifestyles^a.

Social relations. Indigenous people play a crucial role in CBFM implementation in areas they claim as ancestral domain. DENR formulated guidelines and undertakes the identification, delineation and recognition of ancestral land and domain claims through Department Administrative Orders 93/02. DENR further provides specific guidelines on the management of certified ancestral domain claims. However, there remains considerable uncertainty about the future of all ongoing and new CBFM projects under indigenous peoples' tenure^a.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I–IV	Allocated for soil and water	With management plans	Sustainably managed
1,540	1,540	n.d.	n.d.	n.d.

The Philippines has been experimenting with people's participation for more than 30 years. CBFM has now been given the status of the flagship/banner program of DENR, particularly to address poverty and the lack of economic development in upland and forest-dwelling communities.

Summary

The Philippines has lost a substantial part of its natural forest, and timber production has declined dramatically over the last three decades. Many of the problems associated with the large-scale destruction of the forest resource can be linked to a combination of land and concession tenure issues, and the lack of ability or will to enforce the conditions of the concessions. Moreover, many of the rural poor did not have land tenure and often settled illegally on forest land. Considerable efforts have recently been put into the development of community forestry, but the success of this approach in restoring the country's degraded landscapes, particularly on steep slopes, and in increasing rural incomes, remains to be proven.

Key points

- An area of 15.9 million hectares has been defined legally as forest land (land with greater than 18% slope), but the estimated natural-forest PFE under actual forest cover is only about 6.24 million hectares, comprising 4.70 million hectares of production forest and 1.54 million hectares of protection forest. There are also an estimated 274,000 hectares of plantation.
- At least 76,000 hectares of natural-forest production PFE are estimated to be sustainably managed. No estimate could be made of the extent to which the protection PFE is so managed.

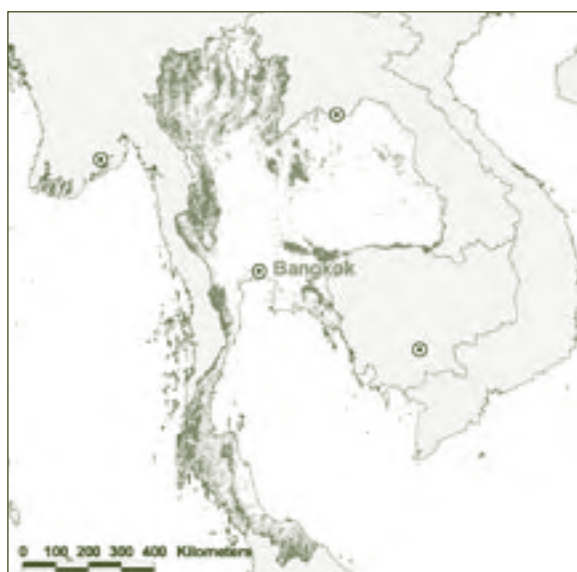
- While commercial-scale concessions (using what are called 'timber licence agreements' – TLAs) have been the main mechanism for allocating logging rights in the past, forest management is now being conducted largely under community-based approaches; TLAs will be completely phased out by 2006.
- The contribution of the industrial forest sector to the national economy has declined dramatically in recent years and stood at only 0.05% of GDP in 2002.
- On the other hand, an estimated 18–20 million people are dependent on forest lands (not necessarily forested) for subsistence uses and traditional and customary lifestyles.
- DENR is the government agency responsible for forest management and protected areas; a degree of administrative decentralization has been pursued in recent years.
- The Philippines is a net importer of timber.
- The Philippines has a large number of endangered species. In its protected-area network of 6.85 million hectares, the estimated extent of forests is 1.54 million hectares.

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THAILAND



* For legend see page 58

Forest resources

The Kingdom of Thailand is located in the southeastern part of continental Asia, bordered by Myanmar, the Lao People's Democratic Republic, Cambodia and Malaysia. It has a land area of 51.3 million hectares and a population of 63 million people. In the 1980s and 1990s, Thailand's economy was one of the fastest growing in the world, but this coincided with the rapid depletion of its natural resources. Estimates of forest cover range from 13.0 million hectares^a to 14.8 million hectares (for 2000; FAO 2005a).

Forest types. The forests can be classified as: (i) evergreen forests with three sub-types – tropical rainforests, semi-evergreen forests and hill evergreen forests (43% of the forest area), dominated by species of the genera *Dipterocarpus*, *Hopea*, *Shorea*,

Lagerstroemia, *Diospyros*, *Terminalia*, and *Artocarpus*; (ii) pine forests, mainly of *Pinus merkusii* (2%); (iii) mangrove and coastal forests (2%), the main mangrove genera being *Rhizophora*, *Avicennia* and *Bruguiera* and the main beach genera *Diospyros*, *Lagerstroemia* and *Casuarina*; (iv) mixed deciduous forest (22%), the dominant species being *Tectona grandis* (teak), *Xylia kerrii*, *Pterocarpus macrocarpus*, *Dalbergia* spp and *Azelia xylocarpa*; and (v) dry dipterocarp forest (31%).

Dynamics of forest resource change. Forest covered over 60% of the land area in 1953, but by 2000 this had fallen to less than 30%. Between 1990 and 2000, the annual loss of forest cover was an estimated 112,000 hectares, a deforestation rate of 0.7% (FAO 2005a). Remaining forests are subject to a range of disturbances, including encroachment for agriculture, forest fires (an estimated 2.63 million hectares of mostly deciduous forest were affected by fire in the period 1996–2000^a), refugees from neighbouring countries seeking living space, the development of infrastructure, and illegal logging.

Permanent forest estate. The area of PFE reported in 1991 was 23.5 million hectares, much of it already without forest cover. The most recent estimate suggests that this had shrunk by almost 50% to 13.0 million hectares in 2001^a, 1.15 million hectares of the original PFE having been converted to agriculture, 8.3 million hectares to settlements and infrastructure and 1.1 million hectares to other uses^a. The balance now available comprises about 10.1 million hectares of closed forest (the estimated PFE given in Table 1) and 2.84 million hectares of open forest. The production forest is now mainly planted forest on government land.

Table 1 PFE

Estimated total forest area (million hectares)	Total closed natural tropical forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^d			
		Production		Protection	Total
		Natural	Planted		
13.0–14.8	10,127	0	1,870*	8,260	10,130

* Includes semi-natural planted teak

The security of the PFE in Thailand is somewhat problematic. The allocated areas keep changing, boundaries are not clearly demarcated and the land is subject to illegal occupation. The logging ban in 1989 (see 'forest policy and legislation') has not had the expected positive effect; it did little to limit environmental degradation (Pragtong 2000).

Planted forests. The total extent of planted forest in 2000 was an estimated 2.81 million hectares (FAO 2001); not all of this is in the PFE estimated in Table 1. In addition, there were about 2.1 million hectares of rubber plantations, an important source of timber (*ibid.*).

Institutional arrangements

Forest tenure. All forests in Thailand are owned by the state, although all trees established on private lands are private property. The 1997 constitution recognizes the right and duty of traditional and other local communities to participate in natural resource management, although without changes to forest-related legislation it is unclear what this means in practice for forest management. There is an ongoing debate in Thailand about the rights of traditional and other local communities to access forests, including in protected areas. Rural people dependent on the forest and forest land have the right to collect certain NWFPs for their consumption and rural trade^a. Some 'disturbed' state forests are available for long-term rent at a low charge for growing crops or planting trees^a.

SFM policy framework. In the strict sense, there is no framework for SFM in Thailand, even though the country formally subscribes to the overall concept. Production forestry is concentrated in teak and rubber plantations and, for the time being, there is no comprehensive scheme to restore degraded forests to economic use.

Forest policy and legislation. Thai forestry is regulated by a number of legislative instruments: the National Forest Act of 1941, the Wildlife Preservation and Protection Act of 1960, the National Parks Act of 1961, the National Reserved Forests Act of 1964 and the Forest Plantation Act of 1992. A draft Community Forestry Bill has been under development and debate in Thailand for more than a decade, but as of September 2005 had not passed into law.

The national forest policy has been revised periodically, changing its focus to suit changing situations. The 1941 policy focused on timber production and dealt solely with the management of plantations and logging concessions in natural forests. The 1985 forest policy sought to establish the long-term coordinated management of forest resources, envisaging increasing the area of forest to 40% of the land area. With the imposition of the logging ban in 1989 the focus of forestry moved clearly towards conservation. The present forest policy was adopted in 1997, based on suggestions contained in the forest-sector master plan, which was completed in 1995. Reforestation and afforestation were seen as important initiatives for the future supply of wood. Implementation of the plan has, however, been hindered by several constraints, mostly institutional.

Institutions involved in forests. The Royal Forest Department (RFD) was established in 1896 as the sole agency for the administration and management of forest resources. The RFD is also responsible for the training of field staff and for forestry research. In 2003, the RFD had five technical bureaux, seven administrative divisions, 21 regional offices, 76 provincial forestry offices and 530 district forestry offices^a. However, with recent changes in the focus of policy and the decentralization of forest administration (see below), the structure of the RFD has been rationalized. For example, the Forest Management Division, which was responsible for preparing timber harvesting plans, has been dissolved.

The 1997 constitution provides for the decentralization of federal powers and functions to local governments. The 1992 Tambon (local) Administration Act also gives greater roles to local administrations. Accordingly, tambon administrations will manage forests within their territories. Mechanisms for decentralization will include: community forest and buffer-zone management; small-scale forest plantations; and local responsibility for forest and forest-fire protection. Achieving a balance between the roles and functions of the RFD at the various levels and the tambon administrations represents a significant challenge.

Civil society was influential in the decision of the government to ban commercial logging in 1989 in the wake of destructive floods which occurred in the southern region of the country. In 1997, civil

Table 2 Some commonly harvested species for industrial roundwood (2001–03)^d

Timber species	Remarks
<i>Hevea brasiliensis</i> (rubberwood)	Used in furniture manufacturing
<i>Tectona grandis</i> (teak)	Expensive cabinet wood
<i>Eucalyptus</i> spp	Cheaper utility wood
<i>Acacia</i> spp	Cheaper utility wood
<i>Pinus merkusii</i>	Medium-quality timber

society was also closely involved in the revision of the constitution, which expressed as a fundamental state policy the recognition of the rights of communities to participate in natural resource management (Contreras 2002). The Thailand Environment Institute, established in 1993, is the main domestic NGO that focuses on environmental management.

Status of forest management

Forest for production

In the past, Thailand followed a scientific approach to natural forest management under the prescriptions of forest management (working) plans, adequately supported by forest inventories. The last such inventory was undertaken in 1975. General management guidelines prescribed that deciduous teak forest should be managed under a 30-year felling cycle. The dry dipterocarp forest was to be managed under the modified ‘coppice’ and ‘coppice with standards’ systems, based on a 20-year rotation; for the tropical evergreen forest the management system adopted was similar to the selection cutting system prescribed for the deciduous teak forest, based on a 30-year felling cycle. However, the working plan system was discontinued when Thailand banned commercial logging in 1989.

In the period 1960–1988, timber harvesting was carried out through timber concessions under the principle of harvesting yield control. More than 500 concessions were issued, covering about half the country; under this system the forests were over-harvested and residual forest stands badly damaged. After disastrous flash floods in 1988 in Nakomsithammarat Province, in which several

villages were completely destroyed, the government banned logging in natural forests and cancelled all concessions. Despite the logging ban, however, the forests remained accessible and forest clearance and encroachment became widespread. In 1995, it was estimated that there were about 10 million people living on state forest lands; these lands were subsequently allotted to the squatters (Nalampoon 2002). In 1996, the government of Thailand also revoked all logging licences in mangrove forests to reduce their destruction. Today, there is no official logging in natural forest; nevertheless, illegal tree-cutting remains a problem^a, as does encroachment; for example, an estimated 77,000 hectares were encroached upon, presumably by settlers, in the period 1993–98^a.

Silviculture and species selection. Silvicultural management was started in Thailand in the early part of the last century. Different silvicultural systems such as selection, shelterwood, coppice with standards and modified coppice were tried and adopted as appropriate.

The pattern of wood use has changed over the last few decades. During the period of the logging concessions, the five most important species in the timber market were *Dipterocarpus alatus* (29%), *Shorea obtusa* (12%), teak (8%), *Hopea* spp (8%) and *Xylia kerrii* (5%)^a. Now, plantation species have taken the place of all but teak (Table 2), which is derived from ‘semi-natural’ forest.

Planted forest and trees outside the forest.

The RFD began planting teak in 1906 on an area of less than one hectare. By 1980, the annual area planted was about 160,000 hectares, under the *taungya* system. The state enterprises (Forest

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
0	n.a.	n.a.	n.a.	n.a.	1,870	250*	1

* Semi-natural planted teak forests

Industry Organisation and Thai Plywood Factory) also established teak plantations to feed the industry. In 1992, the government passed the Forest Plantation Act, allowing the private sector to establish plantations on degraded forest land. In 1994, the RFD launched a forest plantation promotion project to encourage and support private landowners and local farmers to establish forest plantations of commercial tree species and to help the country become more self-sufficient in timber. Through this project, private owners of plantations were to receive a subsidy from the government. In 2000, the areas of plantation species were: teak – 836,000 hectares; *Eucalyptus* spp – 443,000 hectares; *Acacia mangium* and other *Acacia* spp – 148,000 hectares; other broadleaved species – 541,000 hectares; *Pinus merkusii* and other *Pinus* spp – 689,000 hectares; and other conifers – 148,000 hectares (FAO 2001). But perhaps the most important plantation species for the timber industry is *Hevea brasiliensis* (rubber); the country's large estate of this species, planted originally for its rubber latex, has increasingly been harvested for its timber. Timber from agroforestry plots, home gardens, avenue trees and farm trees is of increasing importance in Thailand.

Forest certification. Legal forest production is based on non-forest sources and planted forest; thus there is no natural forest certified in Thailand. As of October 2005, one planted forest of 921 hectares had been certified by the FSC (FSC 2005).

Estimate of the area of forest sustainably managed for production. With logging activities banned in the natural-forest PFE, there is no natural forest area sustainably managed for timber production; semi-natural planted teak forests in which timber production is possible are treated as planted forests in Table 3.

Timber production and trade. Industrial roundwood production (a large part of it rubberwood) grew from 4.98 million m³ in 1999 to 7.80 million m³ in 2003 (ITTO 2004, 2005); total roundwood production, including for fuelwood, was 27.9 million m³ in 2003 (FAO 2005b). Sawnwood production increased dramatically from 147,000 m³ in 1999 to 2.29 million m³ in 2003, and veneer also grew rapidly, from 3,000 to 160,000 m³; plywood production increased more sedately over the period, from 82,000 to 90,000 m³ (ITTO 2004, 2005). Thailand's downstream processing, particularly furniture and joinery, is also thriving.

Thailand is a net importer of primary wood products. Log imports were about 380,000 m³ in 2003, down from 466,000 in 1999; sawnwood imports were 1.65 million m³ in 2003 (ITTO 2004, 2005). Thailand also exported about 1.51 million m³ of rubberwood sawnwood in 2002 (ITTO 2005).

Non-wood forest products. Rattan and bamboo are the most important marketed NWFPs, but pine resin, lac and medicinal plants also have considerable commercial value. The RFD maintains some 102 forest recreation sites, attracting an estimated 16 million visitors per year^a.

Forest for protection

Soil and water. Since 1965, the RFD's Watershed Management Division has taken measures to rehabilitate degraded steep lands in watersheds through tree-planting and the establishment of forest villages. Catchment areas have been divided into five classes based on the level of protection needed; Class I areas are to be put under strict control. The forest area managed primarily for the protection of soil and water is estimated to be about 9.32 million hectares^a. However, controlling

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I–IV	Allocated for soil and water	With management plans	Sustainably managed
8,260	5,450	9,320	n.d.	522 ^d

encroachment and other human activities to ensure compliance with existing laws and regulations relating to soil and water conservation is proving almost impossible^a.

Biological diversity. Thailand has at least 1,190 tree species, 9,440 flowering plants, 591 ferns, 292 mammals, 962 birds and 123 amphibians^a. Thirty-eight mammals, 50 birds, 22 reptiles, three amphibians and 88 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 26 mammals, 40 birds, three amphibians and one plant are found in forests (IUCN 2004). Fifteen plants are listed in CITES Appendix I and 279 in Appendix II (CITES 2005).

Protective measures in production forests. As there is no timber production in natural forests, all forests are considered as protection forests, although many are still harvested for NWFPs for local consumption^a. In mid 2002, the RFD introduced a new ecosystem management plan for the 1.8-million-hectare Western Forestry Complex that prescribes protective measures to sustain forest ecosystems.

Extent of protected areas. Thailand has a well-established system of 349 protected areas covering a total area of 8.25 million hectares^a. According to UNEP-WCMC (2004), 5.45 million hectares of forest are in protected areas that conform to IUCN protected-area categories I–IV, including 2.04 million hectares of semi-evergreen moist broadleaved forest, 1.63 million hectares of deciduous and semi-deciduous broadleaved forest, and 627,000 hectares of lower montane forest. However, Thailand's protected-area system is fragmented (ICEM 2003), and some areas may be too small to sustain their flora and fauna, particularly large mammals.

Estimate of the area of the forest sustainably managed for protection. Five-year management plans are being produced for all gazetted national parks and wildlife sanctuaries. By 1999, more than

30 national parks and about 20 wildlife sanctuaries had approved management plans (ICEM 2003). However, clear data on the status of management in a large part of the protection PFE are not available. ITTO is providing support for the management of the Phatam Protected Forests Complex in northeast Thailand and to initiate cooperation in transboundary biodiversity conservation between Thailand, Cambodia and Laos. The project extends over an area of 174,000 hectares covering four protected areas. Another ITTO project supports the development of the buffer zone of the 348,000-hectare Kaeng Krachan National Park using participatory approaches. These areas are thought to be managed sustainably.

Socioeconomic aspects

Economic aspects. The decrease in forest production over the past 20 years has reduced the contribution of forestry to GDP to about 0.1%^a. However, the wood-processing sector has been increasing production in recent years using timber obtained mostly from plantations, non-forest sources and imports; illegal logging contributes an unknown percentage of the timber supply. Employment figures in the forest sector are not available^a. Tourism is the country's primary source of foreign exchange, and, no doubt, protected forests are a significant attraction.

Livelihood values. An estimated 10 million forest-dwelling and rural communities are dependent on about 2.6 million hectares of forests for subsistence uses and traditional and customary lifestyles^a, making use of NWFPs such as edible plants, wild fruits, wild meat, mushrooms and honey.

Social relations. The enactment of the Community Forest Bill would help community forestry to gain new prominence in Thailand and could help resolve conflicts between the national forestry administration and local communities. However, the long-running debate over the draft bill illustrates its contentious nature.

Summary

Forestry in Thailand is constrained by several factors. Coincident with Thailand's rapid economic growth in the 1980s and 1990s, its forest resources became severely depleted. Logging in natural forests has been banned, but the forests remain under pressure from encroachment, illegal logging, fire and other agents. The Royal Forest Department, the government agency responsible for forests, has a long history of forest management and remains reasonably well resourced. Plantations, especially of rubberwood, and imports are now supplying the country's thriving downstream-processing timber industry. The huge importance of tourism to the Thai economy provides an excellent incentive for strong measures to improve forest protection.

Key points

- The PFE is estimated to be 10.1 million hectares, of which 1.87 million is production PFE (all plantations) and 8.26 million protection PFE.
- An estimated 50% of the reported PFE in 1991 has been converted to agriculture, settlements and other uses.
- A logging ban has been in place in natural forests since 1989, after disastrous flash floods; however, it has not been sufficient to stop forest loss and degradation.
- Illegal tree-cutting in natural forests remains a problem.
- At least 522,000 hectares of protection PFE are being managed sustainably, but generally little information is available on the status of management in forested protected areas.
- Forests are owned by the state. There is an ongoing debate in Thailand about the rights of traditional and local communities to use and manage forests, including in protected areas.
- A draft Community Forestry bill has been under development and debate in Thailand for more than a decade.
- Timber production in Thailand has shifted from natural forests to planted forests, particularly teak and rubberwood, and non-forest sources of wood, supplemented by imports.

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VANUATU



* For legend see page 58

Forest resources

Vanuatu has a land area of 1.21 million hectares across about 80 islands and a population of about 200,000 people. It lies approximately 170 km to the southeast of the southernmost island of the Solomon Islands and about 800 km west of Fiji. The four main islands of Santo, Efate, Malekula and Erromango generally consist of a narrow coastal plain rising through broken foothills to a steep mountainous interior. The majority of the rural population (about 80% of the total) lives in a subsistence economy. The land has not yet been classified according to function or land capability. The area of natural forests and other wooded land is an estimated 902,000 hectares (74% of the land area)^a.

Forest types. A national forest inventory, completed in 1990, estimated that forests and other wooded areas comprised 205,000 hectares of mid-to-high forest, 239,000 hectares of low forest and 2,500 hectares of mangroves; the rest were thickets (434,000 hectares), scrub (45,000 hectares) and woodland (380 hectares). The mid-to-high forest (canopy height ranging from 20–30 m) and low forest (ranging in height from 10–20 m) fall under the broad category of tropical evergreen forests, the main species being of the genera *Calophyllum*, *Camptosperma*, *Dillenia*, *Elaeocarpus*, *Endospermum* and *Gmelina*. The common species in the mangrove forests belong to the genera *Rhizophora*, *Avicennia*, *Lumnitzera*, *Sonneratia* and *Xylocarpus*.

Dynamics of forest resource change. Despite reported agricultural expansion, FAO (2005a) estimated that Vanuatu's forest area increased slightly in the 1990s.

Vanuatu is subject to frequent cyclones; on average, at least one severe cyclone causing significant forest damage occurs every five years. These open up large gaps in the forest canopy and allow the invasion of the vine *Merremia*.

Permanent forest estate. Vanuatu has no legally defined PFE; since all land is owned by individuals or clans, a future PFE will need to be negotiated with and agreed by the respective landowners. The figures given in Table 1 show the area of forest that could possibly comprise a PFE in the future.

Planted forests. The area of planted forest in Vanuatu is about 2,100 hectares^{a,d}, including about 300 hectares of privately owned *Endospermum*

Table 1 PFE *

Estimated total forest area (million hectares)	Total closed natural tropical forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^{a,d}			
		Production		Protection	Total
		Natural	Planted		
0.902	442	117	2.10	8.37	127

* Possible components of a future PFE

medullosum. The annual planting rate in Vanuatu is reported to be 30–40 hectares. Agro-industrial plantations of *Cocos nucifera* (coconut), with an area of 215,000 hectares, are an important non-forest source of wood in Vanuatu.

Institutional arrangements

Forest tenure. In Vanuatu, all lands, including forest lands, are customarily owned. The land may be owned communally, usually by clans (extended family units), or individually^a.

SFM policy framework. Article 7(d) of the 1979 constitution states that “every person has the fundamental duty to ... safeguard the natural wealth, resources and environment in the interest of the present generation and of the future generations”. This is echoed in the 1997 national forest policy, the principle goal of which is to ensure the sustainable management of Vanuatu’s forests to achieve greater social and economic benefits for current and future generations. The ITTO C&I have been adopted as a monitoring tool, and training has been provided.

Forest policy and legislation. In 1991, the government instituted the National Forest Programme, an important outcome of which was the draft national forest policy of 1995, which was later issued as the formal Vanuatu National Forest Policy Statement of 1997. During its preparation the views of stakeholder groups, including national and provincial governments, chiefs, community leaders, churches and the forest industry, were sought. Consultative meetings and workshops were held in each province. The national forest policy contains an indicative program of action in all aspects of the management of Vanuatu’s forests which, if fully implemented, would lead to a significant improvement in forest management^a. It also makes specific recommendations on the management of forests in the different island groups. The policy defines a series of objectives, measures and strategies for implementation under nine major headings: forest management, environment and conservation, landowners and communities, forest industries, afforestation and extension, forest research, forest training and education, forest administration, and forest revenue. The policy advocates giving firm legal effect to a log

export ban, establishing the AAC, and instituting licences of a kind that will encourage commitment to value-added processing, etc.

The principal forest law in force is the Forestry Act of 2001, which superseded the Forest Act of 1982. Other laws that support the implementation of the forest policy include the International Trade (Flora and Fauna) Act of 1989, the National Parks Act of 1993 and the Timber Rights Guarantees Act of 2000. Under the provisions of these acts, several rules and regulations have been issued: eg a ban on log exports (1993), a code of logging practice (1996), mobile sawmill regulations (1996) and sandalwood regulations (1997).

Institutions involved in forests. The Ministry of Agriculture, Forestry and Fisheries is responsible for forestry. Within the ministry, the Vanuatu Department of Forests (VDF), established in January 1980, is responsible for the management of natural forests through policy development, planning, protection, silvicultural principles and guidelines. It is also responsible for all reforestation, afforestation and small-scale sawmilling. Total staffing for the implementation of SFM was 51 in 2000, including 18 professionals^a. This is considered inadequate for policing adherence to forest-related rules and regulations; the VDF and other departments depend largely on the owners of the resource to come forward to report breaches of the regulations by concessionaires^a.

The VDF maintains a policy of open cooperation with NGOs and collaborates closely with some programs carried out by them. NGOs such as the Foundation of the People of South Pacific support and assist in training and extension programs. The Forestry Act provides a mechanism for wider and more consultative planning in forest management.

Status of forest management

Forest for production

Under the system of forest ownership existing in Vanuatu the role of the government through the VDF is to provide guidance and support to customary owners in planning the use and development of their forest resource. The final decision on how to use the forest resource is the prerogative of the owners. The guiding regulations include the following:

Table 2 Some commonly harvested species for industrial roundwood (2001–03)

Timber species	Remarks
<i>Dysoxylum confertiflorum</i>	Used for sawmilling and furniture manufacturing
<i>Pterocarpus indicus</i> (bluwota)	PNG rosewood, high-priced species
<i>Intsia bijuga</i> (natora)	Valuable timber species known as merbau in Southeast Asia
<i>Calophyllum neo-ebudicum</i>	Used for sawmilling and furniture manufacturing
<i>Endospermum medullosum</i> (whitewood)	New Guinea basswood

- harvesting quotas allocated to each of the four main islands (which are regarded as FMUs), based on estimated AAC levels;
- minimum diameter limit set for each timber species;
- periodic closure of harvesting in sandalwood areas;
- licensing of operators to help ensure good logging practice; and
- selection logging to be practised.

Even though the importance of long-term forest management plans is emphasized in the Forestry Act, so far no plans have been prepared for any of the four main FMUs (which correspond to the four main islands) or for individual concessions^a. According to the Forestry Act, logging companies are required to prepare and submit a coupe harvesting plan, providing details of all operations, which has to be approved by the VDF before logging commences.

The national forest inventory estimated that the total forest area suitable for logging in Vanuatu was around 117,000 hectares, about 25% of the total forest resource, and the total forest growing stock was about 13 million m³. The remainder of the forest was considered unsuitable due to steep slopes, dissected land forms, low sawlog volumes and cultural reasons. The quality of the natural forest for commercial forestry is low: in over 50,000 hectares of the harvestable natural forests, the expected timber yield is about 20 m³ per hectare and even in the best parts of it the yield will not be more than 30 m³ per hectare.

A harvesting plan is normally prepared through consultation involving representatives of the

provincial government, the VDF, the Department of Environment, the Lands Department, resource owners' representatives and the logging company. A code of logging practice has been developed in consultation with the industry that is designed to foster the application of sustainable forest harvesting to reduce damage, soil disturbance and canopy openings. Recently, logging has been increasingly observed to be more controlled and damage to the forest is reported to have been reduced (A. Leslie, pers. comm., September 2004); nevertheless, a lack of monitoring and post-harvest surveying of logging operations means limited information on the quality of harvesting is available.

Logging concession agreements are relatively short-term (5–10 years); at present, 7,200 hectares are allocated for logging under eight separate concessions. The largest concessions are foreign-owned (by operators from Malaysia and New Zealand). The estimated annual sustainable timber yield from the 117,000 hectares of natural forest suitable for logging is 68,000 m³ ^a.

Silviculture and species selection. There are no comprehensive guidelines for the silvicultural management of the production forests, although the broad suggestion is to follow selective logging with minimum diameter cutting limits. Around 20 species are generally recognized as marketable but the timber industry in Vanuatu concentrates on just a few species, mainly for domestic sale. Many species cut elsewhere in the Pacific are not used in Vanuatu. Besides the species listed in Table 2, commonly used species are: *Syzygium* spp, *Myristica fatua*, *Elaeocarpus angustifolius*, *Antiaris toxicaria* and *Castanospermum australe*. In addition, *Agathis macrophylla* (kauri) is much

Table 3 Management of the production PFE ('000 hectares)

	Natural				Planted		
	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
Total							
117	n.d.	0	0	0	2.1	2.1	0

sought-after for timber and has been an important export in the past. Easily accessible stands are now exhausted. *Santalum austrocaledonicum* (sandalwood), valued for the essential oil in its heartwood, is a major silvicultural challenge, in particular regarding its regeneration.

Planted forest and trees outside the forest.

Forest plantations tend to be established in small woodlots, generally of less than one hectare. *Pinus caribaea* and *Cordia alliodora* are the most important plantation species, and *Swietenia macrophylla* and *Tectona grandis* have been tried out in the recent past together with agroforestry tree species. Currently, there is little logging for commercial purposes in planted forests. Plantation development in Vanuatu has been short on planning and proper implementation. Considering the inadequacies of Vanuatu's natural forests for production purposes because of their quality, composition and distribution, forest plantations will have to play a much larger role if future timber needs are to be met. The national forest policy suggested an initial target of 20,000 hectares of forest plantations by 2020. Trees outside the forest are mainly coconut and fruit trees in home gardens. Trees on farms and cattle ranches are important for meeting local needs for timber.

Forest certification. No certification initiatives have yet been taken.

Estimate of the area of forest sustainably managed for production. In the absence of long-term management plans and post-harvest care, production forests in Vanuatu cannot be considered to be managed sustainably (Table 3). Encouragingly, though, the current annual industrial log harvest of about 30,000 m³ is well below the estimated sustainable yield (68,000 m³ – see above).

Timber production and trade. Total roundwood production in 2003 was 119,000 m³, of which

about 76% was used as fuelwood (FAO 2005b).

The production of industrial logs was an estimated 30,000 m³ in 2003, down from 41,000 m³ in 1999 (ITTO 2004, 2005). An estimated 1,000 m³ of logs and 11,000 m³ of sawnwood were exported in 2003 (ITTO 2005). The wood-processing industry is not well developed; processing units are small and of low technology. The exploitable forest resource is probably too limited and geographically dispersed to encourage the establishment of competitive international-scale mills. There are two significant-sized, fixed-site mills and several smaller mills, plus around 50 portable sawmills; the average recovery of logs processed for export is a low 35%^a. The fixed-site mills generally have some form of wood-preservation treatment facilities.

The government of Vanuatu has operated a log export ban intermittently to assist the development of a domestic processing industry.

Non-wood forest products. Being the raw material to produce sandalwood oil, sandalwood (*Santalum album*, *S. austrocaledonicum*) is the most important NWFP in Vanuatu; about 52 tonnes were exported in 2000, much of it to Taiwan Province of China. The estimated sustainable yield of sandalwood is 80 tonnes. An oil-extraction facility has recently been constructed for the domestic production of sandalwood oil. Other important NWFPs that are locally processed and exported include sago fruit shells, *Canarium* nuts and *Barringtonia* nuts. Bamboo, palm fibres, medicinal plants and live birds are important locally. Forest recreation is an emerging activity. There is an ecotourism facility in one of the forest protected areas.

Forest for protection

Soil and water. Much of the natural forest in the mountainous interiors has a primarily protective role. However, some of these forests have been degraded by grazing and, in places, by burning.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
8.37 ^a	0	n.d.	n.d.	n.d.

In some areas, erosion and soil degradation are significant problems. No data are available on the extent or percentage of forest managed primarily for the protection of soil and water, although some areas are reserved for this purpose in coupe harvesting plans^a.

Biological diversity. Vanuatu's forests are relatively species-poor and structurally less complex than the forests of the Solomon Islands and PNG due to the geological youth of the archipelago, its isolation and frequent cyclones. The degree of endemism in the Vanuatu flora is not as great as in neighbouring countries, either; around 15–20% of trees and shrubs are thought to be endemic. Five mammals, eight birds, two reptiles and ten plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, two mammals and seven birds are found in forests (IUCN 2004). Forty-three plants are listed in CITES Appendix II (CITES 2005). Vanuatu has national conservation strategies for six commercial tree species (*Endospermum medullosum*, *Agathis macrophylla*, *Agathis silbae*, *Intsia bijuga*, *Pterocarpus indicus* and *Santalum austrocaledonicum*)^a.

Protective measures in production forests. The Code of Logging Practice has provisions for exclusion zones (eg steep slopes, environmentally sensitive and unstable soils, stream buffers, etc), guidelines for establishing infrastructure (eg road standards) and operational controls.

Extent of protected areas. There are five forest protected areas totalling 8,366 hectares, falling within the mid-to-high forest (6,349 hectares – 3% of all mid-to-high forest), low forest (1,717 hectares – 0.7% of all low forest) and mangrove forest (300 hectares – 12% of all mangroves)^a. According to UNEP-WCMC (2004), however, no forests are in protected areas conforming to IUCN protected-area categories I-IV, although 5,900 hectares are reported in IUCN Category VI. The boundaries of the protected areas are not demarcated on the ground but are mapped using customary land

boundaries, which usually use physically prominent features such as trees, coastline, ridges and rivers; they are therefore known to most people living near the area^a. There is a limited capacity in the country to implement the National Parks Act for the protection of these areas. Although the system of customary landownership makes it difficult to create new protected areas, more than 50% of existing protected areas were either initiated or supported by landowners and surrounding communities^a.

Estimate of the area of forest sustainably managed for protection. No information on the status of management in protected areas was available for this report (Table 4).

Socioeconomic aspects

Economic aspects. Forestry's contribution to GDP was about 7.7% (US\$2.84 million) in 2000^a. An estimated 500 people are employed directly in the logging sector^a.

Livelihood values. According to a recent national census, 80% of the Vanuatuan population is engaged in some form of small-scale commercial or subsistence forestry activities^a. In addition to commercial forestry operations, fuelwood, herbal medicines, wild meat, edible nuts, thatch grass, and plants used for ceremonial purposes and the manufacture of musical instruments are all part of the subsistence needs of the rural community. The value of forest products for subsistence use could be as high as US\$14 million per year^a.

Social relations. The Forestry Act (2001) provides a mechanism for a broad consultative planning process. This mechanism comprises a management committee involving a provincial/state representative, a representative of the resource owner, and representatives of the VDF, the Environment Department and the Lands Department. The low level of literacy in Vanuatu makes it difficult for forestry officers to fully explain forestry issues and terminology to landowners^a.

Summary

No formal PFE has been created in Vanuatu because all forests are under customary ownership. The role of the national government in forest management is in policy development, planning, protection, silvicultural principles and guidelines, and the supervision of logging companies. However, to date it has not been possible to implement a forestry regime that operates on the basis of long-term forest management plans.

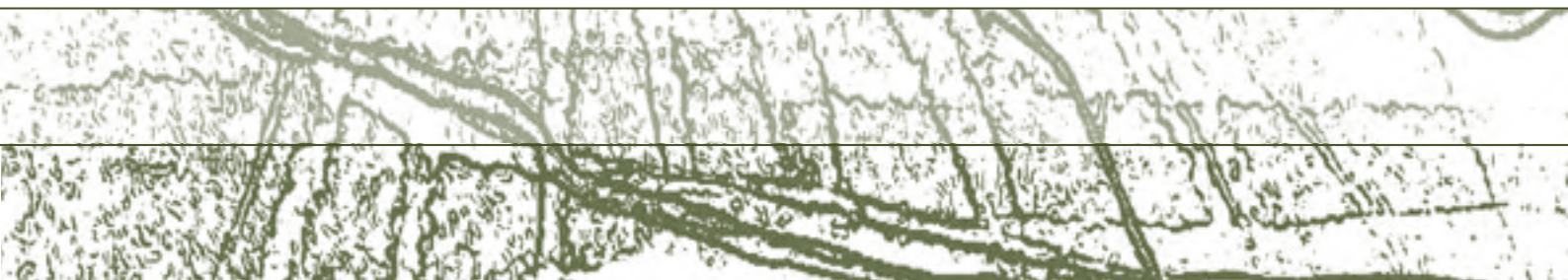
Key points

- All lands, including forests, are customarily owned.
- There is, therefore, no formal PFE. Theoretically, a future PFE could amount to 127,000 hectares, of which 117,000 would be natural-forest production PFE and 8,340 protection PFE; there are about 2,100 hectares of plantations.
- Production forests are not covered by long-term management plans and therefore cannot be considered sustainably managed. No estimate could be made of the area of protection PFE under SFM.
- The current annual harvest of about 30,000 m³ is well below the estimated sustainable yield (68,000 m³) from the 117,000 hectares of natural forest deemed suitable for production forestry.
- The national forest policy contains an indicative program of action in all aspects of the management of Vanuatu's forests which, if fully implemented, would lead to a significant improvement in forest management.
- The Department of Forestry under the Ministry of Agriculture, Forestry and Fisheries has responsibility for administering and managing the forest. The personnel, funds and facilities available to it are inadequate to carry out these functions.
- The four FMUs (corresponding to the four main islands) are not covered by long-term management plans, although coupes are usually covered by harvesting plans based on the Code of Logging Practice.

- The protected-area system of Vanuatu is very small; about 3% of the mid-to-high forest and 0.7% of the low forest are represented in protected areas.

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LATIN AMERICA & THE CARIBBEAN

BOLIVIA



* For legend see page 58

Forest resources

The landlocked country of Bolivia has a land area of 110 million hectares and an estimated population of 8.6 million people. It has three broad biogeographical zones: the high-altitude, unforested *altiplano* (highlands in the Andean mountain zone), with peaks exceeding 6,000 m; *los yungas* and *los valles*, which include the valleys on the eastern flank of the Andes; and the tropical lowlands of Amazonia (*El Oriente*), containing moist tropical forests in the northeastern part and subtropical plains in the southeast (*El Chaco*). Recent estimates of forest area include 53.1 million hectares (FAO 2005), 58.6–59.5 million hectares^a and 52.2 million hectares (UNEP-WCMC 2000).

Forest types. Eighty per cent of the forest lies in the tropical moist forest zone (departments of Pando,

La Paz, Beni, northwestern Cochabamba and the mid- and north-western parts of Santa Cruz). This forest is rich in timber species, such as *Swietenia macrophylla* (mara), *Hura crepitans*, *Calophyllum* spp and rubber, and NWFPs such as *Bertholletia excelsa* (Brazil nut). The semi-deciduous forest, the *Chiquitania*, is mainly located in the department of Santa Cruz and is characterized by species such as *Astronium urundeuva*, *Piptadenia macrocarpa* and *Tabebuia* spp. Sub-Andean and Andean forests cover the western flank of the Andean chain at altitudes between 400 and 3,500 m. These are characterized by Lauraceae and Meliaceae up to 900 m, by walnut-pine forests (*Juglans australis* and *Podocarpus* spp) between 1,200 m and 1,700 m and, beyond that up to 2,700 m, by *Alnus acuminata* (aliso).

Dynamics of forest resource change. FAO (2005) estimated deforestation at 161,000 hectares or 0.3% per year over the period 1990–2000. The government of Bolivia estimated the total area deforested in 1993–2000 at 1.9 million hectares and reported that it was highest in the western (non-Amazonian) part of the country^a. Deforestation and forest degradation in Bolivia are linked to planned and unplanned settlement as well as the expansion of agriculture and permanent pasture. On one hand, commercial farmers clear large areas for soybean plantations and, on the other, small-scale farmers also cause deforestation by employing slash-and-burn practices. Uncontrolled forest fires occur regularly at the end of the drier seasons and cause local damage to forest stands that have already been opened up. However, no large fires, droughts or increased storms have been observed recently in Bolivia's tropical forest region^a.

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production*		Protection	Total
		Natural	Planted		
52.2–59.5	47,999	17,000 ^d	60 ^a	14,700 ^{d**}	31,760 ^d

* Production PFE includes the delimited concession areas of 5.47 million hectares in the Oriente and other production areas (TCOs and ASLs) – see below

** The figure given for protection PFE is subject to the final designation of a number of protected areas

Permanent forest estate. Integrated land-use plans exist for about 76.5 million hectares of the country^a. Out of the 59.5 million hectares of forest as defined in these plans, 31.7 million hectares are classified as permanent forest areas, of which at least 2.3 million hectares have been converted to agricultural land^a. Twenty-five million hectares have been classified as highly productive forests and a further 1.7 million hectares as potentially productive but reserved for recreational or other non-timber use. About 5.47 million hectares are allocated as production forests for timber concessions according to Forest Law 1700 of 1996 (Table 1).

Planted forests. The total area of planted forests in Bolivia is estimated to be around 60,000 hectares^a. The official estimate of the total area of planted forest in the tropical lowlands is 20,000 hectares (Malky Harb 2005), although FAO (2003) put the planted forest area in the Amazon part of Bolivia at 46,000 hectares, including 28,000 hectares for production. Planted forest plots are generally small and include both indigenous and exotic tree species. A large proportion of the planted forest is located in the departments of Cochabamba and Chuquisca. Most has been established under programs supported by international organizations, the main focus being on local communities with various aims including increasing revenues for small landowners, restoring degraded lands and eradicating coca plantations.

Institutional arrangements

Forest tenure. Forests are both publicly and privately owned in Bolivia. In 2002, 28.2 million hectares (53%) of the forest estate were publicly owned and administered by the state (White & Martin 2002). Another nearly 17 million hectares of publicly owned forest are under specific user rights or ownership (*derechos sobre los productos y propiedad*), including more than 12.6 million hectares of indigenous community lands (*tierras comunitarias de origen – TCOs*)^a. A further 2.8 million hectares (5%) are privately owned by 'local social groups' (*agrupaciones sociales del lugar – ASLs*) and another 5.4 million hectares (10%) are privately owned by individuals and industries (White & Martin 2002).

SFM policy framework. In 1995, Bolivia adopted the Tarapoto Proposal of C&I for the Sustainability of the

Amazon Forest, sponsored by the Amazon Cooperation Treaty. The country is also using the ITTO C&I as an instrument to monitor progress towards SFM.

Forest policy and legislation. Forestry is regulated under Forest Law 1700 of 12 July 1996 and its decrees and regulations approved in December 1996. This law was one of the first applications of sustainable development principles in the country. It adopts the concept of SFM as follows: "The goal shall be to regulate the sustainable use and protection of the forests and forest lands for the benefit of present and future generations, harmonizing the social, economic and ecological interests of the country" (Article 1). Since 1996, the ancestral rights of local communities have had precedence over forest concession-holders where these rights overlap, and subsequent laws have strengthened community rights. Together with Environmental Law 1333 of April 1992 and the Law of Agrarian Reform 1715 of October 1996, Law 1700 regulates all aspects of the management and conservation of forest resources. Article 2 of Law 1700 defines the broad objectives of forest development in Bolivia, which are to:

- promote the adoption of sustainable and efficient forest activities and forest conservation to contribute to attaining the socioeconomic development of the nation;
- achieve sustainable and enhanced yields from forest resources and guarantee the conservation of ecosystems, biodiversity and the environment;
- protect and rehabilitate water catchment areas, prevent and check soil erosion and the degradation of forests, grasslands, soil and water, and promote afforestation and reforestation;
- facilitate access to forest resources and their benefits for the whole population, in strict compliance with regulations for protection and sustainability;
- promote forestry and agroforestry research and the dissemination of its results for the benefit of the production, conservation and protection of forest resources; and
- stimulate understanding and promote awareness of the responsible management of catchment areas and their forest resources.

Institutions involved in forests. According to Article 19 of Law 1700, the Ministry of Sustainable Development and Planning (*Ministerio de Desarrollo Sostenible y Medio Ambiente*) has overall responsibility for the national forestry regime. The Directorate General of Forests is responsible for forest policy within this ministry. The Forestry Superintendency (*Superintendencia Forestal*) is the regulating organization and the National Forestry Development Fund (*Fondo Nacional de Desarrollo Forestal – FONABOSQUE*) is the financing mechanism, although it is not in operation. Departmental governments and municipalities should support the development of the forest sector in accordance with specifications in the law. The Renewable Natural Resource Regulatory System (*Sistema de Regulación de Recursos Naturales Renovables – SIRENARE*) regulates, controls and supervises the sustainable utilization of renewable resources (Article 21).

Through Law 1788 on the organization of executive power (*Ley de Organización del Poder Ejecutivo*), the Vice-Minister of the Environment, Natural Resources and Forestry Development is given responsibility for the following strategic objectives related to forests:

- carry out a preliminary evaluation of the potential of national forest resources;
- facilitate technical assistance in the empowerment and strengthening of ASLs and indigenous community land committees (*comités de tierras comunitarias de origen*) by carrying out inventories, management plans and annual operational forest plans;
- identify and classify areas for permanent forest production to be licensed by the Forestry Superintendency;
- apply current policies and standards and develop complementary standards to facilitate the development of forestry activities;
- establish reference lists of forestry permits; and
- follow up and evaluate forestry plans, programs and projects.

The country is strengthening the ability of its personnel to implement SFM by providing in-service training and maintaining forestry education at a high level, including specialization courses in forest

management at the University of Cochabamba (see Achá & Guevara 2003). Through the Law of Popular Participation (Law 1702, 1996), urban and rural municipalities have been created and given new responsibilities and resources, including over the use and management of forests. Territorial grass-roots organizations such as 'peasant communities' and 'neighbours' councils' are being recognized and given important tasks in the new structure for the use of public resources. The Law of Regional Decentralization has created *prefecturas* in the nine departments of the country with responsibility for the regulation, planning and coordination of activities in the municipalities within them.

The FSC has established the Bolivian Council for Voluntary Forest Certification (*Consejo Boliviano para la Certificación Forestal Voluntaria*) to oversee the establishment of this certification system in Bolivia. The private sector is organized through a producers' association coordinated by the Bolivian Forestry Chamber (*Cámara Forestal de Bolivia*). The Chamber also includes a technical component known as the *Promabosque* which, among other tasks, promotes SFM in natural and planted forests. Three forest concessions covering a total area of 262,000 hectares have been granted to the two major universities in Bolivia for educational and research purposes.

Status of forest management

Forest for production

Since 1996, access to forest resources in the PFE has been based on:

- forest concessions in state lands (*tierras fiscales*);
- concessions for ASLs;
- harvesting permits in privately owned forest lands, divided into two categories: (i) sustainable forestry with management plans, and (ii) conversion permits (*permisos de desmonte*); and
- forest management in TCOs.

Under Law 1700, forest concessions are granted for a period of 40 years, subject to a forest management plan audit every five years. Management plans and auditing are also required in TCOs and private forests. The exclusive user rights of indigenous groups over

Table 2 Some commonly harvested species for industrial roundwood*

Timber species	Remarks
<i>Hura crepitans</i> (ochoó)	11% of production, 2002 (about 63,000 m ³)
<i>Amuburana cearensis</i> (roble)	7% of production, 2002
<i>Cedrela odorata</i> (cedro)	Production declined from 103,000 m ³ in 1998 to 20,000 m ³ in 2002
<i>Carinaria ianarensis</i> (yesquero blanco)	4% of production, 2002
<i>Tabebuia</i> spp (tajibo)	8% of production, 2002

* Sources: ^c, SIFOR/BOL (2002)

their forest resources are guaranteed in the TCOs. In privately owned forests, a permit for conversion into other economic land-uses can also be obtained. The rules for forest management plans are described in Law 1700 and complementary regulations (Decree 24453). A management plan has to be prepared by a professional forester who is independent of the concessionaire. Forest management is supervised by the Forestry Superintendency and also by those municipalities in which the concession is situated.

Bolivia has recently made efforts to implement forest policies to meet SFM objectives. SFM, however, is a relatively new concept and still needs to be fully introduced and enforced. In 2003, a total of 86 commercial forest concessions were operating in an area of 5.47 million hectares, most of them with a valid management plan^a. A system of auditing has been developed and the Forestry Superintendency is beginning to operationalize this. The fact that a significant number of forest concessions has been certified over the past five years (see below) indicates the high standard of forest management already being achieved.

Regulations under Law 1700 recognize as a valid five-year audit those forest audits carried out by an international system of voluntary forest certification, properly accredited by credible international bodies. Accordingly, in late 2003 the Forestry Superintendency renewed the forest-concessions rights for 40 more years of FSC-certified forest concessions.

Silviculture and species selection. Management plans prescribe methods of checking the progress of regeneration after forest harvesting, generally through permanent observation plots. They also

prescribe silvicultural operations before, during and after harvesting. Harvesting itself has to be done according to RIL prescriptions and a detailed annual operational plan. Silvicultural prescriptions and RIL are implemented in most certified forest concessions.

There are more than 2,000 tree species in Bolivia, of which at least 220 have been used and marketed in different areas of the country (STCP 2000). In the past, forest operations in Bolivia were based on the selective logging of a few valuable species, in particular mara and *Cedrela odorata* (cedro). In recent years, the number of harvested species has increased and this has resulted in higher removals. For instance, in 1995 (before the new forest law) mara was the most important tree species harvested in the country, accounting for around 16% of the commercial timber removed; currently, however, it officially constitutes less than 1% of commercial timber removed (SIFOR/BOL 2002). In addition to the species listed in Table 2, important timber species harvested in Bolivia include *Sterculia apetala* (sujo) and *Schizolobium amazonicum* (serebó).

Planted forest and trees outside the forest. The major species planted – mostly in higher-altitude areas – are *Eucalyptus globulus* (about 41,000 hectares) and *Pinus patula*; these two occupy about 90% of the area planted. Although considered relatively ineffective for controlling soil erosion, both species were planted for this purpose because they were considered suitable for cool climates. At the moment, these plantations are major providers of fuelwood and local timber. Other plantations are of *Alnus acuminata*, *Pinus radiata*, *P. pseudostrobus*, *Cupressus lusitanica*, *Acacia* spp and other species,

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
17,000	5,470*	5,470	2,210	2,210	60	n.d.	0

* Includes only those concessions allocated for commercial harvesting to the private sector and excludes community-based concessions

both exotic and indigenous. More than 25 species of eucalypt and pine have been tried. Trees from outside the forest are not used to any great extent as a source of traded timber.

Forest certification. Bolivia has the largest area of certified natural tropical forests in Latin America, all under the FSC scheme. The total certified forest area as of December 2005 was 2.21 million hectares (FSC 2005).

Estimate of the area of forest sustainably managed for production. The total area of sustainably managed natural forest for production is estimated to be at least 2.18 million hectares (Table 3), which comprises the area certified plus an estimated 0.5 million hectares of forest undergoing certification processes and 2,705 hectares of community forest in the Chiquiacá and Orozas communities for which a management plan has been developed under an ITTO project (PD 44/99 Rev.2 (F)). In addition, 40,000 hectares of planted forests are believed to be well managed^{a,c}, although not necessarily covered by formal management plans; these consist essentially of community forests in mountain regions.

Timber production and trade. The total sustainable production capacity of the production PFE is estimated to be about 8 million m³, but present production is far less. According to ITTO (2005), the 2003 production of logs was 650,000 m³ and sawnwood 347,000 m³. Sawnwood is the main industrial wood product and most of it is export-oriented.

The diversity of timber species and the lack of markets for lesser-known species is a problem in Bolivia. Although the country produces a significant quantity of certified wood, access to this sensitive international market is still limited.

Non-wood forest products. Brazil nut is by far the most important NWFP exported by Bolivia, while palm hearts and cacao are also significant. Palm hearts are harvested mostly in private forests and are subject to a management plan. Many other NWFPs are used locally and nationally but make little contribution to exports.

Forest for protection

Soil and water. The Environmental Law of 1992 dedicates two chapters to soil and water protection. It also defines soil and watershed conservation as a specific responsibility of the state. Through international cooperation, many small-scale plantations have been established to protect watersheds in the Andes, mainly to control soil erosion but also as a local source of firewood and products for local markets.

Biological diversity. Bolivia is renowned for its biological diversity, considered seventh in the world for the diversity of its birds, tenth for other vertebrates and 15th for primates; it also contains at least 18,000 species of plant. There is a high degree of endemism and many of its ecosystems are undisturbed. Twenty-six mammals, 31 birds, three reptiles, 21 amphibians and 70 plant species are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, twelve mammals, 19 birds, one reptile and 17 amphibians are found in forests (IUCN 2004). Bolivia has listed six plant species in CITES Appendix I and 448 plant species in Appendix II (CITES 2005). Timber species listed in Appendix II include mara and *Podocarpus parlatorei*.

Protective measures in production forests. Detailed regulations have been established under Law 1700 for commercial forestry operations to assist in protecting watersheds and soil. Forest

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
14,700	7,660	6,790	n.d.	2,380 ^d

management plans must make special provision for biological corridors, the regulation of hunting and the conservation of endangered plant and animal species.

Extent of protected areas. There are five official protected-area categories: (i) national parks; (ii) natural monuments; (iii) wildlife sanctuaries; (iv) wildlife reserves; and (v) natural areas for integrated use. Around one-third of the forested area of Bolivia (18.5 million hectares) has been allocated to a total of 36 protected areas^a. These include the *Reservas Naturales de Inmovilización*, which have provisional status as protected areas until a final decision is taken about the category of protected area to which they belong based on their values and characteristics. According to UNEP-WCMC (2004), 7.65 million hectares of forest are in protected areas that conform to IUCN protected-area categories I-IV, including 1.39 million hectares of lowland evergreen broadleaved rainforest and 1.32 million hectares of lower montane forest. Five protected areas, covering a total area of 4 million hectares situated in lowland tropical and subtropical areas, are interconnected through permanent production forests^a.

Estimate of the area of forest sustainably managed for protection. An estimated 10.7 million hectares of forested protected areas are covered by administrative decrees or simple management directives and staffed with forest rangers^a; these include 2.38 million hectares in the Madidi National Park (the subject of an ITTO project), for which a management plan is being developed and activities instigated to strengthen field-level management. This latter area is the extent of the estimated area of sustainably managed protection PFE, since insufficient information was available on the status of management elsewhere.

Socioeconomic aspects

Economic aspects. In 2002, forest-based activities contributed about 3% to Bolivia's GDP; logging and the wood-processing industry employed 60,000 people^a. There is also a significant informal sector involved in logging and industrial operations.

Livelihood values. Tropical forests are of great value to local forest dwellers, including indigenous peoples who have subsistence user rights for non-commercial purposes without the need for permits throughout the forest estate; hunting and fishing are the most important activities. Forest areas are also considered as a reserve of available land and are used for subsistence agriculture. An estimated 300,000 people derive a large part of their living from forest resources^c.

Social relations. The 1996 forest law recognizes local rights governing the use of forest resources, but the system still needs to be fully implemented and enforced. In fact, weak law enforcement and land tenure problems are still major constraints to SFM. Local tensions between legally defined forest users and forest dwellers remain unabated. Illegal logging of mara and cedro in particular still exists. Illegal crops, particularly coca, are planted by migratory farmers in fields and small openings and are often a major reason for violence in forested areas^c.

Summary

Bolivia has made remarkable progress towards SFM over the past decade. It has launched and implemented a comprehensive and ambitious reform of its forest sector and embarked on a major process of conferring property rights for natural forests to indigenous communities. Through an overarching political decentralization process, responsibilities and monitoring functions are being decentralized to municipalities and rural communities; this has generated some tensions. Forest certification has become a major factor in the introduction of SFM practices, and Bolivia has the largest area of certified natural forest in Latin America. However, the reform process faces many obstacles; full implementation still needs time and continuous and strong political will.

Key points

- The PFE comprises an estimated 17.0 million hectares of production forest and 14.7 million hectares of protection forest. A further 16.3 million hectares of forest have not yet been allocated.
- There remain huge, partly unexploited forest resources in the Amazon Basin.
- The estimated area of natural-forest production PFE under sustainable management is at least 2.18 million hectares; the estimated area of protection PFE so managed is at least 2.38 million hectares.
- The Ministry of Sustainable Development and Planning has overall responsibility for the national forestry regime.
- The Forestry Superintendency oversees adherence to the forest law.
- Territorial grassroots organizations are gaining increasing recognition in the new structure for the use of forest resources, but tensions remain.
- A well-established wood-processing industry, good professional knowledge and the establishment of certified forests provide a good basis for SFM. But access to some markets for certified timber remains problematic and the lack of a significant price premium may make it difficult to maintain high standards.
- An auditing system is in place; as it becomes operational, a clearer picture of the overall situation in production forests will emerge.
- Land tenure and, in particular, the absence of clearly defined property rights are key limitations to attracting investments to the Bolivian forest sector and, consequently, to achieving SFM.
- There are ambitious plans for the creation and management of protected areas, but these still need to be acted upon. The status of their management is mostly unclear.
- Illegal logging and illegal crops are constraints to the full adoption of SFM and the effective conservation of protected areas in many localities.

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BRAZIL



*For legend see page 58

Forest resources

Brazil has a land area of 846 million hectares and a population of about 177 million people. It shares 16,000 km of borders with ten neighbouring countries and its Atlantic coast is 7,370 km long. Ninety-three per cent of the country is below 800 m in altitude. The highest peaks, of about 2,500 m, are found on the northern border with Venezuela in the territory of Roraima and the state of Amazonas, and in the southeast on the Atlantic coast. Two geographic features stand out: the vast Amazon Basin, which contains the world's largest area of tropical rainforest; and the Brazilian Highlands, an eroded plateau in the south and southeast of the country, which separates Brazil's inland regions from a narrow Atlantic coastal plain. The climate of

Brazil is largely tropical or subtropical; temperatures average about 26°C with little seasonal variation. Annual rainfall varies from 3,000 mm or more in some parts of the northern region to 1,600 mm in central Brazil and 300 mm in the northeast. Estimates of total forest cover range from 544 million hectares (FAO 2005a) to 444 million hectares (UNEP-WCMC 2000); both estimates include tropical and non-tropical forests, although the area of non-tropical forest is small. According to UNEP-WCMC (2000), 430 million hectares of the total are tropical.

Forest types. Brazilian forests can be classified broadly as Amazon rainforest, Atlantic rainforest, central *cerrado* savanna, arid *caatinga* and the wetlands of Pantanal. About 95% of the existing natural forests (and 98% of the potentially productive natural forests) are in the Amazon (Macqueen et al. 2003). The extent of the major forest types are as follows: lowland evergreen broadleaved forests – 217 million hectares; semi-evergreen moist broadleaved forest – 48 million hectares; and sparse trees and parkland – 38 million hectares (UNEP-WCMC 2004). Data about the extent of secondary forests are not available. Mangrove forests cover about 1.6 million hectares (ibid.).

Dynamics of forest resource change. The annual rate of change in forest cover in the period 1990–2000 was estimated by FAO (2005a) to be 0.4%, or 2.31 million hectares per year. However, efforts to reduce this rate may be working; according to the Brazilian government, in the twelve-month period August 2004 to July 2005 some 1.89 million hectares were deforested in the Amazon, down

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural tropical forest ('000 hectares) Source: derived from FAO 2001	PFE ('000 hectares)**			
		Production		Protection	Total
		Natural	Planted		
444–544*	489,515	98,100	3,810	271,000	372,910

* Tropical and non-tropical

** Estimate for production and protection PFE are derived from MMA (2001) CIFOR (2003), FAO (2004) and Poore & Thang (2002). Tropical forest area only. The production PFE includes 48.2 million hectares of conservation units for sustainable use and an estimated 50 million hectares of legal reserves for production purposes (CIFOR 2003)

from 2.7 million hectares in the corresponding period in 2003–04 (Damé 2005). While all kinds of forest have been subject to deforestation, it has been most severe in the Atlantic rainforests and in the central plains. Of the original area of Atlantic rainforest, only 7% remains; by comparison, 86% of the Brazilian Amazon remains intact. Many factors contribute to deforestation in the Amazon, the main ones in recent years being the expansion of cattle-raising and commercial agriculture, in particular soybeans. In 2004, about 20% of the total Brazilian cattle herd of 204 million animals was in the Amazon, and the industry is reportedly growing at more than 4% per year (Louven 2005). Other factors in deforestation include unregulated logging, mining and oil extraction, subsistence agriculture and fire.

Natural hazards such as floods, cyclones and droughts are rare, but forest fires have been a conspicuous recent component of forest destruction. Fire is a relatively new phenomenon in the Brazilian Amazon and is mainly human-induced.

Permanent forest estate. In the Amazon the PFE may be considered to comprise 48.2 million hectares of conservation units, 103 million hectares of indigenous lands, 20.4 million hectares of permanent preservation areas and 198 million hectares of legal reserves on private lands, including both production forests and protection areas, amounting to a total of about 370 million hectares^b.

Planted forests. The total plantation forest area was an estimated 4.98 million hectares in 2000 (FAO 2005a), but the split of this between tropical and non-tropical was not reported. Tomaselli and Siqueira (2005) reported a total of 1.96 million hectares of *Pinus* and 3.29 million hectares of *Eucalyptus* plantation (the two genera comprising an estimated 95% of all plantations). Of these 5.25 million hectares, 3.81 million were established in states with a significant proportion or all of their territories in the tropics. Approximately 14,000 hectares of *Tectona grandis* (teak) have been established, and this area is increasing.

Institutional arrangements

Forest tenure. About 70% of the production PFE in the Amazon is owned privately (FAO 2004). There are legal stipulations to set aside conservation areas within each private forest property and requirements

for 'legal reserves' in private forest areas are also defined by law. According to the 1965 forest code and subsequent regulations (eg Decree 1.282 of 1994), 80% of the forest property is to be kept as legal reserve in the Amazon, 35% in the *cerrado* and 20% in other areas. Legal reserves in private lands cover 198 million hectares, and indigenous lands (Indian reserves) cover 103 million hectares (ibid.). Parts of these forests have been set apart as 'extractive reserves' for the harvesting of latex, nuts, fruits, oils and other products as a way of providing sustainable economic benefits from the rainforest. The extractive reserves, which are administered by the Brazilian Institute of Environment and Renewable Resources (*Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* – IBAMA), now make up about 4 million hectares (0.8%) of the Brazilian Amazon (IBAMA website). The National Council of Rubber Tappers of Brazil has set 10% of the Amazon as its target for extractive reserves. Despite the fact that much production forest land is privately owned, the forests are considered under the Brazilian constitution to be a common asset for all inhabitants, and ownership and tenure disputes are a major problem. Private owners are only able to exercise their rights within the limits imposed by the forest law of 1965, which regulates the harvesting of timber resources.

SFM policy framework. A new national forest policy was launched in 2001. During 2004, the creation of the Coordinating Commission for the National Forestry Program (*Comissão Coordenadora do Programa Nacional de Florestas* – CONAFLO), made up of 42 representatives of major public, private and civil-society interest groups, has added a participative dimension to policy identification and formulation in the country. Policies relating to forestry aim to achieve: better cooperation between the federal and state governments; the creation of national and state forests and extractive reserves; the stimulation of wood and NWFP production; the creation of national parks and biological reserves; the removal of undue incentives for deforestation; new instruments for financing SFM; the elimination of local structural imbalances in forestry enterprises; the establishment of state-level forest programs; the change-over from increased government presence to enhanced people's participation and private investment; and continuous monitoring and evaluation.

Forest policy and legislation. Brazil is a federation of 26 states, a federal district and more than 5,500 local governments (*municípios*). The adoption of a new constitution in 1988 prompted powerful decentralization in the management of natural resources and in the implementation of development programs. Considerable political and tax power and fiscal revenue shifted from the central government to states and *municípios*, and privatization and economic liberalization policies were also pursued. However, unclear rules and the ensuing friction have made it difficult for the state and municipal governments to have a more intense and direct involvement in the management of forestry resources. Moreover, efforts to define the relative responsibilities of different layers of government have proved inadequate, as have efforts to exert sub-national power to improve the management of the sector (Gregersen et al. 2004).

The National Forest Program 2000–2010 (*Programa Nacional de Florestas – PNF*) seeks to ensure the sustainability of the forests. One of the aims is to establish 50 million hectares of sustainably managed national forests (*Florestas Nacionais – FLONAs*) by 2010 and to achieve a target of 20 million hectares of forest plantations on private land. It incorporates six broad program areas, focusing on: the encouragement of the sustainable use of forests; fostering reforestation; the recovery of permanent preservation areas and reserves; the support of indigenous people; the control of deforestation and illegal activities; and the prevention of forest fires. Forest legislation includes: the forest law of 1965 (as amended); the Law of Protection of Fauna of 1967; the National Environmental Policy of 1981; the Water Resources Policy of 1997; Law No 9605 of 1998 on environmental crimes; Decree No 3179 of 1999, establishing penalties for forest crimes; and Decree No 3420 of 2000, creating the PNF. These are complemented by regulations from the National Environmental Council and instructions from the Ministry of the Environment, Water Resources and Amazon (*Ministerio de Medio Ambiente – MMA*) and IBAMA, which provide for a national system of conservation units, penalties for all damages caused to nature, obligatory forest replacement, as well as norms related to felling quotas, land conversions, the prevention of forest fires, etc.

Institutions involved in forests. The MMA is responsible for forestry as well as for planning, coordinating and controlling activities related to the National Environment Policy and policies for developing the Amazon. It supervises the activities of IBAMA, chairs the National Council for the Environment (*Conama Conselho Nacional do Meio Ambiente – CONAMA*) and takes part in the President's Chamber for Natural Resources Policies, which coordinates various aspects related to forests. In addition to MMA, other agencies also have responsibilities related to forest resources, such as the National Colonization and Agrarian Reform Institute (*Instituto Nacional de Colonização e Reforma Agrária – INCRA*). Another federal agency with an important impact on land management is the Indian National Foundation (*Fundação Nacional do Índio – FUNAI*), which is responsible for the preservation of Indian culture. In 1999, a Secretariat for Biodiversity and Forests was created in MMA.

IBAMA, established in 1985, implements and coordinates national forest policy. It was created by merging several earlier federal agencies, including the Brazilian Forest Development Institute; it is responsible for the coordination of national environmental issues. In general, IBAMA administers forests nationwide, monitors and controls forestry programs, and conducts environmental awareness campaigns. It also has authority to transfer some of these powers and responsibilities to sub-national governments, although reportedly this has not happened on a significant scale (Toni 2003). IBAMA has no control over the 113 million hectares of indigenous lands, which remain the responsibility of FUNAI, nor has it any control over conversions in settlement areas.

Forestry research is carried out mainly by the Brazilian Agricultural Research Corporation (*Empresa Brasileira de Pesquisa Agropecuária – EMBRAPA*) through its National Forestry Research Center located in Colombo in the state of Paraná. EMBRAPA has groups of forestry research staff at various centres: for the savanna in Brasília; for the humid tropics in Belém do Pará; and for the *caatinga* in Petrolina, Pernambuco state. It also has forestry research units in the states of Acre, Rondônia, Roraima, Amapá and Amazonas. The National Institute of Amazonian Research (*Instituto Nacional de Pesquisas da Amazonia – INPA*), an autonomous

institution in Manaus, conducts research on forest products and silviculture. Universities, large forestry enterprises, and NGOs such as the Amazon Institute of People and the Environment (*Instituto do Homem e Meio Ambiente da Amazônia* – IMAZON) also engage in forestry research. University education in forestry started in 1960; forest engineering courses are now offered by 20 universities. There are some 7,000 forest engineers working in Brazil, 1,600 with master's degrees and 300 with PhDs.

Various national and international NGOs participate in programs and projects and contribute to raising awareness, increasing political pressure for action and supplying some of the technical expertise that may be lacking in some regions. The federal government and its community program have been fostering linkages between local governments and the local population. Under this program, *municípios* stimulate discussions for the preparation of sustainable local development plans. At the beginning of 2002, some 157 *municípios* (less than 3% of all *municípios*) had participated in the program. In certain cases the priorities of poor local populations have clashed with the interests of entrenched and powerful elites of loggers and cattle ranchers (Toni 2003).

Status of forest management

Forest for production

Even though the need for managing forests according to approved management plans was specified in the 1965 forest law, this was almost completely ignored until 1994 when the government defined SFM in practical terms through Decree 1.282. In 1995, Brazil adopted the Tarapoto Proposal of C&I for the Sustainability of the Amazon Forest, sponsored by the Amazon Cooperation Treaty. This, along with the ITTO C&I, form the basis of sustainable management in Brazil's tropical forests.

Brazilian legislation does not yet provide for forest-utilization concessions in FLONAs or other publicly owned forest areas; thus, there are no conventional forest concessions in Brazil, and almost all production management is conducted by private enterprises in privately owned forests. In line with its desire to introduce SFM to 50 million hectares of FLONAs by 2010, the government has been investigating options for allocating timber production in these

areas, including the introduction of a concession system (Verissimo & Cochrane 2003). An estimated 43.9 million hectares of the production PFE in the Amazon are owned privately; of these, an estimated 21.9 million hectares of accessible forest could produce a sustainable yield of 15.2–21.9 million m³ per year (Tomaselli & Siqueira 2005). By law the use of natural forest resources on private land requires the presentation of a sustainable forest management plan (*plano de manejo florestal sustentável* – PMFS) to IBAMA. Timber may also be harvested when land is converted to other uses such as agriculture. Present legislation allows the conversion of a specified percentage of land into other uses, while the remainder must be maintained under forest cover and requires a PMFS for harvesting. The requirements for the authorization of deforestation are much easier to fulfil than the highly bureaucratic requirements for the approval of forest management plans and annual operation plans. However, control and law enforcement in the Amazon are extremely difficult because of the vastness of the area, poor infrastructure, a lack of capacity and the large number of actors contributing to deforestation^b. Other problems facing forestry in Brazil are: the remoteness of many forests from centres of commerce and control; the weak competitiveness of SFM as a land-use; the lack of competitiveness of the tropical timber industry, for various reasons; extensive degraded forests; lack of full-cost pricing and the abundant availability of low-cost timber; and a serious shortage of management skills^b. In 2001, IBAMA suspended 23% of forest management operations for poor inventory, lack of compliance, lack of zoning and other reasons (Macqueen et al. 2003). It has been reported that only about 7% of forest production is under proper forest management (FAO 2004). However, a new and positive trend is emerging. A few private forestry operations have introduced SFM, incorporating scientific planning, multipurpose management, environmental conservation, social service programs and R&D; these include Orsa Florestal, which restructured its Jari operations, and Cikel Brasil Verde, a fully integrated timber company.

Silviculture and species selection. Technical requirements for logging include inventory and the preparation of stock maps, estimation of the AAC, the fixing of cutting size, harvesting rules, conser-

Table 2 Some commonly harvested tropical timber species for industrial roundwood

Timber species	Remarks
<i>Parkia</i> spp (faveira)	At least five different species are used as plywood
<i>Calophyllum brasiliense</i> (jacareuba)	Widely used for exterior construction, furniture, etc
<i>Hymenaea courbaril</i> (jatobá)	Main dark hardwood for multiple uses
<i>Brosimum utile</i> (amapa)	Widely harvested in the Amazon
<i>Erismia uncinatum</i> (cedrinho)	Widely used locally in the Amazon

vation measures and silvicultural treatment (FAO 2004). The cutting cycle has been reduced from 50 to 30 years, and recently to 25 years. Initially, selective logging was confined to very valuable species such as *Swietenia macrophylla* (mogno) and *Virola surinamensis* (virola), which are both under harvesting moratoriums, but, with increasing demand, the number of species extracted has increased. More and more new species are finding markets, and some 150 species are now being logged in Amazon forests (Macqueen et al. 2003). Nevertheless, the issue of lesser-known and lesser-utilized species is still real, as there is insufficient demand for them and they do not command high prices. Table 2 lists some commonly harvested tropical timber species.

Planted forest and trees outside the forest.

Even though planted forests account for only about 1% of the total forest in Brazil, their contribution to industrial development has been significant. The main industrial tree species used today are various species of *Pinus* and *Eucalyptus*. *E. grandis*, *E. saligna* and *E. urophylla* are the species commonly planted in southern Brazil, and *E. citriodora* and *E. camaldulensis* in the drier parts. The pulp and paper and charcoal industries are dependent on eucalypt plantations and there are plans to expand them. After the failure of large-scale *Gmelina arborea* plantations in the Jari project in the Amazon, there have been considerable improvements in the silviculture and management of hardwood plantations, now being managed on a 25- to 30-year rotation. *Tectona grandis* (teak) has become a favourite (eg in Mato Grosso and Rondônia) because of its high value and quality and its amenability to being raised in an agroforestry environment.

Forest certification. As of December 2005, a total of 3.46 million hectares of natural and planted forests, including Mil Madeireira, ORSA Florestal, Cockel, and Guavirá Industrial e Agroforestal, had been certified under the FSC umbrella in Brazil. Of this, an estimated 1.16 million hectares were natural tropical forest and 1.35 million hectares planted tropical forest (FSC 2005). The Brazilian forest certification system CERFLOR was started in the 1990s and became operational for planted forests in 2003; a system for natural forests is under development with financial assistance from ITTO.

Estimate of the area of forest sustainably managed for production. An estimated 7% of the timber of the Amazon comes from areas covered by approved forest management plans and 25% from approved forest conversion areas (FAO 2004; CIFOR 2003). As described earlier, there is no concession system in Brazil; most legally produced timber in the Amazon is harvested from private lands subject to the approval by IBAMA of a management plan. Information on the implementation of such plans was generally not available for this report. A small amount of state-owned forest is also producing timber. The 65,714-hectare Antimary State Forest in the state of Acre is being managed sustainably according to a management plan developed under an ITTO project; some 16,713 m³ were produced in 2003 from an area of 2,200 hectares; annual production is expected to increase to 52,000 m³ (data supplied by ITTO project PD 94/90 Rev.3 (I)). Some 3,222 hectares of the Tapajós FLONA near Santarém in Pará state is also being managed according to a management plan developed under another ITTO project (PD 68/89 Rev.1 (F)); the management plan covers a total area of 136,000 hectares of

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
98,100	n.a.	5,250	1,160	1,360	3,810	1,350*	1,350

* Estimate based on the assumption that at least the certified planted forests have management plans

production forest within the FLONA. An estimated 1.16 million hectares of natural tropical forest are certified under the FSC umbrella. Available information indicates that at least an estimated 1.36 million hectares of natural tropical forest are being sustainably managed (Table 3).

Timber production and trade. Total roundwood production amounted to an estimated 236 million m³ in 2003, including 133 million m³ (56%) of fuelwood (FAO 2005b). In 2001, the contribution of plantations to total wood production was 83 million m³ (35% of the total); eucalypts alone accounted for 56 million m³, providing raw material for pulp, fibreboard, particle-board and charcoal (FAO 2003). Brazil produced an estimated 29.7 million m³ of tropical logs in 2003, up slightly from 27.3 million m³ in 1999 (ITTO 2004, 2005). About 15.9 million m³ of tropical sawnwood were produced in 2003, of which 1.32 million m³ were exported. In the same year, Brazil produced an estimated 1.2 million m³ of tropical plywood, of which 738,000 m³ were exported; Brazil does not export logs. Brazil also produces substantial volumes (nearly 80 million m³ in 2003) of non-tropical timber (ibid.). According to an ITTO diagnostic mission, a key constraint to the development of a sustainable timber industry based on natural tropical forests is the fragility of the supply chain, which is subject to disturbance by several factors. Moreover, the financial competitiveness of SFM in natural forests with alternative land-uses is often low, leading to significant deforestation^b.

Non-wood forest products. Brazil owes its name to *brazilin*, a red dye from *Caesalpinia echinata*, and to the dye extractors, *brasileiros*. A large number of NWFPs (food, medicinal plants, perfumes, dyes and tannins, natural rubber, Brazil nut, handicraft and construction materials, exudates, honey and wax) are used locally. The list of plants providing NWFPs is substantial.

Forest for protection

Soil and water. The Amazon River Basin produces 20% of all freshwater in the world; it is therefore vital that its soil and water resources are properly protected. However, no information on the area of forest set aside primarily for soil and water protection was made available for this report.

Biological diversity. Brazil's forests contain a significant share of the world's biodiversity, including an estimated 56,000–62,000 higher plant (not including mosses, lichens and fungi) and mammal species. The Amazon is home to 20% of the world's plant species, 20% of bird species and 10% of mammal species. Seventy-four mammals, 123 birds, 22 reptiles, 24 amphibians and 381 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 45 mammals, 77 birds, five reptiles, 18 amphibians and twelve plants are found in forests (IUCN 2004). Brazil has listed 59 plant species in CITES Appendix I and 610 in Appendix II (CITES 2005). The Brazilian National Policy and Strategy for Biodiversity (ESNABIO) and the National Biodiversity Programme are designed to address the situation through *in situ* and *ex situ* measures and the management of biotechnology.

Protective measures in production forests.

Measures taken to protect the production forests as part of the country's forest conservation strategy include, among others: a moratorium on the harvesting and sale of over-harvested species such as mogno and virola; the introduction and implementation of measures to control illegal logging through high-tech devices for timber-tracing and satellite data transfer; limiting the area allowed for farming in forest properties in the Amazon; yield regulation in natural selection forests; restoration forestry programs; the establishment of ecological

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
271,000	19,000*	n.d.	n.d.	n.d.

* Includes tropical and some non-tropical forest

corridors; incentives for *municípios* that have environmental conservation areas through the transfer of a 'products and services tax'; and broadening the scope of eligible activities for Clean Development Mechanism support.

Extent of protected areas. There is great uncertainty about the extent of protected areas in Brazil, with figures ranging from 27 million hectares to 271 million hectares; partly this stems from differences in the definition of 'protected' and the extent to which extractive uses are permitted. The estimate given in Table 1 and Table 4 includes indigenous reserves and protected areas on private land. According to UNEP-WCMC (2004), 19.0 million hectares of forest (tropical and non-tropical) are in protected areas conforming to IUCN protected-area categories I-IV, including 10.4 million hectares of lowland evergreen broadleaved rain-forest and 5.41 million hectares of unclassified tropical and non-tropical forest. Law 9.985 of 2000 created a National System of Nature Conservation Areas (*Sistema Nacional de Unidades de Conservação*), consisting of two main categories: (i) strictly protected areas (exclusively serving forest and biodiversity conservation), in which timber harvesting and the extraction of NWFPs are not allowed – these include national parks, biological reserves, ecological reserves, national monuments and wildlife refuge areas (IUCN categories I-IV); and (ii) sustainable-use protected areas, where controlled utilization is allowed – these cover national forests, environmental protection areas and extractive reserves. The combined total of 69 million hectares (about 8% of the national territory) is categorized, in terms of responsibility, as federal conservation units (45 million hectares) and state conservation units (24 million hectares).

Estimate of the area of forest sustainably managed for protection. No data were available on the status of management of the protection PFE (Table 4). However, vast areas of the Amazon are currently under no threat from deforestation

or other significant human-induced disturbance due to their remoteness.

Socioeconomic aspects

Economic aspects. Forestry contributes about 5% to Brazil's GDP. It is estimated that 1.8 million people have employment directly related to forests (Virgilio et al. 2002). The timber industry employs, on average, 4% of the total workers in the manufacturing sector. Data on the number of people employed in that part of the sector specifically utilizing natural tropical forests were not available for this report.

Livelihood values. The indigenous communities in the Amazon, dwellers in extractive reserves and rubber tappers, and *caatinga* forest users in the northeast depend in large measure on forests for subsistence; however, no data on the extent of this dependence were available for this report.

Social relations. The majority of the Amazon's inhabitants are recent settlers and the differences in their backgrounds lead to frequent friction. While indigenous peoples comprise 0.2% of Brazil's total population, indigenous lands and ancestral domains – mostly in the Amazon – cover about 11.5% of the total land area^b. Of the 586 indigenous areas, 138 have been recognized formally and 326 areas have reached the final stage of such recognition; in 27 areas, boundaries have been demarcated but in only 19 have the boundaries been fully approved^b. The slow process of recognition and approval of tenure causes dissatisfaction on the part of the indigenous communities. Nevertheless, the situation of indigenous communities has improved in some areas; indigenous organizations are now both stronger and more numerous and the indigenous population has started to grow, thus reducing fears of extinction. On the other hand, the majority of indigenous people still suffer from economic marginalization, malnutrition and inadequate assistance and protection (as they remain under the guardianship of the federal government)^b.

Summary

Brazil is endowed with an incredible abundance and variety of flora and fauna; it has more known species of plant than any other country. The Amazon represents the single largest tract of tropical rainforest and is still 86% intact; in contrast, the Atlantic forest covers less than 7% of its original area (although it still harbours a wide variety of biodiversity). Some of the most significant problems facing forestry in Brazil are: poor infrastructure; the remoteness of many forests from centres of commerce and control; the weak competitiveness of SFM as a land-use; the lack of competitiveness of the tropical timber industry; lack of full-cost pricing and the abundant availability of low-cost timber; a serious shortage of management skills; and a lack of enforcement of laws and regulations. To date, the high level of biodiversity in the Amazon has not been a development asset. Given that development will continue in the region, probably at an accelerated rate, there is an urgent need to find ways of using the biodiversity resource in financially remunerative and sustainable ways. Government has been working to address institutional barriers to SFM and a number of recent initiatives offer hope that the area of production PFE in the Amazon under SFM will expand significantly in the future.

Key points

- Brazil is a forest-rich country with a tropical-forest PFE of 370 million hectares. Despite deforestation in certain parts, there are still huge forest resources in the Amazon region.
- An estimated 1.36 million hectares of natural tropical forest production PFE are being sustainably managed; insufficient information was available to estimate the area of protection PFE so managed.
- Vast areas of the Amazon are currently under no threat from deforestation or other significant human-induced disturbance due to their remoteness.
- Brazil has successfully raised large-scale industrial forest plantations through private investment to ensure a sustainable supply of raw material.
- The majority of the production forest is under private ownership, although ownership and tenure disputes are a major problem.

- A wide range of policies, strategies, laws and regulations have been developed to facilitate forest administration and to achieve SFM.
- Institutional weaknesses and an inadequate capacity for enforcing policy and policy instruments have been a significant constraint.
- Only a small portion of the forest is under management plans; the bulk of wood production, though derived from private sources, is reported to be unauthorized because it is not based on official approvals. Harvests are often not based on any SFM criteria.
- A number of companies have come forward for the voluntary certification of their forest management operations. However, the financial competitiveness of SFM in natural forests with alternative land-uses is often low, leading to significant deforestation and threatening the long-term viability of sustainably managed natural forests.

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COLOMBIA



*For legend see page 58

Forest resources

With a land area of 114 million hectares, Colombia is the fourth-largest country in South America by area; it has a population of 44.2 million people. Colombia is characterized by two well-defined biogeographical zones: the Andean mountain zone of three mountain ranges and three tropical plains – one between the Pacific and the Andes, one fronting the Caribbean coast in the north, and one containing the Amazon and Orinoco basins to the east. Estimates of forest area include 65.6 million hectares (UNEP-WCMC 2000), 53.2 million hectares^a, and 49.6 million hectares (FAO 2005).

Forest types. An estimated 85% of Colombia's closed forests are found in the Amazon Basin and on the Pacific coast (CONIF 2004). In the Amazon, terrace forests contain valuable timber species such as *Virola* spp, *Brosimum utile* and *Humiriastym*

procerum; there are also large tracts of swamp and catival forests characterized by stands of *Mora megistosperma*, *Campnosperma panamensis* and *Prioria copaifeira*. Submontane and montane Andean forests are also extensive and contain patches of *Quercus humboltii* (roble). Colombia also has a significant mangrove resource.

Dynamics of forest resource change. FAO (2005) estimated the average annual rate of deforestation at about 190,000 hectares (0.4%) in the period 1990–2000. Deforestation is highest in the foothills of the Andes in the departments of Chocó, Cesar, Santanderes, Nariño and Putumayo, where colonists are concentrated and the majority of coca is produced.

Natural hazards affecting forests include those associated with the El Niño/Southern Oscillation phenomenon and volcanic activity; hurricanes occasionally affect forests on the Caribbean coast.

Permanent forest estate. Although it is estimated that harvestable forests for timber may cover as much as 38 million hectares, the utilizable potential is limited by accessibility and ecological factors. The Ministry of Environment estimated an area of permanent production forest of about 5.5 million hectares, containing a growing stock of 200 million m³ (CONIF 2004). There is no PFE *per se* classified in Colombia; figures in Table 1 are indicative only.

Planted forests. FAO (2005) estimated that the area of planted forest was 141,000 hectares in 2000; this corresponds closely to the official estimate of 148,000 hectares^a. However, according to the National Forest Development Plan of 2000 (*Plan Nacional de Desarrollo Forestal*), Colombia had 350,100 hectares of planted forest in 1997.

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^d			
		Production		Protection	Total
		Natural	Planted		
49.6–65.6	51,437	5,500*	148 ^a	8,860**	14,508

* The estimate for natural production PFE is derived from CONIF (2004)

** Protection PFE is the sum of forests classified in IUCN protected-area categories I–IV by UNEP-WCMC (2004)

Institutional arrangements

Forest tenure. The 1991 constitution recognizes the ancestral rights to land of indigenous groups and Afro-Colombian traditional communities. Forest ownership is both public and private. Private land is subdivided into private property and collective property, the second of which includes indigenous, Afro-Colombian and farmer groups. Today, 22.1 million hectares of forest, mostly in the Amazon region, are owned by indigenous communities and 5.4 million hectares, mainly in the Pacific region, by Afro-Colombian communities (CONIF 2004). In addition, many forest areas in the Andean region, in particular planted forests, are privately owned.

SFM policy framework. Colombia has developed its own set of C&I for SFM, based on those proposed by ITTO. The country has extensive legislation on forest management, with detailed instructions on the preparation of management plans. However, the degree of control exercised by regional corporations in charge of forest management (see below) is not clear and there may be huge differences in the way in which management standards are applied in different parts of the country. This may also be caused by the generally difficult governance situation in the country: critical portions of Colombia's Andean, Chocó and Amazonian forests are located in municipalities where armed groups (left-wing guerrillas and right-wing paramilitaries) contest political authority. This is perhaps most evident in the case of the Andes, where the largest continuous forest remnants (Serranía de San Lucas, Nudo del Paramillo, Páramo de Las Hermosas and East Andes) lie in municipalities where both armed groups are present (Alvarez 2005).

Forest policy and legislation. The forest law (*Ley 2 sobre Economía Forestal de la Nación y Conservación de Recursos Naturales Renovables*) dates back to January 1959. It has been complemented by a number of decrees, the most important ones being the forest code of 1974 (*Decreto 2811, Código Nacional de Recursos Naturales Renovables y de Protección al Medio Ambiente*) and the decree of 1996 on forest use (*Decreto 1791 Régimen de Aprovechamiento Forestal*). Regulations that restrict the export of logs from natural forests have been in force for more than ten years; only roundwood coming from planted forests can be exported. A new

forest law was approved by Congress in December 2005 and at the time this report went to press it was awaiting Presidential approval. The new law seeks to: expand the sustainable use of natural forests and make the control of these forests more rigorous; further promote forest plantations and create financial mechanisms for investments; and regulate and further develop forest concessions in the country.

The forest policy (*Política de Bosques*) now in force was approved in 1996; it is being revised and was due to be finalized in 2005. Among the aims of the policy are to: (i) achieve the sustainable use of forests for their conservation; (ii) consolidate the incorporation of the forest sector in the national economy; and (iii) contribute to the improvement of the quality of life of the people. Essential steps include: (i) the modernization of administration; (ii) the conservation, restoration and use of natural forests; and (iii) the strengthening, support and consolidation of the international position of Colombia in forestry matters.

In 1998, the Green Plan (*Plan Verde*) was formulated. This promotes reforestation and, in particular, the restoration and rehabilitation of degraded forest and the management of secondary forests. A National Forestry Development Plan approved in December 2000 has been adopted as official state policy and offers a strategic vision for forest management through 2025. The plan has been developed according to the concepts of the Forests Program of the Convention on Biological Diversity, which takes the ecosystem approach as its conceptual foundation. This approach aims to achieve a balance between conservation, sustainable use and the equitable distribution of benefits. The Forest for Peace (*Bosque para la Paz*) program promotes co-management, reforestation and forest restoration as important elements in social development. Another program is *Familias Guardabosques*, which aims to promote SFM and the substitution of illicit crops such as coca.

Institutions involved in forests. Law 99 created the Ministry of Environment in December 1993, replacing the former forest service (*Instituto de Desarrollo de los Recursos Naturales Renovables* – INDERENA). In 2001, the Ministry of Environment became part of the Ministry of Environment, Housing and Territorial Development (*Ministerio de Ambiente,*

Vivienda y Desarrollo Territorial – MAVDT). MAVDT formulates policy on the environment and renewable natural resources and establishes the broad guidelines, rules and criteria for the environmental regulation of land-use, including forestry. At the national level, the Department of National Planning, the Ministry of Agriculture and Rural Development and the Ministry of Commerce, Industry and Tourism also play roles in forest development and conservation. Technical support and research in natural resource management are confined to a private-public corporation, the National Corporation for Forestry Research and Development (*Corporación Nacional de Investigación y Fomento Forestal* – CONIF), and to universities. The Alexander von Humboldt Institute was created in 1993 to promote, coordinate and perform research on the conservation and sustainable use of biodiversity in Colombia. Fewer than 50 people work on forest management-related activities in the federal government^a.

Colombia is one of the most decentralized countries in Latin America: 40% of total public expenditure is managed locally (by municipalities). The management of forests is part of the National Environmental System (*Sistema Nacional Ambiental* – SINA), which was established by Law 99 and consists of 33 autonomous regional corporations (*corporaciones autónomas regionales y las corporaciones de desarrollo sostenible*). These corporations are responsible for the management and administration of all natural resources in the area of their jurisdiction, including the granting of concessions, permissions and authorizations for forest harvesting.

Local NGOs play an important part in monitoring resource use and in forest development. There are no major industrial associations and support by international donors for forestry is relatively limited. The forestry and agricultural faculties of the various universities in the country also play important roles in forest research and development.

Status of forest management

Forest for production

Colombian law differentiates between permits, concessions and authorizations for timber harvesting, but no forest concession has been allocated in the last 20 years. The present policy is one of 'non-use'

by commercial forestry in natural forests; however, cutting permits are still widely used, which include legal requirements for management procedures. When forests are converted to other land-uses or for the development of infrastructure, the law stipulates compensation measures, generally in the form of afforestation. No information on the area on which timber-harvesting is permitted was made available for this report.

The National Forestry Development Plan proposes that an area of 2 million hectares of forests be identified as potential production forest by 2005, and the government of Colombia is in the process of verifying the management of 3.13 million hectares of production forest^c. Pilot projects have started in different forest areas, including three ITTO-supported field projects – in Guaviare (74,000 hectares, including 2,500 hectares of managed natural forest), Choco (2,000 hectares of protection planted forest) and an area of 64,000 hectares of degraded natural forest and planted forest in San Nicolás/Río Negro. One particular forest production area of several thousand hectares is situated in Atrato, Arenal. In the Amazon region there are a number of pilot areas that include sustained-yield management, totalling about 120,000 hectares. In all these pilot areas, forest management plans have been prepared and are being implemented through a multi-stakeholder approach.

Silviculture and species selection. Forest harvesting is carried out through timber-licence contracts in the forest areas operated by most of the regional corporations; thus, there is no systematic application of silviculture, even though this is required for continuous logging activities under Decree 2811 of 1974 (Article 213) and Decree 1791 of 1996 (Article 5b). Particularly in the Pacific region, many timber species are subject to uncontrolled salvage logging, among them *Brosimum utile* (sande), *Carapa guianensis* (andiroba), *Cedrela odorata* (cedro), *Prioria copaifera* (cativo), *Campnosperma panamensis* (sajo) and *Tabebuia serratifolia/T. rosea* (cedro rosado). An estimated 250 species are used by industry^a. Table 2 lists five commonly harvested timber species in Colombia.

Planted forest and trees outside the forest. Since 1970, the government has provided incentives for forest plantation development and, since 1994, has exempted from some taxes those who invest in

Table 2 Some commonly harvested species for industrial roundwood^c

Timber species	Remarks
<i>Pinus patula</i> (pino candelabro)	From plantations in mountainous regions
<i>Dialyanthera</i> sp (virola)	Particularly in the Pacific region
<i>Prioria copaifera</i> (cativo)	Often in nearly pure stands, partly over-harvested
<i>Brosimum utile</i> (sande)	Particularly in the Pacific region
<i>Cariniana pyriformis</i> (abarco)	Widely distributed, outdoor and indoor use, furniture

the establishment and maintenance of plantations. Since then, more than 70,000 hectares have been reforested as protection forests, mainly in Antioquia, Córdoba, Magdalena, Santander and the Valle del Cauca. The main plantation species are *Pinus caribaea*, *P. oocarpa* and, in particular, *Pinus patula* (pino candelabro); these comprise 55% of the total planted area, followed by eucalypts (20%, including *Eucalyptus globulus*, *E. camaldulensis* and *E. urophylla*) and *Acacia mangium* and other broadleaved species, in particular *Gmelina arborea* and *Tectona grandis* (teak, teca). Indigenous species planted include *Cordia alliodora* (vara de humo), *Bombacopsis quinata* (ceiba tolúa), *Tabebuia rosea*, *Alnus acuminata* (aliso), *Lafoensia speciosa* and roble. The forest law currently under review intends to further promote forest plantations and raise the area covered by them to about 1.5 million hectares.

Forest certification. Since 1996, certification has gained ground in Colombia. The *Grupo de Certificación Forestal Voluntaria* has developed drafts for national certification schemes for both natural and planted forests. Pilot projects are being implemented in eight forest zones, including the certification of a bamboo plantation. As of December 2005, two planted forest areas covering 58,444 hectares had been certified (FSC 2005).

Estimate of the area of forest sustainably managed for production. Little information is available on the quality of natural forest management in Colombia and it is therefore difficult to make a general assessment of forest management standards. Several pilot areas, partly supported by ITTO projects covering about 200,000 hectares of natural forests, are considered to be sustainably managed^c.

Timber production and trade. The production of industrial roundwood from natural and planted forests in 2003 was 3.14 million m³, compared to 2.40 million m³ in 1999 (ITTO 2004, 2005). Nearly all of this wood served the domestic market. The production of sawnwood in 2003 amounted to about 599,000 m³, compared to 729,000 m³ in 1999. Veneer production in 2003 was very small (9,000 m³) and plywood production in 2003 was estimated at 38,000 m³ (ITTO 2005).

Non-wood forest products. More than 300 NWFP species are known and used in Colombia. *Guadua angustifolia* (guadua), a bamboo native to the coffee belt (*región cafetera*), is one of the country's most important NWFPs. It is used mainly for local housing construction, but also by modern architectural designers and in handicrafts. In the departments of Caldas, Quindío, Risaralda, Tolima and Valle del Cauca the natural area of guadua is about 21,000 hectares, supplemented by 5,100 hectares of plantations; total annual production exceeds 250,000 m³ (CONIF 2004). The principal products harvested in natural forests include rubber; palm fruits, particularly *Mauritia flexuosa* (canangucha) and *Euterpe precatoria* (asahí); fruits from *Theobroma grandiflorum* (copoazu); *Euterpe oleracea* (palm hearts); *Chamaedorea* spp (xate leaves) for ornamental use; and wildlife, especially fish and reptiles. Coca, although illegal, is also widely grown. There is great potential for ecotourism but this cannot be developed at present because of security problems.

Forest for protection

Soil and water. Colombia is one of the ten most productive countries worldwide in terms of fresh-water yield. It has 19 major irrigation districts

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
5,500	2,150 ^{c,d}	n.d.	0	200 ^c	148	80	58

and more than 500 small irrigation areas. Many environmental campaigns have been launched in the cities to inform communities about the importance of water conservation. Fifty-two protection forest areas have been classified, covering about 312,000 hectares; regulations exist for the use and protection of these areas but they are not being implemented^a. CONIF (2004) reports an area of 650,000 hectares in *reservas forestales protectoras de orden nacional* and *distritos de conservación de suelos*. Water shortages could eventually affect more than 14 million people in some parts of the country, particularly in Magdalena and Cauca (CONIF 2004). Through its system of regional corporations, the country emphasizes watershed reforestation projects. Over the past nine years, about 120,000 hectares of new protection plantations have been established (ibid.).

Biological diversity. Colombia is a country with great physical contrasts, resulting in a great variety of ecosystems, a richness of species and many endemics. It has one of the highest levels of species diversity in the world, boasting some 55,000 plant species, of which one-third are endemic (one of the top 20 countries in the world in this respect), 1,721 bird species and 205 reptile species. Thirty-nine mammals, 88 birds, 16 reptiles, 208 amphibians and 225 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 21 mammals, 79 birds, 194 amphibians and five plants are found in forests (IUCN 2004). Colombia has listed nine plant species in CITES Appendix I, 338 plant species in Appendix II and one species in Appendix III (CITES 2005). Timber species listed in Appendix II include *Swietenia macrophylla*, *Guaiaacum officinale* and *Tachigali versicolor*; *Cedrela odorata* is the sole listing in Appendix III.

Protective measures in production forests. Timber licences are not granted in critical watershed

protection areas and on steep slopes (government of Colombia 1999). There are no specific provisions for RIL.

Extent of protected areas. Colombia has 49 forest protected areas (national parks, nature reserves, sanctuaries for flora and fauna, and one unique natural area, *Unica Area Natural*), covering 10.3 million hectares; there are no data on connectivity^a. Under Law 2 of 1959, seven zones of forest reserves have been set up for sustainable management and for watershed and biodiversity protection. Today, these areas cover 53.6 million hectares, including 38.2 million hectares in the Amazon Basin (CONIF 2004).

According to UNEP-WCMC (2004), 8.86 million hectares of forest are in protected areas conforming to IUCN protected-area categories I–IV, of which more than 5 million hectares are lowland evergreen rainforest. The integrity of protected areas is threatened, however, by a lack of control, guerrilla activities and drug trafficking^c.

Estimate of the area of forest sustainably managed for protection. Insufficient information was available to estimate the area of protection PFE that is sustainably managed.

Socioeconomic aspects

Economic aspects. When including downstream industries (manufacture of pulp, paper, cardboard, processed wood and furniture), the contribution of the forest sector to GDP is 1.8% (CONIF 2004). The trade balance in forest products is negative because of the import of pulp and paper, although the gap declined from US\$280 million in the 1990s to US\$39 million in 2001 and 2002. It is estimated that the forestry sector provides employment to 54,000 people, comprising 24,000 in forest industry and 30,000 in reforestation^a.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
8,860	8,860	312	n.d.	n.d.

Livelihood values. It is estimated that more than 2,000 plants are used by local communities for medicinal purposes. Domestication of wild animals (*zoocría*) is another important economic activity, including species as different as crocodiles and butterflies. The gathering of ornamental plants, particularly orchids, is important in the low-level cloud forest and contributes locally to livelihoods. Illegal coca production and trade remain financially the most attractive economic activities for many colonists living in the Amazon and Orinoco basins.

Social relations. The main forest zones of the country are inhabited nearly exclusively by indigenous communities or Afro-Colombian communities (*Chocó*). Their traditional lifestyles are closely linked to the use of forest resources through shifting cultivation and the gathering of forest products, including hunting and fishing. The constitution of 1991 and laws 99 and 70 of 1993 recognize this and make specific reference to such traditional forest uses. There are conflicts over timber resources and illegal crops between local forest-users and the armed forces of different factions.

Summary

The overall forest management situation in Colombia is not clear. On the one hand, advances have been made at the policy level in the priority activities identified under ITTO's Objective 2000, including the approval of a forest policy, new forestry legislation and the formulation of forest management plans. Forests are administered within the wider context of environmental management, and existing policy goals emphasize protection and conservation functions as well as forest restoration and forest land rehabilitation. However, there is as yet no clear designation of the PFE and inadequate control of forest resources on the ground, in particular in the Amazon region; nor are silvicultural methods applied in natural production forests.

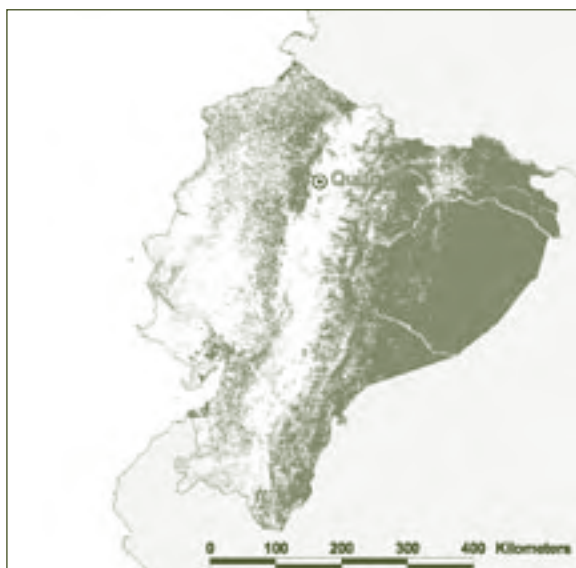
Key points

- Colombia has a rich and largely unexploited forest resource in the Amazon Basin.
- Indigenous communities own 22.1 million hectares of forest, mostly in the Amazon, and Afro-Colombians about 5.4 million hectares, mainly in the Pacific region.
- The PFE is estimated to be 14.5 million hectares – although this has not been designated officially – of which 5.65 million hectares is production PFE and 8.86 million hectares protection PFE.
- The estimated area of natural-forest production PFE under SFM is at least 200,000 hectares. Little information is available on the status of forest management in the protection PFE.
- There is a well-established and well-developed program to establish planted forests. A new forest law awaiting presidential approval would promote an increase in plantations to about 1.5 million hectares.
- There is a lack of forest law enforcement and transparency in the application of laws that deal with forest management. Because of armed conflict, there is little long-term management of or control over resources.
- No specific standards have been established for large-scale production forestry and there are no concession policies.
- However, the new forest law awaiting presidential approval seeks to make major reforms to the management of natural forests.
- National institutions appear to be under-resourced and unable to maintain an effective presence in the field.
- There is a well-established protected area system and a well-established system to monitor biodiversity.
- The wider role of forests in providing environmental services is recognized.

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ECUADOR



*For legend see page 58

Forest resources

Ecuador has a land area of 27.7 million hectares and a population of 12.6 million people, and comprises four main biogeographical zones: the Andean mountains (*sierra*); the Pacific coast; the Amazon Basin; and, 1,000 km from the coast in the Pacific Ocean, the Galapagos Islands. Estimates of forest area include 11.4 million hectares (MAE 2000), 10.6 million hectares (FAO 2005) and 8.4 million hectares^c. According to the Ministry of Environment (*Ministerio del Ambiente* – MAE) (2000), there are about 6.98 million hectares of forest in the Amazon, 2.52 million hectares on the wet Andean mountain slopes and 1.95 million hectares in a few remote areas of the Pacific coastal region. The native forest on the Pacific coast is mostly of low crown density and is generally heavily degraded. Intact forest areas are found in the easternmost part of the country (*oriente*).

Forest types. Four major forest types occur at altitudes of up to 2,800 m:

- Amazon rainforest;
- rainforests in the northwest (mainly in Esmeraldas province). Rainfall increases with altitude, ranging from 1,500–3,000 mm at sea level to 6,000 mm and more at 800 m. The most common commercial species are *Protium* and *Dacryodes* spp, Laureaceae, *Brosimum utile*, *Inga* spp, *Pourouma chocoana* and *Ceiba pentandra* (kapok);
- mixed forests of the Andes, on the western and eastern slopes, at lower and upper levels, and towards the Andean high peaks. These include cloud forests; and
- dry forests along the central and southern coast, with *Cordia alliodora*, *Pseudosamanea guachapele*, *Tabebuia* spp and various Bombacaceae (*Ceiba* and *Bombax* spp, and balsa – *Ochroma lagopus*).

Slightly degraded primary forests cover about 3 million hectares, whereas secondary forests and scrublands (*matorrales*) together cover about 4 million hectares^c. Most of the secondary forests are in the Pacific coast region.

Dynamics of forest resource change. FAO (2005) estimated the annual deforestation rate over the years 1990–2000 to be about 137,000 hectares. Deforestation is highest in the dry forest area in the southern coastal region. The cause is mainly conversion – both regulated and unregulated – to agricultural land. Uncontrolled forest fires are a major threat, particularly on the Pacific coast; landslides in mountain regions are also common after heavy rainfall.

Permanent forest estate. Most of Ecuador's forests are owned by communities or privately (see 'forest tenure'). Although most do not yet have land titles,

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
8.40–11.4	10,854	3,100 ^d	164	4,300 ^d	7,564

the area of forest that might be considered PFE is about 7.56 million hectares (MAE 2000), of which only 600,000 hectares are currently considered economically harvestable due to steep slopes in mountainous terrain, low timber density, difficulty of access and social constraints. All forests classified in the national system of protected areas (*Sistema Nacional de Áreas Protegidas – SNAP*) are considered to be in the protection PFE.

Planted forests. The total area of planted forest in 2002 was about 164,000 hectares^b, of which 80% is eucalypt and pine plantations in the Andes; the remaining 20% is mainly in the coastal region (^c, MAE 2000), including stands of balsa.

Institutional arrangements

Forest tenure. The Ecuadorian Strategy for Forest Sustainable Development (2000; *Estrategia para el Desarrollo Forestal Sostenible*) includes legal provisions to allocate forests to indigenous communities, farmers and other groups already in possession of forest lands on the condition that they guarantee the sustainable management and conservation of the allocated forests. Recently, about 4.5 million hectares of potential production forests were allocated to indigenous communities (ancestral indigenous or Afro-Ecuadorian)^b; these are treated as privately owned. The remaining PFE is mostly in farmers' plots, which generally range in size between 30 and 60 hectares; the process by which these farmers might be granted land tenure still needs to be clarified^b.

SFM policy framework. Ecuador has recently developed its own set of C&I for SFM based on those of ITTO. In 2000, the (1981) forest law (*Ley 74 RO/64 de 4 Agosto de 1981 sobre Ley Forestal y de Conservación de Áreas Naturales y Vida Silvestre*) was revised and a forest policy was formulated that aimed to reduce deforestation and ensure SFM. The law now contains five criteria for SFM: (i) sustainable timber production; (ii) the maintenance of forest cover; (iii) the conservation of biodiversity; (iv) co-responsibility in management; and (v) the reduction of negative social and environmental impacts. The five criteria are accompanied by 33 indicators, which are now being applied but are subject to further evaluation^c.

Forest policy and legislation. Over the past ten years or so, Ecuador has formulated various action plans and policies with the overall aim of promoting the sustainable management of its forest resources. This process has included the formulation of a Forestry Action Plan (1991–1995), a new forest policy (1995), the formulation of strategic goals for national forest actions and a strategy for sustainable forest development in Ecuador (2000), the approval of a law on environmental management (1999), and the formulation of an environmental strategy for sustainable development (2000). The last of these included a number of substantial reforms in the application of the forest law; consequently, Decree 346 was enacted in April 2000 which recognizes that natural forests are highly vulnerable and all interventions should be carried out according to the above-mentioned five SFM criteria.

In 2001, MAE worked with relevant stakeholders representing the private sector and civil society to develop a system of independent monitoring of the forest control system. A forest control entity called *Vigilancia Verde* was created with the overall task of supervising the flow of forest products from the forest to the marketplace, and the *Regencia Forestal* was created to increase the transparency of *Vigilancia Verde*, to provide technical assistance and support law enforcement in forest operations, and to oversee the implementation of the C&I in the management of the forests. In 2002, SGS received a mandate to carry out an independent audit of the new forestry control system under the *Regencia Forestal*. At the end of 2003, however, the Supreme Court of Ecuador declared that the entire control system was incompatible with the country's constitution. As of November 2004, the contractual terms between MAE and SGS were being renegotiated.

Late in 2003, Ecuador launched a process to formulate a national forest and reforestation program with the overall aim of reviving the forest sector and broadening its stakeholder base.

Institutions involved in forests. In early 1999, the Ecuadorian Institute for Forestry, Natural Areas and Wildlife (*Instituto Ecuatoriano Forestal y de Áreas Naturales y Vida Silvestre*) was integrated into the National Directorate of Forests (*Dirección Nacional Forestal*) under MAE – now the sole governing body

Table 2 Some commonly harvested species for industrial roundwood (2001–2003)^c

Timber species	Remarks
<i>Brosimum utile</i> (sande)	Main natural forest species from the Pacific region
<i>Cordia alliodora</i> (laurel)	From forests, secondary forests, pastures and plantations
<i>Cedrela odorata</i> (cedro)	Primary and secondary forests from the Amazonian and Pacific regions
<i>Alnus acuminata</i> (aliso)	In mountainous regions
<i>Humiriastrum procerum</i> (chanul)	From natural forests in the northeast of Ecuador

of the forestry sector. MAE has restructured and modernized the forestry administration in an attempt to decentralize by forming regional centres that have some autonomy in operation and financial control. These centres are, in turn, intended to involve the civil population in planning and decision-making. However, the division of responsibilities between the national and regional levels remains vague and the results of this restructuring are largely unsatisfactory^b.

Both national and international environmental NGOs are very visible in Ecuador. They implement projects in natural resource protection and management and also have an important advocacy role in issues of environmental policy. Forest-owners and timber industries are organized in associations (AIMA, ASOTECA and others). They play an active part in policy-making and forest development.

Status of forest management

Forest for production

There is no coordinated approach to natural forest management in Ecuador; many potential management techniques have not yet been put into practice. There are, however, many examples of management-related activities, including: timber inventories, a system of logging concessions (now dormant), and a continuing program of selection and declaration of protected areas (SNAP), of which a few receive at least some protection and management.

Before 1980, several licensed logging concessions operated in defined areas with defined annual yields. The legal and practical provisions were similar to those operating in many other countries and, as elsewhere, there were serious difficulties of control,

supervision and protection. Due to uncontrolled land reform and subsequent pressure from squatters, concessionaires were forced to withdraw from concessions in the early 1980s and effectively abandoned the use of such agreements as a tool of forest management. Ecuador now uses a system of short-term logging licences which, in addition to its impact on the quality and efficiency of logging operations, has encouraged foresters to consider other ways of ensuring future long-term supplies of timber, particularly through agroforestry. There is strong pressure on the resource from informal and illegal operators who resist regulations they see as unrealistic, and illegal logging is widespread; it may constitute as much as 50–70% of total production^b. SFM is a long way from being achieved in most of Ecuador's PFE: "the forest stock of Ecuador, in view of its importance for national development, has been exploited irrationally. The forest sector presents a picture giving evidence of a clear failure in sustainability" (MAE 2000).

Most timber-harvesting today is done on indigenous and small-farmer community lands and private lands. Legal harvesting is carried out under three kinds of permit: (i) cutting permits (the great majority); (ii) areas harvested according to simplified forest management plans (PAFSIs), which mainly involve non-mechanized extraction; and (iii) areas with integrated management and sustainable management areas (PAFSUs), which are bigger and suitable for industrial harvesting; however, no PAFSUs have been established in the field. More than 1,000 cutting permits were issued in 2003, varying in size from less than one hectare to more than 150, with allowable cuts ranging from less than 5 m³ to more than 2,000 m³ ^c.

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
3,100	n.d.	65	0	101	164	65	21.3*

* This area comprises forest described as 'plantation' (1,341 hectares) and 'semi-natural and mixed plantation and natural forest' (20,000 hectares)

Silviculture and species selection. About 120 timber species are used in the domestic market. The prime species harvested in the past include *Swietenia macrophylla* (mara), *Cedrela odorata* (cedro) and *Anacardium excelsum* (marañón), but these have become scarce. Today, 80% of the harvesting volumes from native forests come from about 25 species^c. Besides those listed in Table 2, the more important species are *Virola*, *Otoba glycyarpa* (sangre de gallina), *Cedrelinga catenaeformis* (chuncho), *Podocarpus* spp and *Prumnopitys* spp (romerillo, azucena) from the southeastern forests, and *Trattinnickia glaziovii* (copal).

Planted forest and trees outside the forest. It is estimated that about 1 million hectares of forest land are suitable for forest plantations^b; however, so far there is no firm plan to effectively support an increase in the forest plantation area. The main planted forest species include pines and eucalypts, as well as *Cordia alliodora* (laurel), *Schizolobium parahybum* (pachao) and *Tectona grandis* (teak, teca) in lowland areas and *Alnus acuminata* (aliso) in the mountains. A private company (Durini Group) owns more than 20,000 hectares of plantations. The group established long-rotation plantations (eg with *Cordia alliodora* and *Jacaranda copaia*) in harvested forest plots and has managed these forests for more than 20 years. Balsa, a major export timber from natural forests, is planted today on a limited scale.

Forest certification. Certification is an emerging topic in Ecuador, promoted by NGOs, private enterprises and communities. A first project involving Afro-Ecuadorian communities near Esmeraldas did not succeed. In 2000, the indigenous community, Awa, on the border with Colombia, initiated a

certification process with FSC covering 2,000 hectares, but this was not successful either^c. The Durini Group, the principal investor in forestry, is engaged with FSC in certifying 10,900 hectares of natural forests; the same group owns 16,220 hectares of certified planted and semi-natural forest (FSC: 9,220 hectares, ISO 14001: 7,000 hectares). Currently, 21,341 hectares are certified under the FSC umbrella (FSC 2005).

Estimate of the area of forest sustainably managed for production. The estimated area of natural-forest production PFE under SFM is at least 101,000 hectares (Table 3); this area includes forests currently in the process of becoming certified as well as some 37 FMUs considered to be sustainably managed^c. The latter areas include private forest lots and planted and natural forests in the *sierra* managed by communities.

Timber production and trade. Total production of logs for industrial purposes was 1.24 million m³ in 2003, down from 1.44 million m³ in 2000. Total sawnwood production was an estimated 52,000 m³, up from 36,000 m³ in 2000. Ecuador exported 11,000 m³ of logs in 2003, down from about 91,000 m³ in 2000. Plywood exports were 70,000 m³ in 2003 (ITTO 2005).

Non-wood forest products. A number of NWFPs are important, in particular fibres; bamboo (*Guadua*); latex; gum; palm products, particularly palm hearts; and medical plants. Tagua or vegetable ivory (seed of the palm *Phytelephas macrocarpa*) is used commercially in handicrafts, as are fibres of *Bactris gasipaes* and *Carludovica palmata* (paja toquilla). A number of ecotourism centres, mostly in the Amazon, attract international visitors.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
4,300	1,790	2,450*	513	n.d.

* Designated for protection under SNAP but timber production is not excluded

Forest for protection

Soil and water. Protection forest lands include all present, former and potential forest lands that are of special importance for the protection of soil or water resources or for preventing erosion or flooding. They include state land as well as privately owned or occupied land on steep slopes or water catchments and other areas unsuitable for agriculture or livestock production. These areas are distributed in many parts of the country and vary greatly in size and importance; in total they amount to about 2.45 million hectares (Egas 2003).

Biological diversity. Ecuador has a wide range of ecosystems and is considered a mega-biodiverse country. It has more than 16,000 plant species from 273 families, including more than 1,200 ferns and 3,200 orchids. There are 369 native mammals, 1,616 birds, 394 reptiles and 415 amphibians. Thirty-five mammals, 79 birds, eleven reptiles, 163 amphibians and 1,832 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 13 mammals, 65 birds, 145 reptiles and 1,162 plants are found in forests (IUCN 2004). Eleven plants are listed in CITES Appendix I and 1,293 in Appendix II (CITES 2005).

Extent of protected areas. Protected areas on the Ecuador mainland amount to 4.67 million hectares (18% of the total land area), distributed in 31 different legal categories (national parks, biological reserves, ecological reserves, geo-botanical reserves, bird reserves, wildlife reserves, etc). In addition, the biological reserve of the Galapagos Islands covers 14.1 million hectares of land and marine ecosystems. According to UNEP-WCMC (2004), 1.79 million hectares of forest are in protected areas conforming to IUCN protected-area categories I-IV, including 1.55 million hectares of lowland evergreen broad-leaved rainforest. However, some areas that have been officially declared as protection forests are claimed by indigenous communities and colonists.

Estimate of the area of forest sustainably managed for protection. Little information was available for this report on the quality of management in the protection PFE (Table 4). Up to 500,000 hectares are reportedly covered by management plans^c. Management plans have been prepared (under an ITTO project) for two small reserves (totalling 13,000 hectares) and are now starting to be implemented.

Socioeconomic aspects

Economic aspects. Forest-based activities contribute around 2% of GDP^b. However, data are quite unreliable due to the high level of informality in the forest sector. The forest and timber industry is characterized by a high number of small timber extractors and wood-processing units with low capital input and by poor working conditions; it has difficulty delivering high-quality processed products. It is estimated that there are more than 500 units of active extractors and timber companies, most of them producing less than 2,000 m³ annually. An estimated 235,000 people are in employment linked to forestry and timber industries, which is 8% of the country's active economic population^b.

Livelihood values. Forests have great value for local forest dwellers, with hunting and fishing the most important activities. Forests are also considered as a land reserve and are converted for subsistence agriculture.

Social relations. Illegal harvesting is widespread^b and illicit crops are found in certain forest areas. Forest tenure remains a significant problem and there are many conflicts between communities, government and the private sector. The legal system has not yet been able to resolve such issues, to the extent that signed contracts between the forest industry and the communities may remain unfulfilled for many years^b.

Summary

SFM is a long way from being achieved in most of Ecuador's PFE. National forestry institutions remain weak. One reason for this is that there has been no organizational or staffing continuity in the ministry responsible for forests, MAE, and also a lack of clarity in the decentralization process. On the positive side there is a declared political willingness to designate state forests to communes, indigenous communities, settlers and other interested groups if they can prove that they have the capacity to manage and conserve forest resources. Nevertheless, there is little sign of consistent progress towards SFM.

Key points

- Information on the forest sector is quite often poor and contradictory.
- The PFE is estimated to be 7.56 million hectares, of which 3.26 million hectares (including 164,000 hectares of plantations) may be regarded as production PFE.
- At least 101,000 hectares of natural forest in the production PFE are under SFM. Insufficient information was available for an estimate to be made of the extent of protection PFE so managed.
- Native forests are under threat mainly because of the expansion of the agricultural frontier near the coast and in the Amazon area.
- There is strong pressure on the forest from informal and illegal operators resisting change towards SFM, and illegal logging is widespread in all three forest regions.
- Many accessible forests are now degraded and secondary.
- The capacity to implement the national forest program and other forest-related policies and laws is low.
- In many cases, and despite new legislative provisions, forest tenure remains unclear.
- There is a discrepancy between actual harvesting practices and forestry regulations. Harvesting is generally unsustainable, and legal provisions for harvesting operations are unrealistic and may push forest-users towards illegality.

- Institutional weaknesses have created bureaucracy and additional costs, which have been transferred to the private sector. High transaction costs stimulate informality and corruption and increase timber volumes from illegal sources.
- The effective management of protected forests is inhibited by a lack of funding, a lack of sufficient political support to the forest sector and, in some areas, disputes over tenure.

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GUATEMALA



*For legend see page 58

Forest resources

With a population of 12.4 million people and a land area of 10.9 million hectares, Guatemala has the lowest forest area per capita in Central America after El Salvador. The country can be divided into three main biogeographical regions. The first, where most of the population lives, comprises highlands made up of several mountain chains stretching from the border with Mexico southwards to the border with Honduras. The highest peaks are steep volcanic cones reaching more than 4,000 m above sea level; the country's main conifer forests are found here. The second is the Pacific plain, stretching along the Pacific coast, which is characterized by rich volcanic soils. Once covered with tropical moist forest and natural grassland, this region is now mainly developed into sugar, banana and rubber tree plantations, and cattle ranches. The third, the Petén, is a flat, low-lying region situated in the north bordering Mexico

and Belize. This is mainly a limestone plateau covered with dense moist tropical forests, swamps and grasslands, and features the ruins of ancient Mayan cities. Estimates of total forest area include 2.85 million hectares (FAO 2005a) and 4.29 million hectares^a, the latter (for 2002) based on the analysis of satellite imagery.

Forest types. Four major forest types can be distinguished:

- tropical hardwood forests (*bosque latifoliado*): more than 300 tree species have so far been identified, but two genera, *Dialium* and *Brosimum*, dominate;
- closed pine forests in the highlands (*bosque de pino denso*): the most commercially important species is *Pinus oocarpa*;
- mixed hardwood and pine forests (*bosque mixto*) covering about 450,000 hectares, composed of two main tree associations: pine-oak and pine-liquidambar (*Liquidambar styraciflua*). *Cupressus lusitanica* (cypress) is also found in these forests; and
- relicts of mangrove forests (*bosque de manglar*) covering about 17,000 hectares on the Pacific coast^a.

Dynamics of forest resource change. The average annual deforestation rate in 1990–2000 was an estimated 54,000 hectares, or 1.7% of the forest area (FAO 2005a). There has been deforestation in the conifer forests of the highlands for centuries, but today it mostly takes place in the Petén, which was an intact and inaccessible forest area up to the 1960s. Large-scale deforestation started there in the 1970s as a result of a land colonization program initiated by the government and accelerated in the 1980s when entire villages of indigenous people

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
2.85–4.29	2,824	1,140 ^d	71 ^a	1,240 ^d	2,451

sought refuge from the country's civil war. An estimated 78% of the deforestation in the Petén is caused by shifting cultivation, the remainder by cattle ranching^a. The country has about one million hectares of secondary forests (*bosques secundarios, arbustales*).

Uncontrolled forest fires occur regularly at the end of the drier seasons in the conifer forests and the tropical hardwood forests, causing local damage to forest stands that have already been opened up. Uncontrolled fires damaged over 60,000 hectares of forest in 2003^a. About 4,000 hectares of conifer forests are affected by insect infestations that followed previous fires^a.

Permanent forest estate. Twenty-two per cent of the country's land area (2.36 million hectares) is covered by forests with an integrated land-use plan^a. The estimated total area of natural-forest PFE is 2.38 million hectares^a (Table 1), which can be subdivided into 1.14 million hectares of production forest and 1.24 million hectares of protection forest^{c,d}. The distribution of the PFE by forest type is as follows: tropical hardwood forest – 1.7 million hectares; conifer forest – 50,000 hectares; mixed hardwood and pine forest – 130,000 hectares; and open woodlands and secondary forests – 500,000 hectares^c.

Planted forests. In 2003, there were an estimated 71,000 hectares of planted forest in Guatemala, mainly of local pine species^a. About 3 million hectares of non-forested land are considered suitable for tree-planting^a.

Institutional arrangements

Forest tenure. Forest ownership may be public or private; public is divided into national (federal government), local government or municipal and communal. An estimated 38% (1.5 million hectares) are privately owned, 34% (1.4 million hectares) are national forests and about 930,000 hectares are municipally/communally owned. Indigenous communal lands (*ejidales*) have special status by law. Because of the civil war (which ended formally in 1996), the ownership of about 210,000 hectares is obscure – more than one million people were displaced from their traditional lands in the 1980s and 1990s. Moreover, the complicated system of land tenure has led to many overlapping rights.

As a result, despite recent efforts the problems of insecurity of land tenure and ownership remain critical for the rural poor.

SFM policy framework. Guatemala is actively involved in the Lepaterique C&I process of Central American countries. Since 2001, the country has been making a major effort to test and adopt FSC standards as a binding instrument for monitoring forest management. The country is also considering adapting the ITTO C&I as an instrument to monitor progress towards SFM at the national level^c.

Forest policy and legislation. The present forest law (October 1996, Decree 101-96) emphasizes the importance of reforestation and forest conservation and makes reference to SFM. The ministry in charge of rural development until 2000 (*Ministerio de Agricultura, Ganadería y Alimentación – MAGA*) established an environmental policy in 1998, identifying sustainable development as its primary goal. A new forest policy was formulated in 1999; this promotes the concept of productive management of natural forests (*fomento al manejo productivo de bosques naturales*), with the aim of making natural forests a main feature of economic development in order to conserve biodiversity and improve the living conditions of forest-dependent populations. This aim was to be achieved by intensive silvicultural management to increase the quality and quantity of timber and NWFPs. The policy also makes specific reference to restoration and rehabilitation as major elements of forest development. Based on this new policy, a strategic plan was developed that includes new financial mechanisms, such as incentive payments for reforestation, the Clean Development Mechanism and payments for environmental services, particularly water. A national biodiversity strategy was formulated between 1995 and 1999; it regulates *in situ* and *ex situ* conservation and includes long-term planning and management directives for protected areas. The Law on Protected Areas of February 1989, amended in 1996 and 1997, regulates the system of protected areas known as SIGAP (*Sistema Guatemalteco de Areas Protegidas*). A national strategy for the conservation and sustainable use of biodiversity was also approved in 1999.

Institutions involved in forests. Through a congressional decree approved in December 2000 (Decree 90-2000), the Ministry for Environment

and Natural Resources (*Ministerio de Ambiente y Recursos Naturales* – MARN) shares authority over natural resources with MAGA, but the relative responsibilities of the two ministries for forest management are not clear. The National Forest Institute (*Instituto Nacional de Bosques* – INAB), created in 1996 out of the former forest service as an independent and decentralized state agency, is responsible for developing SFM in natural forests and for the establishment and management of planted forests. The latter is supported through a national incentive program (*Programa de Incentivos Forestales* – PINFOR) that by the end of 2004 had generated more than US\$50 million for forest development activities^c. INAB is also responsible for forest inventories and the preparation of forest management plans in both planted and natural forests. INAB is supervised by a national council (*Junta Directiva del INAB*) that comprises representatives of MAGA, the private sector and civil society and the national association of municipalities. The National Council of Protected Areas (*Consejo Nacional de Areas Protegidas* – CONAP), established under MARN in 1989, is responsible for the management of protected areas. CONAP is also in charge of the overall management of natural forests, and in particular of the Maya Biosphere Reserve, the largest tract of closed moist tropical forest in Guatemala, and the biosphere reserve of *Sierra de las Minas*. CONAP's tasks include the delivery and supervision of long-term community and industrial concessions. In the mid 1990s, CONAP established a new system of community concessions as an incentive for SFM in multiple-use zones in the Petén. Some of the communities that became involved in forest management under this novel concept have managed, with international support, to certify their forest operations.

The process of decentralization is recent and an expression of national reconciliation after the civil war. Each national institution has its own criteria for decentralization. By the end of 2004, a total of 105 municipal forest offices had been established^c. Municipalities are required to create environmental offices and are encouraged to conduct reforestation projects; municipalities can keep 50% of the revenues from concessions and harvesting licences (Ferroukhi 2003).

Guatemala contains 24 ethnic groups; more than two-thirds of the population is of indigenous descent and 61% is rural. There is a long tradition of forest conservation, particularly in the highlands. Local institutions are in charge of forest administration, and a village council generally deals with forest-related issues. However, such local institutions, communities and local NGOs have long been excluded from forest management, except for a few cases in the Petén. Since the end of the civil war there has been some participation in the classification and management of protected areas through national and regional roundtables (*mesas de diálogo*) and in forest development through consultation roundtables convened by INAB together with the National Forest Program Unit. An association of NGOs (*Asociación Nacional de Recursos Naturales y Medio Ambiente*) participates in the supervisory committee of INAB and in the consultative groups of MARN and CONAP.

Status of forest management

Forest for production

The forest law of 1996 made the preparation of forest management plans compulsory for long-term forest users. The management plan itself, however, is in many cases only an improved timber harvesting plan and often does not prescribe any silvicultural prescriptions or measures to conserve biodiversity. To improve the situation, INAB has adopted a methodology prepared by the former Regional Forest Program for Central America (PROCAFOR) and the Tropical Research and Higher Education Centre (*Centro Agronómico Tropical de Investigación y Enseñanza* – CATIE). The method includes the preparation of 'simplified management plans for hardwood forests' and 'forest management plans for conifer forests in Central America'.

The two main forest types harvested over the past century are the conifer forests and the mixed pine/hardwood forests of subtropical areas. Today, the greatest production potential is in the tropical hardwood forests and in secondary forests.

In 2003, a total area of 697,000 hectares in the PFE was covered by management plans, 483,000 hectares in tropical hardwood forests, 172,000 in mixed forests and 37,200 in pine forests^a.

Table 2 Some commonly harvested hardwood species for industrial roundwood^{c,*}

Timber species	Remarks
<i>Swietenia macrophylla</i> (caoba)	15% of export volume in sawnwood and 40% of total export value in 2003
<i>Lonchocarpus castilloi</i> (manchiche)	Mainly for domestic uses
<i>Calophyllum brasiliense</i> (santa maria)	Mainly for domestic uses
<i>Bucida buceras</i> (pucte)	Increasingly exported as a new species for flooring and parqueting

* Tropical hardwood species only; overall, the most important group of commercial timbers in Guatemala is *Pinus* spp

Since 1998, forest concessions have been granted to communities, who manage for both timber and NWFPs. At the beginning of 2004, twelve community concessions and two industrial concessions had been granted, all of them located in the Petén^a. The total area under forest concessions was 463,423 hectares, most of them community based; the smallest concession was 4,149 hectares and the largest 83,558, and the two industrial concessions were 64,869 hectares and 66,548 hectares in size^a. Forest concessions are managed according to a polycyclic silvicultural system with a 40-year rotation^a. All concessions are required by law to obtain certification under the FSC scheme within three years of establishment.

The most serious problem in forest management is small-scale illegal logging of single trees over wide areas. In the tropical hardwood forests, *Swietenia macrophylla* (caoba) and the various species of *Cedrela* are the species most targeted by illegal logging. In the highlands, illegal logging threatens in particular *Abies guatemalensis* (pinabete) and cypress.

Silviculture and species selection. Of the 424 known indigenous tree species, 320 are considered to have some use^a; about 25 species are traded. The main traditional commercial species in the mountainous areas are pines (*Pinus oocarpa*, *P. pseudostrobus*, *P. maxiinoi*), cypress and *Quercus* spp (roble). Caoba and *Cedrela odorata* (cedro) are the main commercial species in the hardwood forests of the Petén; despite heavy logging over the past 60 years or so, both species occur in abundance in all forest layers and cannot be considered threatened^c. The two species constitute the main valuable species for the majority of the certified FMUs^c. FMUs are

closely monitoring regeneration of the two main species and are promoting enrichment planting after harvesting, particularly with caoba. The minimum cutting diameter for caoba and cedro is 60 cm (55 cm in certain FMUs); for other species it is 45 cm.

Planted forest and trees outside the forest.

Relatively small areas of tree plantations are scattered throughout the country; these are often established without a clear purpose^c. Four conifer species (*P. caribaea*, *P. maximinoi*, *P. oocarpa* and *C. lusitanica*) and two broadleaved species (*Tectona grandis* (teak, teca) – 4,000 hectares, and *Gmelina arborea*) make up 70% of existing plantations. *Hevea brasiliensis* is planted for both rubber and timber. Some 18,400 hectares of new plantations were established between 1997 and 2002, mainly through an incentive program for private investors and communities, with an emphasis on teak plantations and agroforests. The present reforestation policy aims to establish another 240,000 hectares of plantation between 2003 and 2016.

Forest certification. The National Council of Sustainable Forest Management Standards (*Consejo Nacional de Estándares de Manejo Forestal Sostenible*) has developed national certification standards for both natural and planted forests. Since December 2003, these standards have been tested at the national level and were expected to be widely implemented by 2005. With international support, a considerable effort has been made to certify forests in the PFE. As of December 2005, 15 FMUs covering a total area of 522,870 hectares had been certified by SmartWood or SGS according to FSC standards (FSC 2005). Of these, 520,410 hectares were in natural forests and 7,566 hectares

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed		With management plans	Certified
Total					Total		
1,140	540	697	520	672 ^d	71	25	7.57

in plantations; most are located in the Maya Biosphere Reserve in the Petén. After Bolivia and Brazil, Guatemala has the largest extent of FSC-certified forests in the tropics.

Estimate of the area of forest sustainably managed for production. About 700,000 hectares of the production PFE are subject to some sort of management, of which an estimated 265,000 hectares are conifer and mixed forests, both natural and planted, outside the moist tropical forest zone. Assessments of the management of community forest concessions indicate that forest management has improved there^c. At least 672,000 hectares of natural-forest production PFE are considered to be under SFM, composed of the certified forest concessions in the Petén and natural pine forests managed according to defined management principles^d. Table 3 summarizes the forest areas managed for production purposes.

Timber production and trade. Total roundwood production in 2002 was an estimated 16.1 million m³, up from 14.7 million m³ in 1999 (FAO 2005b). Total industrial roundwood production in 2003 was an estimated 492,000 m³, of which 392,000 m³ was coniferous. Total sawnwood production was 200,000 m³ (including about 160,000 m³ of conifers); veneer and plywood production each amounted to about 20,000 m³ in 2003 (ITTO 2005). Some of the sawnwood and most of the veneer and plywood production is exported to other countries in Central America and the Caribbean and to North America, mostly as certified products. Firewood and charcoal are important products for the local market for cooking food and for generating energy for small artisanal industries (brick-making, molasses-making, lime-making, etc).

Non-wood forest products. Among the internationally tradable NWFPs are pine resin, pine seeds, copal (*Bursera bipinnata*, *Protium copal* and other species), xate leaves (from the *Chamaedorea* palm), *Pimenta dioica* (pimiento) and *Manilkara zapota* (chicle gum), a dominant tree in the primary forests of the Petén. Pine resin and copal are mainly produced in private forests and chicle, xate and pimiento in public forests^a. Another species used is *Quassia amara*, known as hombre grande, a natural biocide used in organic agriculture in the Petén.

Forest for protection

Soil and water. The system of protected areas in Guatemala, SIGAP, comprises nearly 950,000 hectares of special protection forests (*zonas de amortiguamiento*)^a. An estimated 184,000 hectares of forest land are managed primarily for soil and water protection^a.

Biological diversity. The forests of Guatemala are extremely rich in biodiversity and are characterized by flora and fauna representative of both temperate and tropical America. Ten mammals, eleven birds, eleven reptiles, 74 amphibians and 87 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, six mammals, ten birds, two reptiles, 74 amphibians and three plants are found in forests (IUCN 2004). Guatemala has listed six plant species in CITES Appendix I and 363 plant species, including *Abies guatemalensis*, in Appendix II (CITES 2005).

Protective measures in production forests. Concession-holders are required to, among other things, conserve seed trees, set aside areas from which tree-felling is excluded, make special provisions for biological corridors, regulate hunting, and conserve endangered plants and animals.

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
1,240	836	184	n.d.	n.d.

Extent of protected areas. Forty-seven (39%) of the 120 protected areas in Guatemala are inter-connected^a. Legally protected areas that include forest and non-forest land cover 3.1 million hectares, or 28% of the national territory. Forty-three are smaller than 1,000 hectares and five are bigger than 100,000 hectares. According to Guatemala's 1999 forest resource assessment^a, about 2.26 million hectares of forests have some protected area status, as follows:

- conifer forests: 42,000 hectares;
- tropical hardwood forests: 1,820,000 hectares (including IUCN Category VI – multiple use);
- mixed conifer/hardwood forests: 140,000 hectares;
- mangrove forests: 4,000 hectares; and
- secondary forests/matorrales: 250,000 hectares.

Of these, about 45% are in IUCN Protected-area Category I (21 areas, 209,000 hectares), Category II (40 areas, 160,000 hectares) and Category III (seven areas, 102,000 hectares); they include national parks, biological reserves, protected biotopes, cultural monuments and wildlife sanctuaries. The estimate by UNEP-WCMC (2004) of the area of forest in protected areas conforming to IUCN protected-area categories differs, putting no hectares in Category I, 382,000 hectares in Category II, 453,000 hectares in Category III (including 119,000 of 'unclassified' forest), and 1,000 hectares in Category IV, for a total of 836,000 hectares in the four categories.

Estimate of the area of forest sustainably managed for protection. Insufficient information was available for estimating the extent of protection PFE managed sustainably.

Socioeconomic aspects

Economic aspects. The forest sector contributed approximately 2.5% to GDP in 2003^a. In 2003, the forest sector directly employed an estimated 37,000 people^a.

Livelihood values. Hunting and the gathering of edible plants such as the fruits of chicle have been of great importance for the Mayan culture for centuries. Both indigenous communities and colonists in the tropical moist forest zone use forest products in their households; products include the fibres of bayal (*Desmoncus* spp) and palm leaves (*sabal*) for housing. In the highlands (the most populated areas), fuelwood from the forests is the most important source of energy.

Social relations. A specific program was launched in 2001 known as the communal forestry program (*Proyecto Fortalecimiento Forestal Municipal y Comunal – BOSCOM*) to counter pressure on natural resources and to provide work for the unemployed; it involves 102 municipalities that carry out reforestation and protection measures. The program also provides incentives for small-scale timber producers in forest management.

Summary

Forests play an important role in Guatemala. They provide a source of income and household products for many poor and a resource for the commercial timber sector. However, SFM has been hindered in the past by, among other things, a protracted civil war, and deforestation was widespread. As the lowland rainforests of the Petén are also opened up, the sector is attempting to improve forest management. Great strides are being made by both private operators and communities, to the extent that more than half the production PFE is now considered to be under SFM.

Key points

- The PFE comprises an estimated 1.14 million hectares of natural-forest production forest, 71,000 hectares of plantations and 1.24 million hectares of protection forest.
- At least 672,000 hectares of production PFE are estimated to be under SFM; insufficient data were available to estimate the area of protection PFE so managed.
- The system of protected areas and the monitoring of biodiversity have both been long established. However, information on the status of their management is lacking.
- A large part of the natural forest estate in the highlands has been over-harvested, and development is proceeding rapidly in the Petén.
- Enormous efforts have been made since the end of the civil war to reorganize the control and management of forest resources; this has included the decentralization of management and monitoring. But support for existing community forest management institutions remains weak.
- There is long-standing experience in the management of conifer forests. The recent implementation of a well-defined concession management policy in moist forest areas also constitutes a solid basis for SFM.
- Forest management certification has been widely introduced with the support of international donors in the community concessions in the Petén, but its long-term prospects will depend on its financial viability once donor support is withdrawn.

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GUYANA



*For legend see page 58

Forest resources

Located on the Atlantic seaboard in northeastern South America between Suriname and Venezuela, Guyana has a land area of 21.4 million hectares and a population of about 800,000 people. It has a very humid climate and can be divided into four biogeographical zones: (i) the narrow coastal plain, where 90% of the population lives and which is largely used for agriculture. It has a narrow fringe of mangroves; (ii) the so-called rolling hills, an extensive, forested area with sandy acid infertile soils reaching 90 m above sea level; (iii) a Precambrian lowland region of tropical rainforest; and (iv) the Pakaraima Mountains, a forested sandstone plateau along the borders with Venezuela and Brazil that stands between 1,000 and 1,200 m above sea level (reaching 2,740 m at Mt Roraima). Forest

cover is an estimated 16.9 million hectares, or 78% of the land area (FAO 2005).

Forest types. The major vegetation types are rainforest, seasonal forest, dry evergreen forest, marsh forest (including mangrove and swamp forest) and mountain forest. The composition of the forest changes considerably from north to south and reflects varied topographic and geological conditions. Rainforest is the most common type and the most important source of timber. Seasonal forests have a lower, more even canopy and include deciduous trees; they are found in the north Rupununi and upper Berbice areas. Dry evergreen forests occupy belts of leached white sands and are also found throughout the Pakaraima Mountains.

Dynamics of forest resource change. Most of Guyana's forests are still intact, unexploited and not threatened by the expansion of agriculture. The annual rate of deforestation is estimated variously to be 0.3% (49,000 hectares, FAO 2005) and less than 0.1%^b. Deforestation is mainly caused by semi-urban expansion and mining.

Permanent forest estate. About 13.6 million hectares have been classified as state forest and may be considered potential production forest. Of these, 5.8 million hectares are allocated to commercial use, 500,000 hectares to research and protection and 63,000 hectares are protected and outside the jurisdiction of the forest service. About 7 million hectares (56% of the state forest), mainly in the south of the country, have not yet been allocated to timber harvesting or other uses; a lack of ready access and long distances to market make the commercial harvesting of these forests economically infeasible at present.

Table 1 PFE *

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^d			
		Production		Protection	Total
		Natural	Planted		
16.9	16,916	5,450	12	980**	6,442

* Amerindian lands are not included here as part of the PFE. A conservation concession area initiated with the support of Conservation International of about 300,000 hectares is included as part of the protection PFE

** Source: UNEP-WCMC (2004)

Planted forests. The estimated total area of planted forest is 12,000 hectares (FAO 2005). No significant reforestation activity is taking place.

Institutional arrangements

Forest tenure. Ownership of the PFE is vested in the state; the remainder of the forest comprises 'other state land', Amerindian land and private property. No Amerindian lands are considered part of the PFE, although many are surrounded by it. Nine indigenous (Amerindian) tribes (Akawaio, Arawak, Arekuna, Carib, Macusi, Patamona, Waiwai, Wapisiaana and Warao), with a total population of about 40,000, have legal title to approximately 1.4 million hectares of land, including forest.

SFM policy framework. Guyana was a participant in the development of the Tarapoto C&I under the Amazon Cooperation Treaty. In 2001, the Guyana Forestry Commission (GFC) reviewed both the Tarapoto and ITTO C&I in the development of a new national forest plan.

Forest policy and legislation. The current forest act was promulgated in 1953. The GFC drafted a new forest act in the late 1990s with technical assistance from the UK Department for International Development; this was approved by the Cabinet Subcommittee on Natural Resources but by late 2004 had not been passed by Parliament. The draft forest act provides the basis for control in state forest, assistance to hinterland communities, and the sound management of forest in Amerindian lands through the provision of advisory group services^b.

The national forest policy was formulated in an open and transparent way with extensive consultation with a wide range of stakeholders and approved in 1997. It is now accepted by all stakeholders as a sound guide for the forest sector as a whole. An ITTO diagnostic mission to Guyana in 2003 found that the national forest policy framework was both comprehensive and sensible, although it was predicated on mutually supportive approaches by government and industry which had not yet developed at the level required^b.

Institutions involved in forests. The president has direct responsibility for forestry, although the day-to-day administration is delegated to the Minister of Agriculture. The Office of the President is also

responsible for other matters related to the environment and natural resources (such as wildlife and protected areas). Two statutory bodies are responsible for coordinating developments in natural resources: (i) the Cabinet Sub-Committee on Natural Resources and Environment, which discusses all matters requiring policy decisions before they are presented to the full cabinet; and (ii) the Natural Resources and Environment Advisory Committee, which includes the heads of Forestry, Geology and Mines, Lands and Surveys, the Guyana Natural Resources Agency, the energy agencies, the Land-use Planning Unit, the Institute of Applied Sciences and Technology, the Hydro-meteorological Department, and the Environmental Protection Agency (EPA). The Presidential Adviser for Natural Resource Management is responsible for coordinating the work of the individual agencies involved in natural resources and the environment. The GFC Board of Directors has direct responsibility for formulating policy guidelines and planning frameworks for the development, use and management of forests.

The GFC, a semi-autonomous public agency, was created in 1979 to replace the Forest Department, which was set up in 1925. The GFC advises the minister on issues relating to forest policy, forest laws and regulations. Guided by the national forest plan, it has the legal mandate to manage and control the utilization of all state forest lands to ensure the optimal use and sustained yield of forest produce and the maintenance and improvement of the forest environment. The GFC also develops and monitors standards for forest-sector operations, develops and implements forest protection and conservation strategies, oversees forest research, and provides support and guidance to forest education and training. It is also involved in a number of initiatives to address emerging social issues in forestry.

The EPA, which was established in 1996, carries out environmental impact assessments on all major land-based developments; before any operation can commence in a forest concession, a company must submit an environmental impact assessment for approval by the EPA and the GFC. The GFC has also established an Environmental Monitoring Unit to monitor all environmental matters pertaining to forestry. The EPA delegates the routine monitoring of forestry developments to the GFC.

One forest producers' association and a number of smaller community-based loggers' associations represent loggers and sawmillers in the forestry sector and endeavour to ensure collaboration in activities such as training, information, public awareness and institutional development. National environmental NGOs are weak, but international environmental organizations are assuming independent roles in forest control and information-sharing, partly in collaboration with the forest administration.

Status of forest management

Forest for production

Current forest harvesting permits are allocated according to three categories based on area and length of contract. The categories are:

- timber sales agreements (TSAs): concessions are granted on a lease for 20 years or more over an area of 24,000 hectares or more. As of October 2004, 23 TSAs had been allocated to local and international companies covering an area of more than 4.0 million hectares (65% of all commercial allocations). The average size of a TSA is 176,000 hectares (ranging from 29,500 to 1.67 million hectares), and companies can hold more than one TSA at a time (Tropical Forest Foundation (TFF) pers. comm., October 2004);
- wood cutting leases (WCLs): licences are granted on 3–10-year leases theoretically for areas of 8,000–24,281 hectares, although a few of the actual WCLs exceed this. In October 2004, five licences were in existence covering a total area of about 327,500 hectares (ibid.) The average size of a WCL was therefore 65,500 hectares;
- state forest permits (SFPs): cutting permits are granted on an annual basis for areas of state forest up to 8,094 hectares in size. SFPs are generally issued to small-scale operators; 284 permits covering a total area of 1.33 million hectares were allocated in 2004 (21% of all commercial allocations) (ibid.). The average size of an SFP is about 4,600 hectares; and
- exploratory permits: before a WCL or a TSA is issued, a three-year exploratory period is granted in order to gather all the necessary information for the preparation of an investment proposal,

an environmental and social impact assessment, and a forest management plan; this requires an exploratory permit. The permit process has been developed to ensure transparency in concession allocation, that the proposed investment is in the national interest, and that the proposed investment is designed to achieve the maximum beneficial use of the forest resource. The permit does not convey the right to harvest or remove any forest produce or to construct roads, buildings or other infrastructure. Permission may be granted to fell and remove forest produce for research purposes only. In 2004, three exploratory permits covering an area of 376,728 hectares had been issued (ibid.). Exploratory permits are also prescribed in the draft forest act.

In 1998, the GFC introduced a Code of Practice for Timber Harvesting based on FAO's Model Code of Forest Practice; the code, which was revised in 2002, prescribes internationally accepted standards for exclusion areas and buffer zones, 100% pre-harvest inventory, road construction, felling, skidding, trucking, operational and camp hygiene, and occupational health and safety. Besides exclusion areas and buffer zones, the code also restricts logging on slopes greater than 40% and sets a minimum distance of 10 m between harvest trees to minimize the size of canopy openings. A log-tagging system to assist the monitoring of timber harvesting and reduce illegal cutting has been in effect since 1999. For the SFPs, a quota system has been put in place that is determined by the size and assumed stocking of the area. The GFC has also developed a draft code of practice for the harvesting of NWFPs.

The draft forest act prescribes the issue of forest concession agreements to replace TSAs and WCLs, and also allows 'forest concession agreements for conservation purposes' and 'use permits'. The former are designed to allow conservation organizations to pay an amount equivalent to that which would have been paid for commercial harvesting rights for the exclusion of timber harvesting from particular forest areas; the latter are designed to address matters such as the collection of orchids or ecotourism where a full concession agreement is not required.

Guyana's forests are characterized by a predominance of relatively slow-growing, high-density timber species and smaller trees than in most other tropical

Table 2 Some commonly harvested species for industrial roundwood*

Timber species	Remarks
<i>Catastemma commune</i> (baromalli)	38% of total log production in 1999–2000
<i>Eperua falcata</i> (wallaba)	Predominantly used for roundwood and splitwood products
<i>Chlorocardium rodiei</i> (greenheart)	20% of total log production
<i>Mora excelsa</i> (mora) and other <i>Mora</i> spp	5% of total log production
<i>Peltogyne venosa</i> (purpleheart)	9% of total production

* Source: TFF pers. comm., October 2004

regions due to the inherently low fertility of soils derived from the ancient Guiana Shield. Commercial timber occurs in spatially segregated 'reefs' or stands in which one or two commercial species are dominant. Nevertheless, a large proportion of the commercial stock in these stands is defective (hollow or crooked), possibly due to the poor nutrient availability of the soils and a very low rate of natural disturbance (which seems to have resulted in over-mature stands), and commercially viable stands are usually separated by stands that are nearly devoid of commercial species. Forest harvesting is, therefore, highly selective; on average, two to three trees are felled per hectare, with an average yield of about 7 m³. The national forest plan prescriptions allow up to 20 m³ per hectare to be harvested on a 60-year cycle, but few concessionaires take even half of this (TFF pers. comm., October 2004). Because of poor operational planning and poor matching of timber resources with markets, most companies re-enter logged-over areas before the end of the cutting cycle, particularly in the more easily accessible areas (ibid.).

Detailed forest management plans are not required for SFPs. The code of practice applies to TSAs and WCLs but is presently only mandatory for new concessions. Nevertheless, companies are being monitored for the implementation of its requirements and violations are reported. The new forest act, once adopted into law, will make the code mandatory for all forest concession areas. At present, few if any companies fully conform to the code, particularly where harvest restrictions (steep slopes, buffer zones, 10 m rule) are concerned, although a few companies conduct 100% pre-harvest forest inven-

tories and harvest planning (ibid.). Log-tagging appears to have been accepted by the industry and has increased the capability of the GFC to monitor timber transactions. RIL techniques are promoted by the ITTO-funded Forestry Training Centre, a subsidiary of GFC, through demonstration forests and hands-on training. This training program, which had trained some 90 forest operators by 2004, has been well received and has led to a growing acceptance and awareness of the GFC's code of practice and RIL practices, and an increasing demand for RIL training. The Iwokrama International Centre for Rainforest Conservation and Development (known as the 'Iwokrama forest') is responsible for the management, conservation and sustainable development of 360,000 hectares of tropical rainforest, which the government of Guyana allocated as a way of demonstrating that tropical forests can provide economic benefits while also conserving biodiversity. Its operation has been supported by a range of donors, including ITTO.

The lack of security associated with logging permits discourages investments in SFM. These arrangements provide little guarantee that the investor will continue to have access rights to the same concession area in the future, thereby encouraging excessive logging and other unsustainable practices. Indeed, it would appear that there is an entrenched culture of forest extraction and utilization within the industry rather than a commitment to enhancing the productivity or value of the forest that is left after harvesting^b.

Silviculture and species selection. The default silvicultural system is natural regeneration with polycyclic cuts, without post-harvest silvicultural

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
5,450	3,800	3,730	0	520	12	0	0

interventions. Under the 1953 Forest Act, yield is regulated by a minimum diameter limit of 34 cm, while forest management plans for WCLs and TSAs must specify the cutting cycle and yield per cutting cycle; they must also indicate species for harvesting and harvesting rules.

There are more than 1,000 tree species but only a few are commercially known and marketed. About 16 species are known to be marketable (Table 2 shows five of these), *Chlorocardium rodiei* (greenheart), *Peltogyne venosa* (purpleheart), *Eperua* spp (wallaba), and *Hymenaea courbaril* (locust) being the favoured species on the international market.

Greenheart is resistant to attack by marine borers and has long been valued as piling for wharves and for other marine applications. *Catostemma commune* (baromalli), the predominant species harvested for plywood production in 2001, was never harvested commercially in any significant way before 1992. Greenheart's share in the total wood production is greater than suggested by log production volumes (of which its share was 20% in 1999–2000), since the production of piles and chainsaw lumber is not included in these figures. Other important species include *Goupia glabra* (kabukalli), *Trattinickia* spp (ulu), *Pouteria speciosa* (suya), *Aspidosperma* spp (shibadan), *Simarouba amara* (marupá) and *Carapa guianensis* (crabwood).

Planted forest and trees outside the forest. About 12,000 hectares of forest plantations, mainly *Pinus caribaea*, were established in the 1960s. They were originally intended to supply a pulp industry but are currently untended. No major reforestation activity is taking place.

Forest certification. Certification became an issue in Guyana when, in 2000, overseas buyers requested evidence of SFM for timber imported from Guyana. An FSC-endorsed national working group has

developed a national certification standard based on FSC and the Peru and Bolivia examples; this was to be submitted to the FSC for endorsement in early 2005. To date, there is no certified forest in Guyana, but two concessionaires are engaged in the process of certifying forest management and chain-of-custody under the FSC scheme, while two more concessionaires have shown an interest in pursuing certification.

Estimate of the area of forest sustainably managed for production. The area of production PFE estimated to be sustainably managed is at least 520,000 hectares^d (Table 3); this is the sum of the concession areas applying for certification and the production forest area of the Iwokrama forest.

Timber production and trade. Total industrial log production was 251,000 m³ in 2003, down from 435,000 m³ in 1999 (ITTO 2004, 2006 in prep.). The ten-year average for 1994–2003 was 342,000 m³, and the highest was in 1997 (521,500 m³) (ITTO 2004). Sawnwood production was 38,000 m³ in 2003, compared to 50,000 m³ in 1999. Plywood production also declined, from 87,000 m³ in 1999 to 75,000 m³ in 2003 (ITTO 2004, 2006 in prep.).

Guyana is a net timber exporter. It allows log exports of all timber species except crabwood and locust, while a ban is proposed for purpleheart to benefit the furniture industry. The total export value of logs, sawnwood and plywood in 2003 was US\$26.4 million, compared to US\$31.3 million in 1999 (ITTO 2002, 2005). Some 66,000 m³ of logs, 27,000 m³ of sawnwood and 53,000 m³ of plywood were exported in 2003 (ITTO 2005).

Non-wood forest products. Many NWFPs are harvested from natural forests but only a few are extracted commercially. *Euterpe oleracea* (palm

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
980	980	n.d.	243 ^d	243 ^d

heart, manicole) is an important product that is exported in large quantities, valued at more than US\$5 million per year (van Andel et al. 2003). Nibi and kufa (rattan-like *Heteropsis flexuosa* and *Clusia* spp) are used for furniture-making and exported to the Caribbean islands, the UK and North America. Fibres of *Mauritia flexuosa* (ité palm) are used to make baskets, mats and other items for export. Other products include latex from *Manilkara bidentata* (balata), *Bixa orellana* (annatto dye) and *Carapa guianensis* (crabwood oil). Mangrove bark is exported for tanning leather. There is a legal trade in wildlife, especially birds, reptiles and amphibians; the export revenue from this is estimated at US\$1.5–2 million per year (ibid.).

Forest for protection

Soil and water. Forests are still intact over large areas and no specific measures have been set out for large-scale soil and watershed conservation. There are, however, threats to biodiversity and to soil and water, of which gold mining may be the greatest. Small-scale gold mining takes place over a wide area; impacts include localized deforestation, the removal of topsoil and the pollution of watercourses with sediment and mercury. Trees felled by gold-miners cause blockages to rivers, sometimes resulting in downstream flooding.

Biological diversity. Guyana's large areas of intact forest ecosystems have a very high conservation and ecological value. More than 1,200 vertebrate species were counted in a 1997 inventory, including 198 mammals, 728 birds, 137 reptiles, 105 amphibians, and more than 6,000 plant species, of which about one hundred are forest trees of commercial interest. It is almost certain that many more species remain to be discovered. Thirteen mammals, three birds, six reptiles, six amphibians and 23 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, five mammals, three

birds, five amphibians and two plants are found in forests (IUCN 2004). Guyana has listed three plant species in CITES Appendix I and 57 in Appendix II (CITES 2005).

Protective measures in production forests. The code of harvesting practice includes provisions for protecting watercourses, reducing the impact of logging on residual stands and conserving protected wildlife. Forest management plans must identify biodiversity reserves (4.5% of the productive forest area). The GFC's monitoring division monitors TSAs against the standards prescribed by the code.

Extent of protected areas. Guyana has only one protected area managed under the Environmental Protection Act – the Kaieteur National Park, which is 63,000 hectares in size. In addition, 16 forest reserves cover a total of 7,700 hectares and the Mabura Hill Forest Reserve extends over 2,000 hectares of forest. According to UNEP-WCMC (2004), 980,000 hectares of Guyana's forest estate are in protected areas conforming to IUCN protected-area categories I-IV. Of the 360,000 hectares of primary forest managed by the Iwokrama International Centre for Rainforest Conservation and Development, 180,000 hectares have been set aside for forest conservation purposes. Conservation International has been awarded a conservation concession of 82,000 hectares to the south of Iwokrama^b. A project funded by the GEF will assist the government with the establishment of a representative system of protected areas. The project has set up an independent Protected Areas Commission and has started to establish a system of protected areas by identifying and supporting the management and development of two pilot areas.

Estimate of the area of forest sustainably managed for protection. The estimated area of protection PFE under sustainable management is at least 243,000 hectares. This area comprises the Kaieteur National Park and the conservation area set aside in the Iwokrama forest.

Socioeconomic aspects

Economic aspects. In 2003, forest-based activities contributed 3.3% to GDP, generating US\$842,700 in royalties (Bank of Guyana 2004) and providing employment for 14,000–16,000 people in 720 enterprises, including sawmills and timber dealers (actual forest-based activities employ approximately 7,000 people)^b. There is also considerable informal and unrecorded employment and economic activity.

Livelihood values. Forests are an integral part of Amerindian culture and are important for building materials, fibres for textiles and weaving, and tannins and dyes, as well as for wildlife, fruit, seeds and nuts that are hunted or gathered for food. Medicines are obtained from more than 130 plant species (van Andel et al. 2003). Some communities have undertaken the commercial harvesting of these resources.

Social relations. Amerindian communities are generally located in remote areas away from urban centres and rely on subsistence fishing, shifting cultivation and hunting for a living. The creation of a Ministry of Amerindian Affairs in 1992 has facilitated a more participatory role for these communities in national development; this takes place mainly through regional democratic councils. Not all Amerindian claims have been fully addressed, but there have been major developments in this direction. Amerindian communities are afflicted by severe social and health problems, particularly in communities adjacent to gold-mining and timber concessions. The Ministry of Amerindian Affairs and the Guyana Geology & Mines Commission (GGMC) have collaborated to train a number of rural residents as rangers to complement GGMC's monitoring efforts in mining districts. The Iwokrama forest initiative has had significant success in involving local Amerindian communities in forest management (Bakken Jensen 2005).

Summary

Guyana has a broad forest resource base and large growing-stock of hardwood timber. It has introduced and implemented a well-designed forest management and control system in its timber production forests. However, there is a gap between the well-functioning core staff of the GFC and the industry that has to implement forest management in the field. Political and social uncertainty, lack of secure tenure, lack of understanding and awareness, lack of skilled labour, outdated management practices and, recently, a difficult economic environment have imposed major challenges for the achievement of SFM. Progress is being made in improving forest harvesting practice.

Key points

- Guyana's forests are still largely intact.
- The PFE comprises an estimated 5.45 million hectares of production forest and 980,000 hectares of protection forest. A further 7.35 million hectares of state forest have not yet been allocated.
- Uncontrolled gold mining is a significant cause of forest degradation and environmental pollution.
- At least 520,000 hectares of production PFE and 243,000 hectares of protection PFE are being managed sustainably.
- A detailed management provision and control system has been elaborated but is inadequately implemented.
- Progress is being made in the training of logging operators.
- The area of totally protected forests is low and there is not enough control and management in protected areas.
- The national forest policy is widely accepted as a sound guide for the forest sector but is yet to be fully implemented.
- A new forest law, which would establish a forest concession system in place of the current TSAs and WCLs, has been drafted but is yet to be enacted.

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HONDURAS



*For legend see page 58

Forest resources

Honduras, the second-largest country in Central America, has a land area of 11.2 million hectares and a population of 6.9 million people. It comprises three distinct biogeographic regions. The central highlands cover about 60% of the country, with fertile valleys and steep slopes between 700 and 1,900 m above sea level, the highest peak reaching more than 2,800 m. A second region is the vast northern coastal plain abutting the Caribbean Sea, which can be divided into two sub-regions: the central plain, mainly covered by grassland, swamps, secondary palm forests and pine forests; and the northeastern plain, the Mosquito Coast (*La Mosquitia*), which is sparsely populated and covered by pine forests, tropical moist forest and some mangrove forests. The third biogeographic region is a narrow strip of land along the Gulf of Fonseca on the southern

Pacific coast, which mainly comprises agricultural land and some remnant mangroves. In total, forest covers an estimated 5.38 million hectares, or 48% of the Honduran land area (FAO 2005). The central highlands and the *La Mosquitia* savannas are covered by 1.5 million hectares of pine forests, while more than 3 million hectares of rainforest cover much of the Caribbean coast, the Agalta Mountains and the eastern lowlands; these constitute the country's major closed forests.

Forest types. Honduras is one of the few tropical countries with large areas of natural conifer forests, which are composed of one or several of seven *Pinus* species, as well as species of the genus *Abies*. At lower altitudes up to 700 m, *P. caribaea* (pino costanero) dominates; between 700 and 1,400 m, *P. oocarpa* occurs often in pure stands; and above 1,500 m up to 1,900 m a mixture of *P. oocarpa* (pino ocote), *P. maximinoi* (pino llorón) and *P. tecumumanii* (pino rojo) constitutes the major forest layer. Above 2,000 m, *P. pseudostrobus*, *P. ayacahuite* (pino blanco), *P. pseudostrobus* (pinabete), *P. hartwegii* (pino de montaña) and species of the genus *Abies* occur. Natural pine forests are used intensively by local communities and by industry. Tropical moist forests are found mostly in the north. The most common species are *Vochysia hondurensis*, *Virola koschnyi*, *V. sebifera*, *Luehea seemanii*, *Terminalia amazonia*, *Cordia alliodora*, *Cedrela mexicana*, *Ceiba pentandra*, *Tabebuia guayacan* and *Swietenia macrophylla*. The *Acrocomia* palm is common over all these forests.

Dynamics of forest resource change. Deforestation averaged an estimated 59,000 hectares per year between 1990 and 2000, which is about 1% of the forest area (FAO 2005). In the past, deforestation

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
5.38	3,811	1,590*	48 ^a	1,600 ^d	3,238

* Includes 1.5 million hectares of pine forests and 90,000 hectares of broadleaved tropical rainforests

was due to agro-industrial development, mainly banana plantations. Today, demand for land by small-scale farmers is thought to be the major cause^a, along with a constant expansion of pasture. The growth in the cattle industry was stimulated until recently by subsidized credit schemes favouring cattle ranching over forest management.

The existence of pine forests in Honduras is closely linked to repeated fire and the regeneration of pines. Nevertheless, frequent human-induced fires have led to widespread degradation in these forests. The worst natural disaster in recent years was Hurricane Mitch in October 1999, which killed thousands of people and caused significant damage to forests.

Permanent forest estate. Some 53% of the national territory was in forest use in 2002^a. The closed forest area is estimated at 3.8 million hectares, both PFE and non-PFE. The permanent forest land, which includes deforested areas in legally gazetted forest, covers 5.93 million hectares, distributed as follows:

- Closed pine forests (*bosque de pino denso*): 695,000 hectares;
- Open pine forests (*bosque de pino ralo*): 1.82 million hectares;
- Tropical hardwood forests (*bosque latifoliado*): 2.86 million hectares;
- Mixed hardwood/pine forests (*bosque mixto*): 559,000 hectares;
- Mangrove forests (*bosque de mangle*): 54,000 hectares.

Table 1 shows the estimated actual area of closed forest in the PFE.

Planted forests. Planted forest covered about 48,000 hectares in 2000^a. Most is privately owned.

Institutional arrangements

Forest tenure. With the passing of a law on the modernization of agriculture (*Ley de Modernización Agrícola*) in 1992, some state-owned forests were transferred to municipal and private ownership. Today, there are three main types of forest ownership: (i) public (*tierras nacionales*), which is under the direct administration of the forest service; (ii) municipal (*ejidales*); and (iii) privately owned/

community forest. There are many claims for the use of forests, particularly over public lands, and large tracts of moist forest have no clear ownership status.

SFM policy framework. Honduras has adopted the ITTO C&I to monitor its progress towards SFM. The forestry action plan 1996–2015 (*Plan de Acción Forestal – PLANFOR*) adopts the principles of sustainable forest development, the conservation of ecosystems and integrated management of watersheds, forest utilization and industrialization, and forestry extension and research. The plan is complementary to another important development plan, *Plan de Ordenamiento Territorial*, particularly in relation to the reduction of deforestation. Nevertheless, outside the PFE and at the forest frontier there is an almost complete lack of adequate control; illegal timber extraction and land conversion are reportedly widespread, driven partly by an increased flow of money from drug trafficking (Contreras-Hermosilla 2003, EIA 2005).

Forest policy and legislation. There is a great diversity of laws and regulations – at least 38 – referring to forests. The current forest law (*Ley Forestal* 85/72) was promulgated in 1972, while a subsequent regulation (*Acuerdo* 634/84) issued in 1984 established detailed instructions for SFM. This constitutes a framework for SFM. Nevertheless, in general the legal provisions pertaining to forests are weak and have features that encourage illegal action by some actors (*ibid.*). The legal system is perceived by some forest communities as unfair (*ibid.*) A revision of forest-related legislation was started in 2002 as part of the Honduras Forestry Agenda (*Agenda Forestal Hondureña*) and includes laws relating to wildlife and protected areas based on the pillars of sustainability, economic profitability, ecological sustainability and social development. The new law, if enacted, will address the conservation of national forests and introduce provisions to support the management of forests by communities, such as technical support and tree-planting subsidies.

Institutions involved in forests. Twelve agencies are engaged in forest development, the most important being: the Secretariat for Agriculture (*Secretaría de Agricultura y Ganadería*); the Secretariat for Natural Resources and Environment (*Secretaría de Recursos Naturales y Ambiente* –

Table 2 Some commonly harvested species for industrial roundwood *

Timber species	Remarks
<i>Pinus caribaea</i> (pino costanero)	From natural pine forests and plantations
<i>Pinus oocarpa</i> (pino ocote)	From natural pine forests
<i>Calophyllum brasiliense</i> (santa maria)	Mainly for domestic use
<i>Cordia alliodora</i> (laurel)	From off-forest areas, village plantations and natural forests
<i>Ceiba pentandra</i> (ceiba)	Mainly off-forest trees are harvested

* Source: AFE-COHDEFOR website, 2003

SERNA), and the State Forestry Administration (*Administración Forestal del Estado-Corporación Hondureña de Desarrollo Forestal – AFE-COHDEFOR*). AFE-COHDEFOR is responsible for the formulation, implementation and control of norms and rules for forest management in *ejidales* and private forests. AFE-COHDEFOR also manages state forests and organizes the marketing of forest products. In early 2004, there were discussions regarding the reorganization of the institutions surrounding forests and the creation of a national forest service (*Servicio Forestal Nacional – SEFONAC*) to replace AFE-COHDEFOR. Generally the forest administration lacks the finance and staff necessary to adequately enforce the law and manage the forests. Approximately 1,000 professionals work in the twelve agencies involved in forestry^a.

Non-governmental organizations are mainly involved in rural development activities, agroforestry and the management of protected areas rather than in production forestry. There is an increased interest among civil-society actors in promoting forest certification and, in the private sector, an increase in action to combat illegal activities.

Status of forest management

Forest for production

Forest management plans have been mandatory in production forests since 1992; they span five years and include a yearly operational plan. Management and silvicultural norms were prepared by AFE-COHDEFOR for conifer forests, mixed forests and forest plantations in 1995 and for hardwood

forests in 1996. Before a forest management plan is prepared, the forest owner must clearly establish legal tenure. Management plans are prepared by foresters according to the norms set by AFE-COHDEFOR. Besides directions for silviculture and harvesting, management plans should contain prescriptions covering the protection of soil and water, biodiversity, and measures against fires, pests and diseases. Forest harvesting is based on a contract between AFE-COHDEFOR and the forest owner, which also specifies the silvicultural and conservation measures of the management plan. Before harvesting, the owner must give a bank guarantee in favour of AFE-COHDEFOR; this is cancelled once all silvicultural and conservation measures are complete. Incentives to promote SFM include: exemption from taxes up to a certain amount if a forest owner invests in reforestation; technical assistance to prepare reforestation plans; and the provision of seeds and nursery stock to private investors.

The pine forests are relatively easy to manage sustainably. They have a great capacity for regeneration if fire can be controlled and used effectively to accelerate regrowth and if regenerating seedlings are protected from animals. Pines are fast-growing and, if management guidelines are followed, continuous production is assured. However, in many cases, the harvesting plan is the only component of the management plan applied. Illegal practices are common in FMUs and there is a general problem of non-compliance with management prescriptions (Contreras-Hermosilla 2003). There is little experience in the management of broadleaved rainforests and few management prescriptions to secure sustainable

Table 3 Management of the production PFE ('000 hectares)^{a,d}

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
1,590	1,070	671	37	187	48	28	0

management in them. A recently completed ITTO project examined the impacts of intensified harvesting on lesser-used species in the broadleaved rainforest of northeastern Honduras and should result in new management prescriptions.

In 2003, management plans covered 1.0 million hectares of pine forests, most of them privately owned, and 96,000 hectares of tropical moist forests (AFE-COHDEFOR website). In total, 903 FMUs had management plans, 97 of which were in public forests, 78 in the *ejidales* and 728 in private forests (ibid.). The total annual allowable cut in the pine forests was 1.97 million m³ (ibid.).

Silviculture and species selection. Of 400 potential timber species, 25 are commonly used commercially. The two most important species by far are *P. caribaea* (pino costanero) and *P. oocarpa* (pino ocote) (Table 2). Important hardwood species from the tropical moist forest include *Vochysia hondurensis* (san juán), *Virola koschnyi* (palo de sangre), *Terminalia amazonica* (cumbillo), *Swietenia macrophylla*, *Calophyllum brasiliense* (santa maría), *Carapa guianensis*, *Cedrela odorata* and *Tabebuia rosea*.

Planted forest and trees outside the forest. Because natural pine forests are so abundant, planted forests have not been developed to any great extent. The main plantation species are native pines (up to one-third of all plantations), with an estimated total planted area of 16,000 hectares. Species such as *Gliricidia sepium*, *Leucaena* spp, *Gmelina arborea* and eucalypts are an essential part of agroforestry; another important planted tree is *Tectona grandis* (teak, teca). The Programme for the Development of Commercial Forest Plantations (*Programa para el Desarrollo de Plantaciones Forestales Comerciales* – PRODEPLAN) was launched in 1997 to stimulate the expansion of the plantation estate.

Forest certification. As of December 2005, three forests with a total area of 37,281 hectares had been certified under the FSC umbrella; two of these were *ejidales* in natural broadleaved forest and one was a private *Pinus* forest (FSC 2005). Some of the bigger private timber companies have recently started to reinvest in their own forests through reforestation and integrated management and have shown interest in certification.

Estimate of the area of forest sustainably managed for production. About 700,000 hectares of the production PFE are subject to some kind of management, a figure which includes an estimated 265,000 hectares of conifer and mixed forests outside the moist tropical forest zone. It is estimated that an area of at least 187,000 hectares is sustainably managed; this includes certified forest, just under 100,000 hectares of natural pine forest, and about 50,000 hectares of tropical broadleaved forest in the upper Cangrejal River Basin, where an ITTO-funded project (see above) helped local communities improve forest management in some of the areas allocated to them.

Timber production and trade. The total annual roundwood production for 1996–2000 was approximately 7 million m³ (FAO 2003). In 2003, the production of industrial pine logs was an estimated 780,000 m³ and tropical hardwood was 21,000 m³ (ITTO 2005); the remainder was for non-industrial uses, particularly fuelwood. The estimated total sawnwood production in 2003 was 525,000 m³, slightly more than in 1999 (404,000 m³) (ITTO 2004, 2005). Nearly all recorded Honduran wood production serves the domestic market; a small amount of pine sawnwood is exported to other countries in Central America and the Caribbean.

Non-wood forest products. The total number of NWFPs used at the regional and national levels is not known. Firewood is the most important NWFP,

and charcoal is also important in local markets. Internationally tradable NWFPs include pine resin (production in 2002: 15,200 barrels), resin of liquidambar (251 barrels), and pine seed for export (more than 460 kg in 2002 for seed banks) (AFE-COHDEFOR website). Much emphasis is given to valuing environmental services and Honduras participates actively in initiatives to develop markets for them.

Forest for protection

Soil and water. Many municipalities manage micro-watersheds declared for the protection of freshwater sources, as per Article 64 of the 1985 Forest Law. Such micro-watersheds are delimited in the field (generally fenced) and no use is permitted other than the protection of water sources. A total forest area of 352,342 hectares has been classified for the primary purpose of protecting soil and water.

Biological diversity. The forests of Honduras are characterized by flora and fauna representative of both temperate and tropical America. Detailed biological inventories are not available; however, it is known that there are more than 700 breeding bird species and an additional 225 that are migratory. Ten mammals, six birds, eleven reptiles, 53 amphibians and 111 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, five mammals, six birds, four reptiles and 53 amphibians are found in forests (IUCN 2004). Honduras has three plant species in CITES Appendix I and 217 in Appendix II (CITES 2005).

Protective measures in production forests. Forest management plans contain some prescriptions, such as for protection strips along watercourses and RIL, but they are not widely applied in forest harvesting (Contreras-Hermosilla 2003).

Extent of protected areas. The extent and status of protected forest areas are not clear. Some 18% of the national territory has some kind of protected area status^a, which corresponds to a total area of about 2 million hectares. According to UNEP-WCMC (2004), 433,700 hectares of forest are in protected areas conforming to IUCN protected-area categories I–IV, including 88,000 hectares of needleleaf forest and 99,000 hectares of montane forest. The Rio Platano UNESCO Biosphere Reserve in northeastern Honduras is designed to protect the largest intact

lowland tropical and pine forests within Honduras. All cloud forests (*bosques nublados*) are protected in ten national parks, eight wildlife reserves and 18 biological reserves; even so, most are heavily degraded (Contreras-Hermosilla 2003). Honduras is part of the Mesoamerican Biological Corridor.

Estimate of the area of forest sustainably managed for protection. Insufficient information was available for an estimate to be made of the area of protection PFE managed sustainably.

Socioeconomic aspects

Economic aspects. Forestry contributes significantly to Honduras's national income, reaching a peak of 10% of GDP late in the 1990s. Nevertheless, its potential is constrained by such factors as the uncertainty of land tenure, high transaction costs, scarcity of public support and specialized services, and economic distortions that depress the prices that primary producers receive for their timber. It is estimated that, in 1999, about 60,500 people were formally employed in the forest sector: 18,500 in forest operations and 42,000 in forest industry^a.

Livelihood values. Honduras has serious problems of infant mortality, illiteracy and overall poverty, and forests constitute an important supplement to livelihoods – both in the provision of goods and services and for land. Informal harvesting and trade in forest products are important for many in forested areas. Collaborative arrangements still need to be developed to make such informal harvesting compatible with the objectives of SFM.

Social relations. Despite the fact that the law has made provisions for local communities to own forests, there are great difficulties in practice in protecting these forests from encroachment, timber theft and illegal hunting. For example, the biosphere reserve of *La Mosquitia* as well as the indigenous communities of Miskito, Pech and Garifuna are greatly threatened by unregulated colonization (IC 2004). On the other hand, the involvement of rural people in forest management reportedly increased in 1998–2002; for example, some 30,000 families benefited from increased participation in the management of about 560,000 hectares, 373 agroforestry groups received technical assistance, and 135 capacity-building events were carried out involving 2,025 participants (AFE-COHDEFOR 2002).

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
1,600	434	n.d.	n.d.	n.d.

Summary

Present management of the broadleaved natural forests in Honduras is sometimes more a matter of extracting only the most valuable species than of silvicultural management. Silvicultural and conservation measures described in forest management plans are often not respected and there is a risk that logged-over areas will become degraded. Illegal logging is widespread and nourishes an informal wood sector that competes with legally produced timber and timber products. Protected forest areas are not clearly delimited and there are difficulties in protecting remote forest areas from forest degradation and deforestation. On the other hand, recent efforts have been made to overcome illegal activities and corruption and to strengthen institutions in order to integrate forests into sustainable development; the wider importance of forests for goods and environmental services has been recognized and the forest law is being revised. The challenge will be to translate a good theoretical framework of law and policy into effective implementation in the field.

Key points

- The PFE comprises an estimated 1.59 million hectares of production forest and 1.60 million hectares of protection forest.
- At least 187,000 hectares of production PFE are being managed sustainably. Insufficient information was available to estimate the area of protection PFE so managed.
- The broadleaved moist forest could make a larger contribution to sustainable development in Honduras, although the potential for timber production is not known.
- Management norms for the pine forests have been formulated and are being implemented in some forests; prescriptions for the sustainable management of the moist forests also exist but are less clear.

- Illegal logging is thought to be prevalent.
- The extent and status of protected forest areas are not clear. Few data are available on the level of protection afforded by forested protected areas.
- Many protected areas are threatened by land conversion.
- A revision and modernization of forest legislation was started in 2002 as part of the Honduras Forestry Agenda, but the new law is yet to be enacted.
- Forest tenure, particularly on public land, is subject to dispute; large tracts of moist forest have no clear ownership status.
- Generally, the forest administration lacks the finance and staff necessary to adequately enforce the law and manage the forests.

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MEXICO



*For legend see page 58

Forest resources

Mexico has a population of 105 million people and a land area of 195 million hectares, making it the third-largest country in Latin America after Brazil and Argentina. It is bordered in the north by the United States; in the west and south by the Pacific Ocean; in the southeast by Guatemala, Belize and the Caribbean Sea; and in the northeast by the Gulf of Mexico. It is mainly mountainous, with less than 35% of its surface area below 500 m and more than half of it above 1,000 m. The northwest of the country contains dry, open forest but rainfall is higher farther south, where tropical moist forests occur. The Southern Highlands, located south of the central plateau, are composed of a number of steep mountain ranges, deep valleys and dry plateaux, including the Chiapas Highlands bordering Guatemala that constitute an important forest zone. The total

forest area including bushland (*matorrales*) and non-tropical forest is estimated by Torres Rojo (2004) to be 64 million hectares and by FAO (2005a) to be 55.2 million hectares. The National Commission for Forests (*Comisión Nacional Forestal* – CONAFOR) estimates the forest area to be 56.9 million hectares along with another 58.5 million hectares of 'vegetation' cover in arid zones^b. There are an estimated 26.4^b to 33.1 million hectares (FAO 2001) of natural tropical forests.

Forest types. Mexico's ecoclimatic zones can be divided into three approximately equal areas: tropical, subtropical/temperate, and semi-arid/arid. The tropical region includes rainforests, which originally covered 6% of the country but probably about half that now^c. The major forest type in the temperate and subtropical north is *Quercus* forest, which may be pure or mixed with other temperate-climate broadleaved species such as *Liquidambar styraciflua* (sweet gum) and *Fagus mexicana* (beech). The 'conifer and broadleaved forests' category of the national forestry inventory is characterized by a few dominant species, including conifers such as *Pinus* and *Abies* combined with various species of *Quercus*, *Cupressus* and *Juniperus*. Tropical forests are found on slopes along the Gulf of Mexico and the Pacific Ocean, the Isthmus of Tehuantepec and in southern Yucatán in the states of Campeche, Chiapas, Oaxaca, Quintana Roo and Veracruz. Among typical tree species are *Terminalia amazonia*, *Dialium* spp, *Brosimum* spp, *Manilkara zapota*, *Lonchocarpus* spp and *Terminalia oblonga*.

Dynamics of forest resource change. The average annual deforestation rate in 1990–2000 was estimated to be 631,000 hectares, or 1.1% of the forest area (FAO 2005a); it is currently

Table 1 Tropical PFE

Estimated total forest area, range (million hectares)	Total closed tropical natural forest ('000 hectares) Source: derived from FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
55.2–64.0*	33,120	7,880 ^c	100	5,600 ^b	13,580

* Includes non-tropical forest

an estimated 400,000 hectares and falling^b. Deforestation is caused mainly by conversion to agricultural land and uncontrolled forest fire. An estimated 550,000 hectares of vegetation are disturbed each year, indicating a rapid degradation process^b. Forest degradation is often the starting point for deforestation; direct causes of deforestation and forest degradation include incentives for forest land conversion, high levels of rural poverty, illegal logging and the cultivation of illegal crops. Shifting cultivation practices that have been applied successfully for centuries are now a major cause of forest destruction in tropical forests. At the national level, a total of 278,000 hectares of forest are rehabilitated to some extent each year^b.

The Yucatán Peninsula is subject to frequent hurricanes; at the time of report preparation no information was available on the effects of Hurricane Wilma, which hit the Peninsula in October 2005. Forest fires occur mainly in the semi-arid part of the country but also in humid tropical forest areas. Fire is a serious problem and is caused mainly by agricultural and grazing activities; it is exacerbated by the effects of hurricanes, which greatly increase the volume of flammable biomass. The country has made a major effort to combat forest fires^b.

Permanent forest estate. The allocation of PFE *per se* is not done in Mexico. The estimate of the tropical production PFE in Table 1 is based on data supplied by the government of Mexico to ITTO in conjunction with a C&I workshop convened in April 2005 and the estimate of protection PFE is based on data reported by an ITTO diagnostic mission to Mexico.

Planted forests. Estimates vary on the extent of plantations. The ITTO mission reported about 100,000 hectares of planted forest for timber production, mainly in the tropical zone, and about 590,000 hectares for protection and rehabilitation^b. FAO (2001) estimated a total plantation estate of 256,000 hectares (plus 11,000 hectares of rubber) and an annual planting rate of 35,000 hectares per year.

Institutional arrangements

Forest tenure. Article 5 of the 2003 forest law (see below) states that the forest resources belong to communes (*ejidos*), local communities, indigenous

peoples and indigenous communities, private landowners or the government, depending on the location of the forest. An estimated 80% of Mexico's forests are owned by *ejidos* and local communities. These forests are also known as *propiedad social*, or forests under social property. They are owned by about 8,500 communities, or *núcleos agrarios*^b. Around 15% of the forest area is owned privately and 5% is classified as national land.

SFM policy framework. Mexico has a comprehensive national forest program spanning 2001–2006 and a national Strategic Forestry Plan 2025 (*Programa Estratégico Forestal* – PEF 2025) that sets the framework of SFM. Mexico has developed a C&I framework for temperate forests and is now formulating a proposal to ITTO to develop a set of C&I specifically for its tropical forests, based on the ITTO framework.

Forest policy and legislation. A new forest law (*Ley General de Desarrollo Forestal Sustentable*) for the management of production forests was enacted in 2003 and became effective when the decree (*Reglamento de la Ley General de Desarrollo Sustentable*) was enacted in February 2005. It emphasizes the importance of forest services and their inclusion in forest management. There appears to be some inconsistency in the interpretation of the different laws that affect forest management, including the forest law, the General Law on Ecological Balance and Environment (*Ley General del Equilibrio Ecológico y Protección al Ambiente*) and the General Law on Wildlife (*Ley General de Vida Silvestre*). In addition, many state governments have created their own forestry/environmental laws.

A number of special programs were set up in the 1990s to bring about greater consistency in forest policy. The most important ones are: the National Forest Development Program (*Programa Nacional de Desarrollo Forestal* – PRODEFOR); the national reforestation program (*Programa Nacional de Reforestación*), which is designed to promote the reforestation of deforested areas; the community forest development program (*Programa de Conservación y Manejo Sustentable de Recursos Forestales en México*); and the national reforestation program, PRODEPLAN, for promoting commercial plantations. These programs are geared mainly towards community development and the reduction of poverty through the restoration of natural capital.

In October 2003, CONAFOR launched a pilot program in markets for environmental services to increase funding for forest conservation and management.

Institutions involved in forests. Mexico is a representative, democratic and federal republic comprising 31 states and one federal district. Each state is autonomous in all internal affairs. In many of the states there is a major interest in environmental issues such as forest restoration and conservation. Several states have their own secretariat for environmental and forestry issues. At the federal level, the Secretariat for Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales de México* – SEMARNAT) is the responsible government agency for natural resources, including forests. Various directorates are responsible for technical aspects of forestry, particularly the Directorate for Forest and Soil Management (*Dirección de Gestión Forestal y Suelos*).

CONAFOR was created by presidential decree in 2001 as a public organ with a decentralized function and the overall objective of integrating natural resource management into the national sustainable development program. Through its 13 regional offices, CONAFOR is responsible for, among other things, the implementation of PEF 2025. The Federal Office for Environmental Protection (*Procuraduría Federal de Protección al Ambiente* – PROFEPA) is in charge of auditing and monitoring production areas and natural protected areas. In addition, there are technical and capacity-building institutes such as the National Forest and Agriculture Research Institute (*Instituto Nacional de Investigaciones Forestales y Agropecuarias*).

NGOs play a major advocacy role on behalf of communities and are also important for information-sharing and capacity-building in respect to collaborative forest management. Community organizations have a strong influence on the use and management of forest areas.

Status of forest management

Forest for production

Forest management is conducted mainly in the *ejido*-owned forests, most of which are located in the temperate and subtropical forest zone; the forest of each *ejido* can be considered as an FMU.

Harvesting in *ejidos* and privately owned forests is implemented through cutting permits. Three kinds of permits are given out: small-scale harvesting permits in areas of up to 20 hectares, medium-sized harvesting permits for areas of between 20 and 250 hectares, and commercial logging permits for areas above 250 hectares. Logging in tropical forests is carried out mainly by forest owners and communities as well as contractors working for timber traders or the forest industry. Forest owners must employ at least one forestry professional who is in charge of forest management, and they must also present a forest management plan (*programa de manejo forestal*) and a yearly harvesting plan. The minimum cutting diameters tend to vary by state. In the (tropical) state of Quintana Roo, for example, harvesting includes trees of high-value species with a diameter of 55 cm and above and trees of other species with a diameter of 35 cm and above.

About 8,500 *ejidos* and local communities in the country possess forested areas, but in some areas private ownership is also important. The extent of forest within *ejidos* varies, the smallest ones being around 300 hectares and the largest nearly 450,000 hectares. An estimated 7.1 million hectares of closed forests (both temperate and tropical) are covered by management plans (FAO 2001) for timber and/or non-timber forest production. The estimated total tropical forest area harvested annually is 179,000 hectares, distributed in 584 forest management units^c. Timber harvesting in moist tropical forest involves the selective cutting of high-value tree species, in particular *Cedrela odorata* (cedro rojo) and *Swietenia macrophylla* (caoba). Both were once abundant in the forests of Yucatán, but over-harvesting – including through illegal logging, a widespread problem in Mexico's forests^c – and a lack of regeneration of these light-demanding species in closed forests have brought the sustainable harvesting level to below 1 m³ per hectare^b. Well-established silvicultural systems known as the Silvicultural Development Method (*Método de Desarrollo Silvícola*) and the Mexican Method of Forest Management (*Método Mexicano de Ordenación de Montes*) are applied in the temperate and pine forests. In the Mayan zone in the state of Quintana Roo, several well-functioning FMUs are applying polycyclic forest management; some are also certified. In general, however, *ejidos* find

Table 2 Some commonly harvested tropical timber species for industrial roundwood^c

Timber species	Remarks
<i>Swietenia macrophylla</i> (caoba, kobchi)	Remains the major logged species in value in all states of Yucatán
<i>Gedrela odorata</i> (cedro rojo)	Both caoba and cedro rojo are being planted due to shortage of supply
<i>Lysiloma latisiliquum</i> (tzalam)	
<i>Lonchocarpus castilloi</i> (machiche)	
<i>Metopium brownei</i> (chechen)	

themselves in a vicious circle: income derived from forest activities is insufficient to justify the investments required to improve their operations^b. The Mexican government has taken a wide range of actions in the fight against illegal logging. What is still missing is the involvement of public and private buyers through clear purchasing policies that will prevent the access of illegal products to national markets; improved information on the problem is also needed^b.

Silviculture and species selection. Around one-third of hardwood timber production comes from tropical species, among them the species listed in Table 2 as well as *Pseudobombax ellipticum* (amapola), *Dendropanax arboreus* (sac-chaca), *Dalbergia retusa* (guanciban), *Brosimum alicastum* (ramon), *Bucida buceras* (pucte) and *Simarouba glauca* (pasak).

Planted forest and trees outside the forest. Species of *Eucalyptus* are predominant, with a planted area of about 105,000 hectares, followed by pines (85,000 hectares) and *Tectona grandis* (teak, teca – about 3,000 hectares); the latter is becoming increasingly important as a plantation species^c. A national forest inventory in 1994 estimated that 10.7 million hectares of land were available for the establishment of planted forest (CONAFOR 2001), but only 4–5 million hectares are suitable for that purpose^b.

Forest certification. As of September 2005, there were 41 FSC-certified FMUs covering a total area of 707,829 hectares of natural forest, the great majority community-owned (FSC 2005). Of these, twelve FMUs covering about 163,000 hectares are located in the tropical part of Mexico.

Estimate of the area of forest sustainably managed for production. Mexico has significantly strengthened its system for implementing SFM and many of the necessary elements are operational. However, the process to improve production has been slow due to limited capacity and willingness of the private sector to change forest management and industrial processing systems^b. An estimated 8.6 million hectares of natural forest are under some form of forest management (Torres Rojo 2004); this figure is more than the total estimated PFE and might include some non-tropical forests in states that are mostly tropical. Of the 8,500 *ejidos*, 2,417 implemented commercial harvesting in 2002^b. The production potential of 'high and medium' forests in the tropics is an estimated 1.4 million m³, much more than current (official) production^b. The area of tropical production PFE being managed sustainably is estimated to be at least 111,000 hectares (Table 3); this includes only certified forests, as no information was available regarding the management of other forests in the production PFE.

Timber production and trade. In 1994, the total growing stock of Mexican forests was an estimated 2.8 billion m³, of which 1.0 billion m³ were in tropical regions (CONAFOR 2001); total roundwood production was an estimated 45.5 million m³ in 2003 (FAO 2005b). Official industrial roundwood production was 6.28 million m³ in 2003, of which an estimated 781,000 m³ was non-coniferous and 606,000 m³ was tropical (ITTO 2006 in prep.); PROFEPA estimates the illegal volume of roundwood from all forests to be in the range of 5–7 million m³^b. Most of the industrial roundwood production is consumed within the country (ITTO 2005). There

Table 3 Management of the tropical production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
7,880	8,600	8,600	163	163	100	34	0

are more than 278 sawmills to process tropical timber, with an average capacity of 5,100 m³ annual log consumption^b.

Non-wood forest products. More than 1,000 species of NWFPs are used, of which 70 are subject to some form of control (Torres Rojo 2004). National commercial NWFP production was 143,000 tonnes in 2002, of which only 4% was sourced from states in the southeastern region of the country; the total value of this portion was 73 million pesos^b. NWFPs include ornamental plants, resin, bamboo fibres, wax, tannin and gums, medicine, fruits, nuts, spices and honey. The most important products from tropical regions include copal, products from different palms such as *Chamaedorea* spp (palma camedor), *Sabal* spp (palma de sombrero), *Scheelea liebmanni* (palma real), *Byrsonima crassifolia* (fruits of nanche), *Pimenta dioica* (pimiento gorda) and *Manilkara zapota* (chicozapote gum).

Forest for protection

Soil and water. Large parts of Mexican forests are classified as water protection areas (*cuencas de amortiguamiento*). Data on their extent are not available.

Biological diversity. Mexico is among the top ten most biologically diverse countries in respect to the number of vertebrates and vascular plants. It has the highest diversity of reptiles of any country and is third for bird diversity and fourth for terrestrial mammals. There are more plant species in Mexico than in the US and Canada combined. Seventy-four mammals, 62 birds, 21 reptiles, 191 amphibians and 262 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 13 mammals, 39 birds, three reptiles, 176 amphibians and 113 plants are

found in forests (IUCN 2004). Mexico has listed 103 plant species in CITES Appendix I and 2,100 plant species in Appendix II (CITES 2005).

Extent of protected areas. Protected areas (*áreas naturales protegidas* – ANPs) cover about 17.9 million hectares (9.2%) of the national territory. This is an increase of almost 70% in the last decade; they cover about 5.6 million hectares in tropical and sub-tropical areas^b. The system includes 34 biosphere reserves (10.4 million hectares), 65 national parks (1.39 million hectares), four natural monuments, 27 protection areas of flora and fauna (5.5 million hectares), four natural protected areas for reclassification and one natural-resources protection area. Discrepancies remain in the definition and number of protected areas; for example, it appears that some designated protected areas occur on private land, and their protection status is unclear. According to UNEP-WCMC (2004), 1.04 million hectares of tropical forest are in protected areas classified in IUCN categories I–IV, of which 419,000 hectares are lowland evergreen broadleaved rainforest.

Estimate of the area of forest sustainably managed for protection. No data were available on the status of management of the protection PFE (Table 4).

Socioeconomic aspects

Economic aspects. The direct contribution of the tropical timber sector to employment could be as high as 60,000, but a considerable number of these people work informally and are not counted in official statistics^b. The contribution of the national forest sector to GDP was about 17 billion pesos, or 1%, in 2003^b.

Livelihood values. It is estimated that about 12 million people live in or adjacent to forest. They are generally considered the poorest segment

Table 4 Management of the tropical protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
5,600	1,040	n.d.	n.d.	n.d.

of the rural population, and forests and *matorrales* form an important component of their livelihoods. A substantial number of *ejidos* depend mainly on forest activities for their livelihoods^b.

Social relations. Often, communities lack the organization and funds to manage forests and woodlands effectively. There is also often a divergence between national interests to protect and manage forests and particular local interests. Recent conflicts have arisen due to the extension of protection areas without proper consultations with the people living in these areas^b. Another area of conflict is excessive utilization and unauthorized land conversion. There is an ongoing conflict in tropical forest areas of the states of Chiapas and Oaxaca over a lack of access to land and insecurity of tenure.

Summary

The management of Mexico's forests differs greatly between the pine and oak forests in the temperate zone, the forests in subtropical regions and the moist tropical forests in the south. The rate of deforestation has apparently slowed but is still high. Over-harvesting and illegal harvesting of forest resources is widespread (although less so in the tropics than in the temperate zone); they exceed sustainable levels in many areas. Community management is the major form of forest management but, in many cases, communities are not equipped to manage their forests sustainably. Some of the problems that obstruct progress towards the sustainable management of the closed forest areas in communes (*ejidos*) include a lack of resources and know-how for the economic use of forest resources and discrepancies in the objectives between communities, the private sector and forest authorities. On the other hand, good progress has been achieved in forest certification, although much of this to date has been outside the tropics. Moreover, the government has taken steps to address shortcomings in the sector and is attempting to combat illegal logging and fire.

Key points

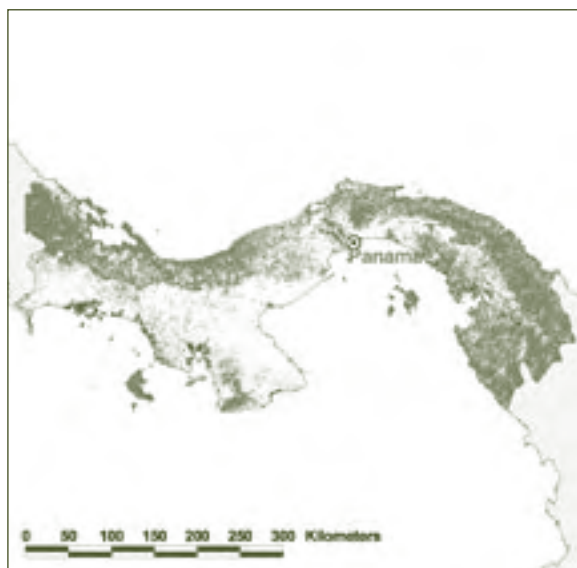
- The rate of deforestation has apparently slowed but is still high.
- Mexico has not formally designated a PFE. ITTO estimates that about 13.6 million hectares can be considered to constitute a tropical PFE, comprising 7.88 million hectares of natural-forest production PFE, 5.60 million hectares of protection PFE and 100,000 hectares of industrial timber plantations.
- The area of natural tropical production PFE under SFM is estimated to be at least 111,000 hectares, corresponding to the total area of certified natural tropical forest; insufficient information was available on the forest management outside these areas for an estimate to be made for the wider tropical production PFE.
- No data were made available on the status of management of Mexico's tropical protection PFE.
- About 8,500 *ejidos* and local communities own an estimated 80% of Mexico's forests. About 15% is owned privately and 5% is national land.
- A forest law enacted in 2003 governs the management of production forests, including in *ejidos*. Some states have also enacted their own forestry/environmental laws.
- The low financial viability of natural forest management appears to be inhibiting the uptake of SFM in some *ejidos*.
- The national government has taken steps to combat illegal logging and forest fire, but both these problems are still prevalent.
- The production potential of the natural forests in the tropics is an estimated 1.4 million m³, much more than current (official) production.
- Continuing conflicts over land-use are apparently inhibiting SFM in some areas.

- Some forests are classified as protected areas but are privately or communally owned, and their protection status is unclear.

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PANAMA



*For legend see page 58

Forest resources

Panama has a land area of 7.56 million hectares and a population of about 3 million people. It can be divided into four biogeographical zones: (i) the Cordillera de Talamanca, which extends southwards from Costa Rica in the west, with peaks of more than 3,000 m; (ii) the central lowlands, bisected by the Panama Canal; (iii) the largely forested eastern region, characterized by a series of lower mountain ranges (San Blas and Portobello ranges) of up to 1,000 m and hilly landscapes up to 800 m (Darien); and (iv) the lowlands on the Caribbean coast. Nearly 90% of the country lies below 1,000 m. Estimates of forest cover include 2.88 million hectares (FAO 2005), 3.01 million hectares^b, 3.3 million hectares (ANAM 2003), and 3.48 million hectares^a. About 2.6 million hectares are degraded primary forests and secondary forests (*rastrojos*), of which about

1.1 million hectares can be considered young secondary forests that are partly used for shifting agriculture (ANAM 2003).

Forest types. The prevalent forest type in Panama is semi-deciduous tropical moist forest, together with lowland, sub-montane and montane evergreen forests. Mangrove forests can be found on the Pacific coast. Tropical moist forests are typical of the low-lying and medium-altitude parts of Darien, where they cover a considerable area. These stands are heterogeneous but always dominated by *Cavallinesia platanifolia*, sometimes in combination with *Anacardium excelsum* in the dominant storey, and average 22–25 m or more in height. The lower storey contains various species of palms. Other forest types in the country characterized by the dominance of a few species are:

- *Quercus* (oak) forests, which are found in the Talamanca Mountains. These are sometimes fully closed, with a dominant storey of two species of oak and a few other species;
- *cativo* (*Prioria copaifera*) forests, which are found alongside mixed forest stands, always in the proximity of rivers on inundated areas; and
- *Campnosperma panamensis* forests, which occur on poorly drained ground in the western Atlantic coastal region.

Dynamics of forest resource change. An estimated 47,000 hectares of forest were lost annually between 1992 and 2000 (ANAM 2003), a rate of 1.3% per year. The highest rate of deforestation was in *Comarca Ngobe Bugle* in the northwest of the country, with 10,000 hectares per year (2.7%), and in the Province of Darien, with 17,000 hectares per year (1.7%). Deforestation is

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
2.88–3.48	3,052	350 ^b	56 ^{a,b}	1,580 ^b	1,986

caused by urbanization, cattle ranching and agro-industrial development, but also by unregulated shifting cultivation (*rozas*) and, in already degraded forest areas, by poor logging practices^c.

Permanent forest estate. According to existing land-use plans, 75% (5.6 million hectares) of the land is suitable for forest use and only 20% has good agricultural potential. The forest law of 1994 (*Ley 1/94*) classifies forest into production, protection and special areas; these latter include scientific, historic, educational, tourist and recreational areas. Of the present forested area, 350,000 hectares are set aside for production, although this has not yet been mapped or demarcated on the ground^{b,c}. About 140,000 hectares in the provinces of Colón, Bocas del Toro and Veraguas have not yet been harvested and may be considered potential production forest. The National Environmental Authority (*Autoridad Nacional del Ambiente – ANAM*) (2003) estimated the area of protection forests to be 1.18 million hectares, comprising 1.08 million hectares of forested areas in national parks^b and 96,000 hectares of forest reserves. The total area of protection PFE is an estimated 1.58 million hectares^b. Nearly 1 million hectares have not yet been allocated; many of these areas, however, are classified under a protected-area category^b.

Planted forests. In 2004, there were about 56,000 hectares^{a,b} of planted forest, most of them privately owned^c. About 1.2 million hectares of land are available for plantation development^a.

Institutional arrangements

Forest tenure. Forests are divided into public, private and *comarcas*, or indigenous reserves, but the majority of the forest estate is state-owned. Regarding indigenous forest lands, the 1972 constitution recognizes the collective landholding units known as *comarcas* and gives them authority to manage their lands according to customary law. Most of the closed forest area is situated within the *comarcas* (*Comarca de Emberá-Wounaan*, *Comarca Kuna de Wargandi*, *Comarca Kuna Yala* and *Comarca de Madungandi*). The *comarcas* comprise 28% of the national territory (2.2 million hectares); large parts are forested.

SFM policy framework. The forest law (*Ley 1/94*) provides a framework for SFM (articles 26, 28 and

44). The ITTO C&I are used to monitor progress towards SFM. No integrated planning for land-use has been applied, nor is there any clear demarcation of a PFE. Boundaries have been delimited and management plans prepared for some protected areas.

Forest policy and legislation. A number of legislative changes during the 1990s affected forestry. Law 1/94 of 1994, which replaced Law 39 of 1966, was designed to conserve and manage forest resources sustainably. Law 1/94 also established a National Fund for Forest Development and Protection (*Fondo de Protección y Desarrollo Forestal – FONDEFOR*) to assist in forest promotion, protection management, supervision, control and research, and forestry extension. The fund, however, is not yet functioning, and all forest-related taxes go to general revenue. Article 43 of Law 1/94 states that all private forest land covered by forests, either natural or artificial, is exempt from national taxes, provided that the landowner is registered in the *Registro Forestal* and a certificate of ownership has been issued.

The most important recent change, however, was the introduction in 1998 of the general environmental law (*Ley 41/98*), which established principles and norms for the protection, conservation and restoration of the environment, and for promoting the sustainable use of natural resources. Under this new legislation, land capability planning has started to provide a basis for environmental management. The law also recognizes the rights of indigenous communities to manage forests in the *comarcas* (Article 44). More recently, Decree Law No 2 of January 2003 approved a set of forest management guidelines for Panama.

Institutions involved in forests. Law 41/98 established ANAM, in charge of the overall supervision and control of forestry. There are 200 forest professionals in Panama, of which approximately 40 work for ANAM (ANAM 2004).

Various national and international NGOs are active in forest management and conservation. These include the National Association for the Conservation of Nature (*Asociación Nacional para la Conservación de la Naturaleza – ANCON*) and other associations such as Fundación NATURA and the National Parks and Environment Foundation (Fundación Parques Nacionales y Medio Ambiente – PA.NA.M.A.).

Table 2 Some commonly harvested species for industrial roundwood (2001-2003)^c

Timber species	Remarks
<i>Bombacopsis quinata</i> (cedro espino)	Important timber species that has maintained its value over many years
<i>Anacardium excelsum</i> (espavé)	Important timber species over the past ten years
<i>Miroxylum balsamum</i> (bálsamo)	Major timber species in the national market
<i>Prioria copaifera</i> (cativo)	Losing its value because of competition from cheap plywood imports
<i>Tectona grandis</i> (teak, teca)	From plantations, increasingly important in the national timber market

Status of forest management

Forest for production

The framework for natural forest management is set by Law 1/94 and its regulation 5/98. Forest management in natural forests is carried out by way of various types of timber-cutting licences, including logging permits on private lands, special permits for subsistence (granted to individuals for cutting a small number of trees for personal use), five-year forest concessions for 1,000–5,000 hectares and for areas larger than 5,000 hectares, logging permits and forest concessions for indigenous communities in the *comarcas*, and logging permits for community forest plantations. Between 1991 and 1999, 29 forest concessions were granted over 67,150 hectares, but forest concession licences have been suspended since 2002. Seventeen permits (over 3,400 hectares) have been granted on private farms and 66 permits for communities over 15,000 hectares. Six community permits were in operation in September 2004, while ANAM granted approximately 5,200 subsistence permits in 2004^b. Logging under existing community permits is selective, generally done without regard to forest management guidelines, and is very detrimental to the remaining forest^b. Moreover, indigenous communities have been known to sell their rights to such permits to private companies for meagre prices. Management is occurring in some privately owned plantations and national parks, and in privately owned tracts of forests located mostly in eastern Panama. Law 1/93 stipulates that the granting of licences for new concessions is conditional on integrated forest

management plans for SFM and independent monitoring of implementation, but few such plans have been prepared. Forests are being high-graded through cutting permits, without regard to long-term sustainability^c. Logged-over forests are generally degraded.

Silviculture and species selection. No formal silvicultural systems are applied in the natural forests. The total number of tree species harvested and marketed to a significant extent is between twelve and 15; the most commonly harvested are shown in Table 2, but new species are now being considered in the market, including *Miroxylon balsamum* (bálsamo), *Platymiscium pinnatum* (quira), *Hieronyma alchorneoides* (zapatero), *Puteria* spp (platano), *Gyranthura darinensis* (cucharo) and *Astronium graveolens* (zorro). Those most harvested previously included *Carapa guianensis* (tangare), *Cedrela odorata* (cedro amargo), *Tabebuia rosea* (oak), *Calophyllum brasiliense* (maria), *Copaifera aromatica* (cabimo), *Dalbergia retusa* (cocobolo), *Ocotea* spp (bambito) and *Swietenia macrophylla* (caoba).

Planted forest and trees outside the forest.

Of the estimated 56,000 hectares of plantations in 2003, 44,000 hectares have been established since 1992^b, the majority by private and community landowners. While the main plantation species before 1990 was *Pinus caribaea* (pino caribe) at 7,000 hectares, after 1995 *Tectona grandis* (teak, teca) became the major species, with nearly 28,000 hectares of new plantations. Teak and pino caribe account for about 80% of the planted area. Other species planted are valuable hardwoods such as *Cordia alliodora* (laurel), *Bombacopsis quinata*

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
350	86	63	0	0	56	32	12.2

(cedro espino), *Terminalia amazonia* (amarillo), caoba, *Hieronyma alchorneoides* and *Dipteryx panamensis* (almendro).

Forest certification. As of December 2005, six plantations with a total area of 12,240 hectares had been certified under the FSC umbrella (FSC 2005). ANAM supports the development of voluntary certification through technical workshops, which have been held with NGOs and the private sector.

Estimate of the area of forest sustainably managed for production. The total area of forest covered by management plans is about 63,000 hectares. Few if any of the existing concessions are thought to manage their forests sustainably^c. More than 1,000 small landowners manage about 32,000 hectares of planted forest.

Timber production and trade. Total roundwood production was an estimated 1.2 million m³ in 2000 (ANAM 2004), 95% of which was for fuelwood and charcoal. Official industrial log production was about 100,000 m³ in 2003, up from 48,000 m³ in 1999 (ITTO 2004, 2005); an estimated 50,000 m³ of logs are entering the local market from illegal sources^c. Sawnwood production in 2003 was about 27,000 m³ (ITTO 2005). The total installed sawmill capacity is approximately 200,000 m³ (ANAM 2004), which is double current official industrial log production. The primary-processing industry is very small, uses antiquated equipment and is located mainly in the periphery of Panama City; it is in such a poor state that it faces extinction within five years^b.

Non-wood forest products. Numerous wildlife species provide important sources of protein in indigenous territories, including tapir, *Agouti paca* (conejo pintado), and other mammal species. Many plants are collected for medicinal purposes. The palm fruit *Phytelephas seemannii* (tagua) and such

fibres as *Astrocaryum* sp (chunga) and *Carludovica palmata* (the 'Panama-hat palm') are used for handicrafts, as is the wood of *Dalbergia retusa* (cocolobo). Poles and leaves of *Cryosophila guagara* (guagara) are used for local construction. Fruits and nuts from forest trees are collected for local use and sale, including *Borojoa patinoi* (borojó), a fruit with aphrodisiac properties.

Forest for protection

Soil and water. Forests managed principally to protect soil and water cover about 326,000 hectares; most of these are situated in the watershed of the Panama Canal, which covers an area of 518,000 hectares^b. They have the important function of protecting the Panama Canal from siltation and ensuring an adequate supply of water for the locks. The Ministry of Health has a program of forest restoration and reforestation in watersheds that serve as water sources for rural communities and municipalities.

Biological diversity. Panama is very biodiverse for its size. Estimates indicate over 10,000 species of vascular plants, 218 mammal species, 929 bird species, 226 reptiles and 164 amphibians (UNEP-WCMC website). Eighteen mammals, 20 birds, seven reptiles and 52 amphibians are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, seven mammals, 18 birds, 52 amphibians and four plants are found in forests (IUCN 2004). Another estimate of endangered species of flora and fauna is 5,308 species^b. Six plant species are listed in CITES Appendix I and 543 in Appendix II, including caoba and *Swietenia humilis* (CITES 2005).

Extent of protected areas. The newly created National System of Protected Areas has 50 protected areas divided into 13 categories with an area

Table 4 Management of the protection PFE ('000 hectares)^{b,c}

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
1,580	1,040	326	396 ^d	180 ^c

of 2.45 million hectares^b (32% of the national territory). However, encroachment and timber theft in the protection PFE are widespread^c. Protected areas are distributed according to the following main management categories: 17 national parks with a total area of 1.3 million hectares, out of which 1.08 million hectares are forested; forest reserves; four wildlife refuges (32,000 hectares); protection forests; wetlands; natural monuments; natural areas; hydro protection zones; wild areas; biological corridors; and multiple-use areas^a. The Darien National Park encompasses nearly 50% of the total forest protected area. Six protected areas out of 43 are interconnected. An estimated 1.04 million hectares of forest are contained within protected areas conforming to IUCN protected-area categories I-IV, including 741,000 hectares of lowland evergreen broadleaved rainforest (UNEP-WCMC 2004).

Estimate of the area of forest sustainably managed for protection. Insufficient information was made available for this report to enable an estimate to be made of the area being sustainably managed over the entire protection PFE. However, an estimated 722,000 hectares of such forests are covered by administrative instruments^b and benefit from some form of management^a. Simple management plans exist for several protected forest areas, but they are generally not implemented due to a lack of financial resources and personnel^b. The core protected forest area in the watershed of the Panama Canal (about 180,000 hectares) is generally considered well managed^c (Table 4).

Socioeconomic aspects

Economic aspects. The contribution of the forest sector to GDP is very low (less than 1% in 2002^a). However, it is an important economic factor locally, particularly for indigenous communities; the forest sector employs about 6,500 people, many of them rural poor^a.

Livelihood values. Special consideration has been given to the *comarcas* where community forest concessions can contribute to the livelihood of local communities; such approaches have been tested through an ITTO project in the Kuna Yala communities on the Atlantic coast with limited success. Forests are generally considered a common good and there is little perception of their sustainable use on the part of stakeholders, including local communities, settlers invading forest areas from other regions and commercial logging operators.

Summary

The management of Panama's PFE is problematic. Concessions have been suspended, and smaller-scale logging is being carried out with little oversight and without detailed management plans or silvicultural prescriptions. The timber industry is in a poor state, with antiquated equipment and an under-supply of legally produced timber. Large areas of forest are classified as protected areas; nevertheless, they are generally not managed or controlled effectively. Forest plantations are being developed, mainly on private properties. Forest management appears strongest in the watershed of the Panama Canal.

Key points

- The PFE comprises an estimated 350,000 hectares of natural production forest and 1.58 million hectares of protection forest. A further 1.60 million hectares of forest have not yet been allocated.
- No production PFE is considered to be under sustainable management. The estimated area of protection PFE under SFM is estimated to be at least 180,000 hectares, comprising the core protection area of the Panama Canal.
- The forest law recognizes the rights of indigenous communities to manage forests in indigenous reserves (called *comarcas*).

- ANAM has insufficient human and financial resources to carry out the field-level monitoring and control of forestry operations necessary to ensure adherence to forest-related laws and regulations.
- The private sector and civil society have been minimally involved in the preparation of SFM policies and strategies.
- There is a lack of information on the silviculture of the country's natural forests and an apparent lack of research and training capacity.
- Most of the protected areas and protection forests are not well delimited and are threatened by encroachment.
- Illegal logging is widespread in the moist forest area, even in protected areas. This is a significant impediment to long-term SFM.

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PERU



* For legend see page 58

Forest resources

Peru, the third-largest country in South America, has a land area of 129 million hectares and a population of 27.1 million people. It has three distinct biogeographical zones. The desert coastal region covers 13.6 million hectares, the semi-arid Andean mountain range (*sierra*) 39.2 million hectares, and the moist tropical Amazon Basin, including the eastern humid slopes of the Andes, 75.7 million hectares. Ninety-two per cent of Peru's forests lie in the Amazon Basin. Estimates of Peru's forest area include 65.2 million hectares (FAO 2005a), 71.1 million hectares (UNEP-WCMC 2004), 78.6 million hectares^a and 86.4 million hectares (government of Peru 2000). Peru has the second-largest forest estate in Latin America and the eighth-largest globally.

Forest types. The main forest type in Peru is tropical moist forest (rainforest), with subtypes that depend on altitude and the different soils within the Amazon Basin, particularly their position in relation to rivers. The alluvial forests, including those on the lower river terraces, offer some of the best potential for integrated forest management and agroforestry because of their vigorous growth, flat terrain and better accessibility; their upper stories are generally 35–40 m in height. These forests have been used intensively in the past, leaving large expanses of secondary forest (*purma*) dominated by stands of fast-growing, light-demanding pioneer species. Hill forests – on rolling terrain with moderate slopes – are the most widespread forest type in the tropical moist forest area.

Dynamics of forest resource change. Annual deforestation in Peru averaged an estimated 0.4% in the period 1990–2000 (FAO 2005a); the current rate is an estimated 269,000 hectares per year^a. Deforestation is caused mainly by the establishment of new settlements due to migration from the Andes, migratory agriculture, illicit cultivation of coca, and the expansion of urban centres such as Iquitos and Pucallpa.

Permanent forest estate. Under the forest law of 2000 (*Ley 27308/2000*), the forest is classified into the following categories:

- production forests (permanent and in reserve);
- forests on protection land;
- forests for future use (forest plantations, secondary forests and degraded forests for restoration);

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^{a,d,*}			
		Production		Protection	Total
		Natural	Planted		
65.2–86.4	64,204	24,600	200–300	16,300	41,150**

* CIEF pers. comm., December 2005

** Includes 250,000 hectares of plantations

- natural protected areas;
- forests in native and rural communities; and
- local forests.

Permanent production forests are intended for timber production and the conservation of forest resources; an approved forest management plan is required. As of 2005, 24.6 million hectares of permanent production forests had been established in the Amazon Basin in the departments of Loreto (14.8 million hectares), Ucayali (4.09 million hectares), Madre de Dios (2.52 million hectares), San Martín (1.5 million hectares), Huanuco (880,000 hectares), Junín (250,000 hectares), Pasco (180,000 hectares), Cuzco (170,000 hectares), and Ayacucho and Puno (CIEF pers. comm., December 2005).

Planted forests. There is some uncertainty about the area of planted forests. According to one estimate, the total forest plantation area was 650,000 hectares in 2001^a. The planned planting rate since 1997 is reported to be 50,000 hectares per year^a, but this may not have been fully achieved. Current realistic estimates suggest the total forestry plantation area to be between 200,000 and 300,000 hectares (CIEF pers. comm., December 2005). Most plantations are located in the Andean region, the main species there being *Eucalyptus globulus*. About 70% of all planted forest is privately or community owned, and 30% is owned publicly.

Institutional arrangements

Forest tenure. Forest lands are classified into public, private and indigenous. Large parts of the forest are owned by communities. In 2002, 8.4 million hectares of forests were classified as public forests reserved for communities and indigenous groups, of which 6.2 million hectares had land titles^a. In the Peruvian Amazon, 1,192 indigenous communities possess land rights. There is uncertainty regarding the extent of ownership of Amazonian forest by community and indigenous groups. FAO (2003a) estimated that some 22.5 million hectares were so owned; others suggest that clear land titles only cover around 10 million hectares (J. Leigh, pers. comm., December 2005).

SFM policy framework. Peru has recently developed standards for forest management. It has adopted national C&I based on the Tarapoto process and has

accepted ITTO's C&I to be used at the FMU level. Specific C&I were prepared for the first permanent production forest in Biabo in 1999. The concession management plans for all other production forests are based on these C&I.

Forest policy and legislation. The forest legislation of 1975 was completely revised recently with the support of an ITTO project (PD 42/96 (F)). The current forestry and wildlife law and its regulations (*Ley Forestal y de Fauna Silvestre – Ley 27308* – and *Reglamento de la Ley Forestal y de Fauna Silvestre – Decreto Supremo 014/2001-AG*) were approved in 2000 and 2001 respectively, and a new national forest strategy was prepared in 2002. This strategy presents an historic analysis/baseline for the forest sector; defines a vision and strategic principles, strategic objectives, expected outputs, and programs for the development of the sector; and provides indicators to monitor the progress made. The document has been widely discussed in a participatory process and was officially adopted by the Peruvian government in August 2004 (*Decreto Supremo 031-2004-AG*). The new forestry and wildlife law embodies the forest policy of the country (articles 3–7) and prescribes several options for SFM and reforestation, including:

- 40-year concessions for commercial timber, NWFPs, ecotourism and environmental services (Article 10);
- the sustainable management of forests belonging to indigenous communities (Article 12);
- the sustainable management of local forests by local governments and rural populations (Decree 014/2001); and
- the establishment of 40-year reforestation concessions (Article 28).

Forestry is a major part of the changing political context in Peru. Forests have become a major issue in the National Governance Agreement that institutionalizes dialogue between different actors, defines approaches to development and strategies for poverty reduction, and aims to improve food security, employment and social cohesion. The administration of forest resources will also be included in the continuing political decentralization from central to regional governments. Moreover, forestry is an important element in defining a policy for rural development.

Institutions involved in forests. The forest sector is overseen by the National Institute for Natural Resources (*Instituto Nacional de Recursos Naturales* – INRENA), which was set up in 1992 under the Ministry of Agriculture. INRENA also runs the state system of natural protected areas (*Sistema Nacional de Areas Naturales Protegidas por el Estado* – SINANPE). The National Consultative Council for Forest Policy (*Consejo Nacional Consultivo de Política Forestal*) is a legally constituted national consultative council to supervise environmental and forest policy. However, as of December 2005 it had not been physically established. In addition, an independent forest control and supervision agency (*Organismo Supervisor de los Recursos Forestales Maderables* – OSINFOR) was created in 2000 and subsequently incorporated into INRENA with limited autonomy. An independent agency for the promotion of forest-based production and forest industries and the marketing of environmental services of forests (*Fondebosque*) has been created and is supported by several international donors; it provides technical assistance, training and financial services to timber producers. National development institutions such as the Peruvian Amazon Research Institute (*Instituto de Investigación de la Amazonía Peruana* – IAP) play important roles in the promotion of SFM at the local level. With the assistance of an ITTO project, INRENA has enhanced its forest production statistical capabilities through its Centre for Strategic Forestry Information (*Centro de Información Estratégica Forestal* – CIEF).

National and international NGOs are very active in Peruvian forestry and are influential in the development of policy; WWF Peru, Foro Ecológico, Conservation International Peru, ProNaturaleza (*Fundación Peruana para la Conservación de la Naturaleza*) and Red Ambiental, for example, are important in driving forest conservation and the forest concession reform process. Various private-sector organizations are also involved, the most active being the National Forestry Chamber (*Cámara Forestal Nacional*), the National Timber Corporation (*Corporación Nacional de la Madera del Perú*) and regional forest producer associations, in particular those of Madre de Dios and Ucayali⁹. Indigenous peoples' associations such as the National Development Institute of the Andeans, Amazon People and Afro-Peruvians (*Instituto Nacional de Desarrollo*

de Pueblos Andinos, Amazónicos y Afroperuanos) are also strongly involved in forest issues. The University of La Molina has a strong forestry faculty that is actively involved in SFM research. All the aforementioned, together with government institutions and private-sector representatives, are also official members of the National and Regional Forestry Dialogue and Consensus Roundtables (*Mesas de Diálogo y Concertación Forestal Nacional y Regionales*), which meet periodically to discuss the implementation of forest policies.

Status of forest management

Forest for production

Up to mid 2002, some 1.85 million hectares of forests were harvested under the old harvesting regime through more than 1,500 harvesting contracts, most of them with an area of less than 1,000 hectares. The total cumulative authorized timber volume under these contracts was 3.64 million m³. Concessionaires often worked with subcontractors, who brought in their own equipment and personnel and were paid on volume extracted. However, basic silvicultural and operational measures such as RIL that might ensure sustainable yield were generally not applied. Extraction remained selective, concentrating on the species of high commercial value or wide industrial use. By mid 2003, only 151,000 hectares of forest licences were still operating under this old regime.

The new forestry and wildlife law eliminated the former harvesting contracts and established long-term concessions over larger areas; these are allocated by public auction and carry an obligation to present and comply with a long-term forest management plan and yearly operational plans. Silvicultural treatments and RIL now form part of the terms of reference for management plans and yearly plans of operation and are being applied in at least 40% of the concessions (CIEF pers. comm., December 2005). The public forests so far classified as permanent production forest and registered in public registries have been divided into harvesting units that range in size from 5,000 to 10,000 hectares. The granting of concessions has been organized through public competition with the following conditions: the length of concession

Table 2 Some commonly harvested species for industrial roundwood (1991–2004)^{c, *}

Timber species	Remarks **
<i>Cedrelinga catenaeformis</i> (tornillo)	112,441 m ³ /year
<i>Swietenia macrophylla</i> (caoba)	53,256 m ³ /year
<i>Cedrela odorata</i> (cedro)	52,997 m ³ /year
<i>Virola</i> spp (cumala)	42,719 m ³ /year
<i>Hura crepitans</i> (catahua)	27,731 m ³ /year

* CIEF pers. comm., December 2005

** Average sawnwood production over the period

is 40 years and renewable; the total area designated for concessions until 2005 was 24.6 million hectares; bidding is open to national and foreign companies under two types of bidding system – public auction (*subasta publica*) for concessions of 10,000–50,000 hectares, and public bidding (*concurso público*) for concessions of 5,000–10,000 hectares; and the maximum cumulative area for a concessionaire is 100,000 hectares under the public auction system and 50,000 hectares under the public bidding system.

By 2005, long-term concessions covering 7.54 million hectares had been allocated as follows (CIEF pers. comm., December 2005):

- Department Madre de Dios:
85 concessions totalling 1.30 million hectares;
- Department Loreto:
242 concessions totalling 2.58 million hectares;
- Department Ucayali:
171 concessions totalling 2.88 million hectares;
- Department San Martin:
34 concessions totalling 498,000 hectares; and
- Department Huanuco:
48 concessions totalling 286,000 hectares.

Many of these concessions are in formerly selectively harvested areas such as the flood zone along Amazonian tributaries and constitute what in some areas will be the third intervention within the last 30–40 years. Generally, the species harvested have changed, as many primary species are no longer present in large volumes. It is expected that the new concessions will harvest increasingly

lesser-known species and intensify their logging operations, at least until the silvicultural prescriptions to be implemented as part of the management plans developed under the new forest concessions regime achieve harvestable volumes of the high-value commercial species. The financial viability of the concessions will depend in large measure on their ability to obtain good prices for such species. Concession areas are also generally relatively small, typically 12,000–20,000 hectares. There is some question about whether concessions of such size will encourage substantial capital investment.

The new forest law specifies forest audits every five years and the renewal or suspension of concession agreements depends absolutely on the results of such audits, which are based on the application of a set of C&I for SFM derived from ITTO and the Tarapoto process. In addition, extraordinary inspections are being carried out in the forest concessions as part of the country's CITES-Appendix II mahogany observation strategy. Through CIEF, INRENA has the capacity to track the volumes and species of all legally harvested timber from concessions and other permits.

Silviculture and species selection. At least 90 species are used for timber and timber products; about 20 meet 80% of the demand^c. In the past, the major timber species harvested in the Peruvian Amazon was *Swietenia macrophylla* (caoba), and this is still an important species; Peru became the largest single exporter of it after Brazil banned its harvesting and export. Its high value also encourages illegal activities: INRENA has reported that, in 2003, 90% of illegally traded logs were of caoba; there are also indications that caoba and other high-value

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
24,600	8,000	5,000	59.5 *	560	200–300	8	0

* Includes 32,600 hectares of semi-natural and mixed plantation and natural forest

species are being obtained illegally from protected and indigenous areas^c. *Guazuma* spp (bolaina) and *Calycophyllum spruceanum* (capirona) are the species most traded in the domestic market. Other important species include *Virola* spp (cumala), *Amburana cearensis* (ishipingo), *Dipteryx micrantha* (shihua-huaco), *Hura crepitans* (catahua), and *Cariniana decandra* (cachimbo). Table 2 shows the five most commonly harvested species, ranked by average sawnwood production for the period 1991–2004.

Planted forest and trees outside the forest. 1997 was declared the 'Year of Reforestation' in Peru and in 1999 an ambitious reforestation scheme was started under the name *Sierra Verde*. Between 1997 and 2000 *Prosopis* was sown over more than 400,000 hectares to thicken sparse woody formations and to establish new woody cover where there was none before. However, it is estimated that only 10% survived. In 2005, reforestation was declared of national interest by Supreme Decree 003-2005-AG; a national reforestation plan has been developed and is to be launched shortly. A considerable number of long-term reforestation and enrichment-planting trials of native species such as *Cedrelinga catenaeformis* (tornillo), *Simarouba amara* (marupa), *Parkia velutina* (pashaco) and others in the Peruvian Amazon (eg in Jenaro Herrera, Bosque Von Humbolt and Tingo Maria) have been established, with good results. However, these trials have not yet been expanded to an operational scale.

Forest certification. According to FSC (2005), one natural forest covering 26,936 hectares was certified as of December 2005, and one semi-natural and mixed plantation and natural forest area covering about 32,600 hectares. Both belong to indigenous communities in Ucayali. A national working group on forest certification, coordinated by WWF Peru, is working on the establishment of an FSC-accredited

system for the voluntary certification of forest products, and several companies have commenced a pre-certification process^c.

Estimate of the area of forest sustainably managed for production. It is difficult to estimate the area of forest that is sustainably managed. The system of forest concessions is very new and there is little information on how that part of the PFE with management plans is being managed. An estimated 500,000 hectares of concessions are undergoing certification processes and, with the already-certified forest, form the minimum set of sustainably managed forest shown in Table 3.

Timber production and trade. Roundwood production in 2003 was estimated to be 10.3 million m³, of which 9.10 million m³ was fuelwood (FAO 2005b). National production of industrial timber in 2003 was an estimated 1.29 million m³ of logs, 528,000 m³ of sawnwood and about 101,000 m³ of plywood (ITTO 2006 in prep.). It is estimated that the maximum sustainable harvest under a 40-year polycyclic system is in the range 25–40 m³ per hectare^b; current offtake would appear to be well below that. It is estimated that there are 250 sawmills in Peru, the majority with a small installed capacity (averaging 2,900 m³/yr)^b. About 25% of them have bandsaws and a capacity of 10,000 m³ per year or more. There are also five veneer mills, twelve plywood mills, 20 parquet plants and 80 small workshops producing fruit boxes, etc (FAO 2003a). Almost all the wood is used domestically; only a very small amount is exported. The export of logs is not permitted; only processed products may be exported.

Non-wood forest products. The use of NWFPs is widespread in Peru, particularly in the Peruvian Amazon, where over 130 products have been identified for major local consumption and national and international trade. Important products for

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I–IV	Allocated for soil and water	With management plans	Sustainably managed
16,300	3,130	390	n.d.	1,540 ^d

the international market include *Prosopis juliflora* (algarroba) from dry zones (6.5 million kg per year), *Uncaria tomentosa* (uña de gato or cat's claw, 500,000 kg per year), *Bertholletia excelsa* (castaña or Brazil nut, 1 million kg per year), *Caesalpinia tara* (tara fruit, 3.9 million kg per year), palmito (palm heart, 200,000 kg per year), *Croton lechleri* (sangre de grado), caña brava and caña hueca (1.1 million units per year), and a great number of medicinal and aromatic plants^a. Trade in NWFPs in 2000 earned more than US\$14 million^a.

Forest for protection

Soil and water. Soil and watershed conservation is important, particularly in the Andes. The National Program for the Management of Water Catchments and Soil Conservation (*Programa Nacional de Manejo de Cuencas hidrográficas y de Conservación de Suelos*) has been carrying out the most extensive forestry program in the country; it aims to use participatory programs of social development to contribute to soil and water conservation based on reforestation. A total of 390,000 hectares of forest are classified as exclusively for soil and water protection^a. The total forest carbon stock is estimated at 6.4 billion tons, 95% of which is in Amazonian forests^a.

Biological diversity. Peru has a great range of geographical conditions and is very biodiverse. It contains 10% of the global total of flowering plants (40,000–50,000 plant species), 462 mammals, 1,816 birds, 360 reptiles, 332 amphibians, 2,000 sea fish and 797 fresh water fish. Forty-eight mammals, 97 birds, eight reptiles, 78 amphibians and 276 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 19 mammals, 70 birds, 62 amphibians and two plants are found in forests (IUCN 2004). Twelve plants are listed in CITES Appendix I; 463, including caoba, in Appendix II; and one in Appendix III (CITES 2005).

Protective measures in production forests.

Management-plan prescriptions for forest concessions give clear guidance on leaving protection strips along streams; they specify species to be protected and refer to wildlife protection in concession areas. There are also prescriptions for RIL.

Extent of protected areas. In 2001, new natural protected areas were defined and existing protected areas were reclassified. The well-developed and relatively well-funded system of protected areas, SINANPE, now contains 61 protected areas covering an area of 17.7 million hectares, or 14% of the country. Protected areas include national parks, national reserves, national sanctuaries, historic sanctuaries, hunting reserves, communal reserves, reserved zones and protection forests. Their main purpose is to protect representative ecosystems and their biodiversity. According to UNEP-WCMC (2004), 3.13 million hectares of forest are in protected areas conforming to IUCN protected-area categories I–IV, including 1.9 million hectares of lowland evergreen broadleaved rainforest. Based on provisions in the new forestry and wildlife law, in July 2001 INRENA granted an area of 135,832 hectares as a 'conservation concession' for a period of 40 years to a private association (the Amazon Watershed Conservation Association – *Asociación para la Conservación de la Cuenca Amazónica – ACCA*). In such concessions, protection activities, ecotourism and the sustainable use of NWFPs may be carried out, but not logging. It is expected that more concessions will be granted in the future for NWFPs and conservation.

Estimate of the area of forest sustainably managed for protection. The area of protection PFE managed sustainably is estimated to be at least 1.54 million hectares, which includes the core water protection forests of about 60,000 hectares^c; the totally protected portion of the Peruvian part of the transboundary protected areas of Tambopata (1.09 million hectares) and El Condor (253,000

hectares), which are supported by ITTO projects; and the ACCA conservation concession (136,000 hectares). Moreover, large areas of the protection PFE, even if not formally under SFM, are under no imminent threat due to their remoteness.

Socioeconomic aspects

Economic aspects. The contribution of the forest sector to GDP is around 1%^a. An estimated 250,000 jobs are generated directly by forestry activities, over 50% of them in the Peruvian Amazon^b. The forest industry and small- to medium-sized enterprises are mostly located in Lima, Trujillo, Chiclayo, Cuzco, Iquitos, Pucallpa and Tarapoto and employ more than 82,000 people. The contribution of forestry, however, is not only made through direct employment but also through the provision of a wide range of goods for consumption, handicrafts and small commerce. Fuelwood collection is still the main extractive use of the country's natural forests. Small-scale logging is important both economically and socially in the Amazon; nearly all forest areas close to the main rivers have been heavily harvested.

Livelihood values. Many NWFPs are used and traded locally, such as fruits and vegetables like *Mauritia flexuosa* (aguaje), camu-camu and palmito, local bamboo (*Guadua angustifolia*), palms and fibres. Wildlife, particularly fish, is an important source of protein throughout the Amazon.

Social relations. The Peruvian Amazon remains a frontier for settlers from other parts of Peru, many of whom engage in small-scale and often illegal logging. The social impacts of the new concession system are unknown. Illegal harvesting of the two most important species, caoba and cedro, is widespread^c. Logging by outsiders of indigenous and community lands can cause intra-community conflicts, including over the distribution of payments. Narcotic crops, particularly coca, are planted by shifting cultivators in fields and small openings in the forest^c.

Summary

Over the past three years, Peru has taken significant steps towards integrating the forest sector into the broader macroeconomic objectives of sustainable development. The new forestry and wildlife law

embodies the forest policy of the country and prescribes several options for SFM and reforestation. An independent forest-control mechanism has been established and a broad coalition of stakeholders from the public and private sectors and civil society works together to develop joint approaches to SFM. Nevertheless, Peru still faces some major challenges in enforcing and applying regulations and planning instruments in the country's vast Amazon forests.

Key points

- Peru has a large forest resource with good potential for sustainable management.
- The PFE comprises an estimated 24.6 million hectares of natural production forest, 200,000–300,000 hectares of plantations and 16.3 million hectares of protection forest. A further 19.1 million hectares of forest have not yet been allocated.
- At least 560,000 hectares of production PFE and 1.54 million hectares of protection PFE are being managed sustainably. Moreover, large areas of the protection PFE, even if not formally under SFM, are under no imminent threat due to their remoteness.
- 59,600 hectares of natural forests have been certified in indigenous territories.
- The deforestation rate of about 269,000 hectares per year is one of the highest in the region; it is caused largely by the influx of settlers to the Amazon region and subsequent clearance for agriculture.
- A new forestry and wildlife law and its regulations were approved in 2000/2001, a national forest strategy was adopted in 2004 and a national reforestation plan was prepared in 2005.
- The forestry and wildlife law is a bold initiative to promote SFM; its effective implementation will probably require substantial investments in human resources in both the public and private sectors.
- Among other things, the new law sets out the parameters of a new concession system.
- An independent forest control and supervision agency has been created to oversee the implementation of this new system.

- The financial viability of SFM will depend in large measure on the prices that can be obtained for a range of lesser-known species.
- There are many informal forest operations, especially linked to caoba and cedro, but these species are becoming economically scarcer. Harvesting pressure for such timbers is increasing both in protected areas and in forests belonging to indigenous communities.
- The capacity to implement SFM at the field level is low, although considerable efforts are being made to address this through training and technical assistance.

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SURINAME



* For legend see page 58

Forest resources

The Republic of Suriname has a land area of 16.3 million hectares and an estimated population of 400,000 people. A lowland region and the southern highlands account for 80% of the land area and form part of the pre-Cambrian Guyana Shield that straddles Suriname, Guyana and French Guiana. In contrast to neighbouring Guyana, however, sandstone mountains are confined to a few areas and only rise as high as 1,280 m above sea level. Along the northern edge of the shield lies a savanna belt, beyond which is a narrow swampy coastal plain where 90% of the population is concentrated. Estimates of forest area include 14.1 million hectares (FAO 2005), 14.8 million hectares^b and 13.6 million hectares (UNEP-WCMC 2004).

Forest types. Three major forest types can be distinguished, corresponding to the three major biogeographical zones: (i) the hydrophytic forests in the north, which comprise swamp forests, mangroves and ridge and marsh forests; (ii) xerophytic savanna forests in the savanna belt; and (iii) the predominant mesophytic moist forest types of the Guyana Shield^b.

Dynamics of forest resource change. Suriname does not face the population and migration pressures that have led to deforestation in other countries; FAO (2005) estimated the rate of deforestation in 1990–2000 to be virtually zero. More than 400,000 hectares of swamp and savanna forests are degraded due to poor-quality logging and mining operations^b. Occasional forest fire is considered to be the main present threat to forest resources.

Permanent forest estate. A first attempt was made to establish a PFE (Table 1) following the enactment of the Forest Management Act in 1992; the total PFE is estimated to be 11.3 million hectares, of which 6.89 million is allocated to production. ITTO (2003), however, estimated the accessible production forest to be 4.5 million hectares^b.

Planted forests. An estimated 52,347 hectares of planted forest once existed in Suriname, but only about 7,000 hectares remain today^b.

Institutional arrangements

Forest tenure. According to the 1987 constitution, all forests, except those on privately owned land, belong to the state. The constitution does not provide for collective rights or the collective

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares) ^d			
		Production		Protection	Total
		Natural	Planted		
13.6–14.8	14,100	6,890*	7 ^b	4,430**	11,327

* Estimate based on Republic of Suriname (2000)

** The protection PFE includes protection forest, special protected forest and nature conservation forest. Not all this area has been formally designated^b

use of land, but Amerindian and Maroon people (the latter being descendants of slaves of African origin) claim these rights.

SFM policy framework. The Forest Management Act (1992) provides criteria for the sustainable use of forest resources. In addition, the government plans to develop national C&I for SFM as part of the Amazon Cooperation Treaty initiative. A recent ITTO diagnostic mission to Suriname proposed the establishment of a forestry database that would include: the classification of the potential of forest land; a national forest inventory; an assessment of forest industry with economic analyses; a survey of the wood-processing industry; and an update of the concession database^b.

Forest policy and legislation. The Forest Management Act covers the sustainable and rational use of forest resources, taking into account the interests of forest-dwellers and the conservation of nature and biological diversity. Its provisions cover: the classification of forests for production, protection and conservation; regulations for forest management and harvesting to stimulate the sustainable use of timber; and regulations for forest transport and the processing industry.

Rules for the implementation of the act were prepared between 1997 and 2000 with technical assistance from FAO and funding from the Netherlands^b. A new national forest policy was adopted in 2003 that lays down guidelines for achieving SFM. The Forest Management Act is now being revised to provide more coherence in the legislation, clearer management prescriptions for SFM and, eventually, to establish a single forest authority. The national forest policy has been described as a balanced policy conducive to achieving SFM, although in the view of two stakeholder groups it is not yet concrete enough and may leave too much room for manoeuvring^b.

A draft environmental act is also being discussed in Parliament. This will have important procedural consequences for the issuance of timber licences and the installation of timber-processing units. In the absence of agreed national C&I, the environmental impact assessments described in this act will be essential for monitoring progress towards SFM.

Institutions involved in forests. The semi-autonomous Foundation for Forest Management and Forest

Control (*Stichting voor Bosbeheer en Bostoezicht* – SBB), which was established in 2001, is responsible for forest management and the monitoring and control of logging; it derives its mandate from the forest service (*Lichtwet en BosBeheer* – LBB). The LBB is in charge of nature conservation and the management of nature reserves in collaboration with the Foundation for Nature Conservation (STINASU)^b. Preparations are now being made to establish a single forest authority (see above), which will also be responsible for nature conservation. Some research and development related to sustainable management is conducted by SBB, partly implemented with international support. This includes a study on the promotion of the efficient use of forest resources through management planning, the issuance of forest licences, guidelines for forest inventory, and the rehabilitation of the forestry training centre for vocational training.

National environmental NGOs are weak, but the influence of international environmental organizations in various aspects of natural resource management is high. The Amazon Conservation Team is working on the use of NWFPs and participatory land-use mapping involving local communities and the government (Tropenbos International 2004).

Status of forest management

Forest for production

In 1993, Suriname invited international investors to establish logging concessions in the country. The requirements for management plans address criteria or methods for SFM in only a limited way, and management plans appear to serve as an administrative tool for charging levies and fees rather than providing guidance in SFM. There are several systems for timber licensing, including concessions, communal wood-cutting permits (*houtkapvergunningen* – HKVs) and ‘incidental cutting licences’ (ICLs). The procedures for granting concessions and licences were not transparent in the past. Concessions vary in length between one and 20 years, but it is now proposed by the forest authority that this should be increased to 25 years.

As of late 2003, 67 concessions had been allocated over a total area of 1.74 million hectares. Thirty-three licences are for areas smaller than

Table 2 Some commonly harvested species for industrial roundwood (2001-2003)^b

Timber species
<i>Dicorynia guianensis</i> (basralocus)
<i>Virola</i> spp (baboen)
<i>Qualea rosea</i> (gronfolo)
<i>Goupia glabra</i> (kopie)
<i>Ocotea rubra</i> (wana)

5,000 hectares in size, ten between 5,000 and 10,000 hectares, and eight are large, foreign-owned concessions between 100,000 and 150,000 hectares totalling 1.09 million hectares. Of the latter, 740,000 hectares have been considered idle or non-compliant and are waiting for final withdrawal notice^b. HKVs are granted to Amerindian or Maroon communities on state-owned lands; approximately 435,000 hectares of forests have either been granted as HKVs or, since the Forest Management Act of 1992, have been allocated as 'community forests' to such communities. Community forests are for local use only, and not for commercial purposes. ICLs are granted to individuals for subsistence purposes and are used generally for converting forest to subsistence agriculture. HKVs are usually negotiated between the community chief and a logging enterprise and may bring little benefit to the community as a whole. About 200 small- and medium-sized logging companies are active, with an annual production capacity of up to 500,000 m³ (with present equipment)^b. About 40% of logs come from regulated forest concessions; the remainder is derived from HKVs, ICLs and illegal sources^b. Budgetary constraints make it difficult for the government to fund law enforcement.

Planned oil-palm plantations and clearcutting for gold and bauxite mining (if continued) will lead to a substantial increase in salvage timber in competition with the output of selective logging, with the likely effect of depressing timber prices and decreasing the incentive to achieve SFM.

Silviculture and species selection. The forests are characterized by a high variety of species;

more than 600 tree species have been described. Some 50 species are known as class A commercial species and about 100 as class B. The species listed in Table 2 are harvested in the highest volumes. International markets particularly seek *Tabebuia serratifolia* (groenhart), *Peltogyne venosa* (purperhart), *Dicorynia guianensis* (basralocus), *Hymenae courbaril* (rode locus) and *Ocotea rubra* (wana)^b. The Celos Management System – an experiment in polycyclic silviculture to sustain timber production by RIL and post-harvesting silvicultural treatments – was applied in Suriname on a limited scale in the 1980s and 1990s.

Planted forest and trees outside the forest.

The predominant planted species for industrial purposes is *Pinus caribaea* – about 58% of the plantations. The rest are planted with broadleaved species and are more of an experimental nature. The principal indigenous species are *Cedrela* spp, *Cordia alliodora* and *Simaruba amara*; the main exotic species are eucalypts. Some of the forest plantations are mature enough to harvest, but many have not yet been thinned. There is little information about standing volume, growth rates or current condition.

Forest certification. There are no certified forests in Suriname. An FSC National Working Group was established in June 1998; this evolved into a working group on forest certification in 2002 under the auspices of SBB and WWF, which is an initiative to advance the institutional, policy and – if needed – legal framework in Suriname for the introduction of forest certification^b.

Estimate of the area of forest sustainably managed for production. The accessible productive forest area is about 4.5 million hectares; the present net productive area is considered to be 2.5 million hectares^b. Only one concession has a fully developed forest management plan. The total sustainably managed forest area is therefore probably close to zero.

Timber production and trade. The annual production of industrial roundwood increased from 183,000 m³ to 250,000 m³ between 1997 and 1999; sawnwood increased from 41,000 to 50,000 m³ and plywood from 7,800 to 8,000 m³ (ITTO 2003). Since 2000, official production has remained stable at about 160,000 m³ per year (ITTO 2005). There are 68

Table 3 Management of the production PFE ('000 hectares)

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
6,890	1,740	73	0	0	7	7	0

sawmills with an estimated installed capacity of 500,000 m³ of roundwood; the present recovery rate is about 40%^b. The use of wood for fuel is negligible. Suriname is a net timber exporter but it also imports wood products such as particleboard, fibreboard and, to a certain extent, plywood. In 2003, Suriname exported logs and sawnwood valued at US\$495,000 and US\$1.89 million respectively (ITTO 2005).

Non-wood forest products. As in neighbouring Guyana, *Euterpe oleracea* (palm heart, manicole) is a major export. Nibi and cufa (rattan-like *Heteropsis flexuosa* and *Clusia* spp) are used locally for furniture-making and exported to the Caribbean. Fibres of *Mauritia flexuosa* (mauritia palm) are used to make baskets, mats and other items for export. Other products include latex from *Manilkara bidentata*, *Bixa orellana* (annatto dye) and *Carapa guianensis* (crabwood oil).

Forest for protection

Soil and water. About 22% of the total forest area has been classified as protection forest and conservation areas (3.27 million hectares) to protect water and soils and to conserve biodiversity. Suriname's forests are generally intact but threats do exist. For example, river pollution is a problem: some waterways are contaminated with mercury as a result of uncontrolled gold mining, and river siltation and soil erosion are prevalent^b.

Biological diversity. Suriname has large intact forest ecosystems of global significance and the forest area has extremely high conservation and ecological value, particularly in the swamps and on the Guyana Shield. No biological inventory was available for this report, but the richness of the forest is not in doubt and it is certain that much remains to be discovered. Twelve mammals, six

reptiles, two amphibians and 27 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, five mammals, two amphibians and one plant are found in forests (IUCN 2004). Suriname has listed two plant species in CITES Appendix I and 41 in Appendix II; none is a timber species (CITES 2005). The country has started to explore the possibility of biodiversity prospecting: a Surinamese pharmaceutical firm and the National Herbarium have established a partnership with Conservation International and others to look for anti-HIV and anti-cancer compounds^b.

Extent of protected areas. According to UNEP-WCMC (2004), an estimated 1.39 million hectares of forest are contained within protected areas classified in IUCN protected-area categories I–IV, including 1.15 million hectares of lowland evergreen broadleaved rainforest.

Estimate of the area of forest sustainably managed for protection. Insufficient data were available to estimate the area of protection PFE being managed sustainably. However, most of the protected area is intact due to a lack of development pressure.

Socioeconomic aspects

Economic aspects. Forest-based activities contributed 2.5% to GDP in 2000 and provided direct employment in logging and the wood-processing industry for around 4,500 people (4.5% of the entire work force)^b. There is also considerable informal and unrecorded employment and economic activity in the sector. Government revenue from forest concessions and other logging activities in the past was practically zero; an exception has been the revenue from export taxes on forest products. Stumpage fees and export fees recently increased significantly, and forest charges may be further

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
4,430	1,390	1,160	n.d.	n.d.

increased under revisions of the Forest Management Act. Log production in Suriname is probably as much as 50% more costly than in Brazil (for example) due to low yields, poor access, a lack of management capacity and a shortage of trained people at all levels. Capital investment in forestry is low and interest rates are high (20% or more), making credit unobtainable for small- and medium-scale investors.

Livelihood values. Subsistence from the forest is a lifeline for most Amerindians and Maroons; about 40,000 people from these tribal communities make their living in the rainforest area^b. Forest resources are important to them for medicines, building materials and fibres, but particularly for wild animals, fruit, seeds and nuts, which are major food sources. More than a thousand plant and animal species are known to be used in one form or another (van Andel et al. 2003). Some communities have also undertaken small-scale timber extraction for commercial use.

Social relations. Suriname's people comprise a racial mix of Amerindians, Creoles, Hindus, Maroons, Javanese, Chinese and Caucasians. About 10% of the population is Amerindians and Maroons, who claim collective land-use rights, including to forests. Mechanisms for structured consultation and participation are urgently needed to resolve conflicts over land tenure, which occur particularly in the coastal zone and in the northern forest area. A recent report by the Inter-American Development Bank (IDB 2005) found that logging concessions have been granted on indigenous and community lands without prior consultation with the communities concerned.

Summary

Suriname has a large forest resource base that contains a sizeable growing stock of valuable hardwood timber. However, its forest-management institutions are not yet equipped to oversee the

introduction of SFM in a commercial sector that has materialized only in the last decade or so. In addition, insecure tenure and recent difficult economic circumstances jeopardize the implementation of SFM.

Key points

- More than 80% of Suriname is forested, and very little deforestation is taking place.
- The PFE comprises an estimated 6.89 million hectares of natural production forest and 4.43 million hectares of protection forest. A further 2.59 million hectares of forest have not yet been allocated.
- As of late 2003, 67 logging concessions had been allocated over a total area of 1.74 million hectares.
- A coherent forest policy and legislation is under development, and the 1992 forest law is currently being revised.
- Current requirements for forest management plans do not have a strong focus on SFM.
- No area of either production or protection PFE has been identified in this report as under sustainable management. Nevertheless, most of the PFE is intact due to a lack of development pressure.
- Suriname's forests produce an estimated 160,000 m³ of industrial roundwood per year; the sector is a significant employer.

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TRINIDAD & TOBAGO



*For legend see page 58

Forest resources

The country of Trinidad and Tobago consists of two main islands and a number of small islets; it has a total land area of 513,000 hectares and a population of 1.3 million people. Trinidad, the much larger island, is traversed by three ranges of hills running more-or-less east to west with a highest point in the northern range of 936 m. These ranges separate two areas of lowland terraces, alluvial plains and swamps. Tobago has a central ridge running for two-thirds the length of the island and rising to 576 m; the southern and western parts of the island are relatively flat. FAO (2005) estimated the forest area to be 259,000 hectares in 2000; another estimate (for 2003) is 248,000 hectares^b.

Forest types. The most widespread forest formation is semi-evergreen seasonal forest (about 100,000 hectares), characterized in the lowlands by

two main canopy species, *Carapa guianensis* (crappo) and *Eschweilera subglandulosa* (guatecare). Tropical evergreen submontane and montane forests occur in the mountains of the northern range. Some swamp forests remain (17,000 hectares), as well as mangrove relicts around the coast^a.

Dynamics of forest resource change. The annual deforestation rate between 1990 and 2000 was an estimated 2,000 hectares, or 0.8% of the forest area (FAO 2005). In 2000, secondary forests accounted for about 17,000 hectares of the forest estate^a. Fires and occasional hurricanes are the main natural hazards affecting the forests.

Permanent forest estate. Of the 192,200 hectares of state-owned forest, 131,500 hectares are designated as 'proclaimed forest reserves' and 11,700 hectares as 'unproclaimed forest reserves'. These – and some other protection forests – constitute the PFE (Table 1); only state forests are counted, since the permanency of private forest is unreported.

Planted forests. The total planted forest is estimated to be about 15,400 hectares, comprising 9,100 hectares of *Tectona grandis* (teak, introduced from Myanmar in 1913), 4,200 hectares of *Pinus caribaea* (Caribbean pine) and other pine species, and 2,100 hectares of mixed hardwoods^b.

Institutional arrangements

Forest tenure. Most forested land is owned and administered by the state. State-owned forest accounts for 192,200 hectares, including all the PFE; the remainder is in private hands.

SFM policy framework. Trinidad and Tobago has long had a systematic approach to SFM; for

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
0.248–0.259	250	127 ^d	15.4 ^b	59.1 ^{b,*}	201.5

* Includes forested area above 90 m contour (where logging is not permitted), wildlife sanctuaries, nature reserves and windbelts within reserves.

Table 2 Some commonly harvested species for industrial roundwood

Timber species	Remarks
<i>Tectona grandis</i> (teak)	From plantations, most valuable timber, 25% of all logs used ^a
<i>Pinus</i> spp	From plantations, 34% of all logs produced ^a
<i>Swietenia macrophylla</i>	From plantations
<i>Cedrela mexicana</i>	From plantations
<i>Cordia alliodora</i> (cypre)	From plantations

example, its block management and shelterwood systems have been applied for more than 60 years^b. However, it lacks a system of C&I suited to its needs, which would be an important part of an SFM policy framework.

Forest policy and legislation. Trinidad and Tobago adopted its first forest policy for the sustainable management of its PFE in 1942. A revision was made in 1981 to take into account the significant social, economic, political and technological changes that had taken place in the country since 1942, but it was never adopted by government. A further revision took place in 1998 and while the cabinet has approved this revision it has not been formally adopted. There is an absence of an agreed strategy and policy in the forest sector^b. Two major pieces of legislation have been revised and amended: the Forests Act (revised 1999) and the Sawmills Act (revised 1999). The 1998 policy revision proposed sustainability within two pillars of forest management:

- (i) the regulation of yield of all types (recreation, wildlife, timber, aesthetics, water, etc); and
- (ii) the improvement of the quantity and quality of stock.

Institutions involved in forests. In Trinidad, the Forestry Division of the Ministry of Public Utilities and the Environment (MPUE) is the state's sole management authority for the sector, being responsible for forestry, watershed management, wildlife, parks, utilization, research and services in support of the private forestry sector. Specific user rights (fuelwood gathering, use of NWFPs) are guaranteed by law for people living adjacent to the forests. However, the absence of an agreed strategy and policy for the forest sector is a source of uncertainty for the Forestry Division and weakens

its operational capacity^b. In 2001, a new strategic plan was developed for the Division for the period 2001–2005 and this was approved in principle by the government. It was expected that this plan would enable the Division to be more effective and efficient in delivering goods and services demanded by new and emerging challenges. Apart from a restructuring of the existing professional staff, several specialist positions are now being sought to meet the challenges of added roles and responsibilities. In Tobago, forests are under the jurisdiction of the Assistant Conservator of Forests, who reports to the Secretary of Agriculture, Land Marketing and the Environment^b.

There is no direct involvement by civil-society organizations in forest management.

Status of forest management

Forest for production

Both natural forests and particularly planted forests are actively managed. About 75,000 hectares of natural forests are regarded as intensively managed and have management plans. All the forest reserves and the external boundaries of the PFE have been fully demarcated. However, the boundaries are not properly maintained and there are frequent incursions/encroachments^a. The police force participates in forest patrols to help control illegal activities.

Up to the 1980s, management plans for forest reserves were written and followed. Subsequently, working plans have not been revised in some cases and the prescriptions have not been followed in others. Harvesting is conducted in accordance with a block system in which areas are opened up for sale on a polycyclic basis. The management of natural

Table 3 Management of the production PFE ('000 hectares)^{b,d}

	Natural				Planted		
	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
Total							
127	75	75	0	15 ^d	15.4	15.4	0

forests has followed a form of selection known as the 'open range system'. Several variations of this have been introduced from time to time, known variously as silvicultural marking in blocks, the periodic block system and the tropical shelterwood system. Because forest resources are limited, there are no forest concessions: individually licensed loggers are allowed to cut a specified number of trees or volume as defined by the Forestry Division. In many cases this has amounted to a 'logger's selection system', uncontrolled by the Forestry Division^b. Some 400 private loggers (mainly wood-workers) are registered (licensed) by the Forestry Division and allotted marked trees for extraction and use^b. Illegal encroachment and illegal logging certainly occur in the PFE, although their extent is unknown; the police-assisted patrols no doubt reduce their prevalence^b. In the case of plantations, particularly teak, coupes to be clearfelled are sub-divided into five-hectare units, and coupes to be thinned are sub-divided into ten-hectare plots for allocation to licensees.

Silviculture and species selection. A large part of timber is derived from planted forests (Table 2). Enrichment planting in natural forests is still practised in depleted and poorly stocked forest to improve the growing stock and thereby support multiple use and sustainability.

Planted forest and trees outside the forest. The total industrial plantation area of about 15,400 hectares is stable, with felled plantations replaced with new plantations and no new areas being planted. Besides the major species of teak and Caribbean pine, a number of other species have been planted on a limited scale in both pure and mixed stands, including by enrichment planting; these include *Cedrela odorata* (cedar), *Cordia alliodora* (cypre), *Swietenia macrophylla* (mahogany) and *Tabebuia rosea* (apamate). All plantations are owned by the state, although it has been reported

that some 1,240 hectares of teak and mixed species have been raised by farmers in private farmlands (Ramnarine & Jhilmit 2003). Forest fires are the most significant threat to planted forests. Trees outside natural and planted forests are probably important as a source of fruit, nuts, fuelwood and timber for local use, but no data on this are available.

Forest certification. So far no forests have been certified.

Estimate of the area of forest sustainably managed for production. Of the natural forests, 15,000 hectares have been managed for many years according to management plans which conform to basic principles of SFM and are harvested according to the periodic block system, which is considered generally consistent with sustainability^b. The balance of production forest has been managed under the open-range system and is now considered to be degraded^b.

Timber production and trade. Trinidad and Tobago produces modest quantities of industrial timber and depends mainly on imports to cover its needs for sawnwood, plywood and paper products; its net timber import bill in 2001 amounted to US\$106 million^b. Total industrial roundwood production in 2003 was 70,000 m³ (ITTO 2005). Plantation areas to be thinned or clearfelled are allocated to sawmillers and woodworkers on a quota system. Annual blocks to be thinned or clearfelled are notified for sale; sawmillers are expected to indicate their interest in working in particular areas. In 2000, there were 85 licensed sawmills whose combined input capacity was 100,000 m³ per year. These ranged in size from typical family enterprises to large companies and processed both the domestic supply of timber and imports of round logs and squares from neighbouring Guyana and Suriname. In 2000, there were

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
59.1	29.2	n.d.	12	n.d.

113 registered and several unregistered furniture factories that processed the lumber into finished products for domestic use and for exports^a.

Non-wood forest products. Little information was made available for this report on the domestic production of the country's major NWFPs. Bamboo is grown as a commercial crop. Some NWFPs are imported from Venezuela and the countries of the Guyana Shield. Edible products such as wild tubers, wild meat, honey, beeswax and thatching grass are used extensively by rural communities. The value of forest products used for subsistence in 2000 is estimated to be about US\$825,000^a.

Forest for protection

Soil and water. There are about 2,000 hectares of protection plantations in the coastal regions^a. It is generally recognized that there is a need to reforest and rehabilitate critical watersheds, but land outside the forest is generally occupied. Some efforts are being made to rehabilitate degraded land through tree-planting in parts of the islands. Some 37,000 hectares of forest are reportedly managed primarily for the protection of soil and water^a.

Biological diversity. Trinidad has surprising biodiversity for its size, brought about by its proximity to other Caribbean islands and, particularly, to continental South America. More than 2,280 species have been recorded, 215 of them endemic. There are over 100 mammals (the richest in the Caribbean), 420 birds and 70 reptiles. One mammal, four birds, five reptiles, nine amphibians and one plant are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, three birds and eight amphibians are found in forests (IUCN 2004). Trinidad and Tobago has listed 49 plant species in CITES Appendix II (CITES 2005).

Protective measures in production forests. Forest management plans prescribe measures to protect riverbanks, rare plants and wildlife in production forests.

Extent of protected areas. A system of 61 national parks and other protected areas was proposed in 1980, about 40 of which have been established and are managed by the Forestry Division; two are being developed with funds from the IDB. According to UNEP-WCMC (2004), 29,300 hectares of forest are in protected areas that conform to IUCN protected-area categories I-IV, including 11,900 hectares of semi-evergreen moist broadleaved forest.

Estimate of the area of forest sustainably managed for protection. Insufficient information was available to estimate the area of sustainably managed protection PFE (Table 4). Some protection forests are covered by management plans and are widely used for ecotourism.

Socioeconomic aspects

Economic aspects. Forests cover most requirements for fuelwood and some of the nation's timber needs. At present, about 10,000 people are employed in local forestry-related jobs and many others are indirectly linked to forestry^b. The Tourism Master Plan aims to make Trinidad and Tobago the foremost tourism destination in the Caribbean. This will involve ecotourism, in which forests will undoubtedly play a substantial role.

Livelihood values. Forests do not generally provide the living area of the poor but they provide important subsistence products for many people. There is no direct conflict between timber-harvesting and livelihood interests, but forest is still being cleared for agricultural and other purposes.

Social relations. Although there are no significant social conflicts associated with the management of the country's forests, the current forest policy proposes increased involvement of local communities in forest management^b. Some ten sites have been earmarked for recreation and are visited by approximately 300,000 people annually^a.

Summary

Trinidad and Tobago's strong tradition in forest management means that SFM has a good footing in the country; however, significant institutional and policy weaknesses could see the deterioration of this tradition unless remedial measures are taken^b. Both natural forests and plantations are affected by over-harvesting, encroachment, fires and other forms of damage, although the extent of these has not been quantified and police patrols probably help reduce illegal activities. There appear to be few social conflicts over forest use, and stronger community involvement in forest management has been foreshadowed.

Key points

- The PFE comprises an estimated 142,000 hectares of production forest (including just over 15,000 hectares of plantations) and 59,000 hectares of protection forest.
- Most timber production derives from planted forests; the main species are teak and Caribbean pine.
- At least 15,000 hectares of natural-forest production PFE are being sustainably managed.
- The country has yet to develop a workable set of C&I for SFM suited to its special needs.
- Individually licensed loggers are able to cut a specified number of trees or volume as defined by the Forestry Division. In many cases this may have amounted to a 'logger's selection system'.
- Trinidad and Tobago imports round logs and squares from neighbouring Guyana and Suriname for local processing; it is a net importer of timber.

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VENEZUELA



*For legend see page 58

Forest resources

Venezuela has a land area of 91.2 million hectares and a population of 25.7 million people. It can be divided into three main biogeographical regions: (i) a narrow coastal area; (ii) the Andean mountain range, which reaches 5,000 m above sea level and supports dry, humid-mountain and cloud forests; and (iii) the basins of the Orinoco and Amazon rivers. The Orinoco Plain, 20% of the country, is mainly covered by heavily degraded evergreen and semi-deciduous forests (*llanos*). The Guayana region (the states of Bolívar and Amazonas) occupies about half of the country and contains 70% of its forests. Estimates of forest area vary from 49.5 million hectares (FAO 2005) to 55 million hectares^a.

Forest types. Tropical moist forest, Venezuela's most extensive forest type, is present in the Orinoco delta, the Guayana region and in small areas south and southwest of Lake Maracaibo; the most common

species are *Couropita guianensis*, *Ceiba pentandra*, *Coumarouna punctata*, *Erismia uncinatum* and *Carapa guianensis*. Tropical mountain forest is found in three mountain zones: the Merida range, the coastal range by the Caribbean and the eastern massif in Sucre and Monagas states. Cloud forest forms in the misty climate of the Andes between 500 and 2,000 m; valuable timber species found there include *Cedrela mexicana*, *Guarea* spp, *Roupala montana*, *Terminalia* spp, *Virola sebifera*, *Rollinia fendleri*, *Calophyllum brasiliense* and, in higher areas, species of *Podocarpus*. The Orinoco Plain was once covered by *llanos* but this has been mostly converted to agriculture and pasture. Once-common species in these forests include *Swietenia macrophylla* (caoba), *Tabebuia pentaphylla* and *Ceiba pentandra*.

Dynamics of forest resource change.

Deforestation in the period 1982–2000 was an estimated 261,000 hectares (0.6%) per year^a; FAO (2005) estimated an average annual rate of deforestation of 218,000 hectares between 1990 and 2000. In the past, deforestation was highest in the *llanos*; for the last 15 years it has been highest in the dry, northwestern Zulia region, which has lost almost two-thirds of its forest cover. Deforestation has also been relatively high (36,000 hectares per year) in the state of Bolívar in the tropical moist forest region, which is also the most important forest development area of the country. Only small areas of secondary forests (*purmas*) remain, since deforested areas have mostly been transformed into pasturelands. Uncontrolled forest fires occur regularly, both in natural and planted forest^a.

Permanent forest estate. The entire forest area is contained within specially designated *Áreas Bajo Régimen de Administración Especial (ABRAEs)* –

Table 1 PFE

Estimated total forest area, range (million hectares)	Total closed natural forest ('000 hectares) Source: FAO 2001	PFE ('000 hectares)			
		Production		Protection	Total
		Natural	Planted		
49.5–55.0	49,926	13,000 ^d	863	20,600 ^d	34,463 ^d

land managed for special purposes according to special laws. As of August 2001, 362 ABRAEs had been established in 25 different categories covering approximately 46% of the total land area. It appears that about 13 million hectares of the country's estimated 29.9 million hectares of closed forests are allocated for production as part of the PFE. This is made up of forest reserves (11.8 million hectares) and forest lots (*lotes boscosos* – 1.2 million hectares). Figures for the natural-forest PFE in Table 1 are ITTO estimates based on data from the Ministry of the Environment and Natural Resources (*Ministerio del Ambiente y de los Recursos Naturales* – MARN 2000, 2004).

Planted forests. There has been a tradition of official and private plantations in Venezuela for more than 50 years. In 1998, there were an estimated 727,000 hectares of planted forests (115,000 hectares being private); 53% of these were industrial plantations^a. The plantation rate has declined recently, from 30,000 hectares per year several years ago to less than 5,000 hectares per year; FAO (2001) estimated the total planted forest area at 863,000 hectares. By far the most important plantation species is *Pinus caribaea* (pino caribe).

Institutional arrangements

Forest tenure. It is estimated that more than 90% of the forest is owned by the state^c. There are private forest lots in both natural and planted forest areas, but their extent is not known. The 1999 constitution recognizes the right of indigenous people to the collective ownership of forest territories, access to resources and rights to cultural uses, but there is no demarcation or formal recognition process in place. The extent to which local communities have the right to administer, conserve and manage timber resources in ABRAEs remains unclear.

SFM policy framework. Venezuela has a long tradition of forest management and professional foresters are involved at all levels of forest production and conservation activities. The country subscribes to the Tarapoto Process, which developed C&I for SFM for the eight Amazon countries, but also plans to develop its own C&I based on the latest revision of ITTO's C&I^c.

Forest policy and legislation. The notion of SFM dates back to the Forest Law of 1966. In 1992, the Penal Law of the Environment came into force, defining offences against the environment. The national forest policy that applied up to 1998 was reviewed by the General Board of Forest Resources, which concluded that the policy needed to be refocused in order to better integrate social concerns and broader environmental issues into forest management. The new approach includes the use of C&I for assessing SFM and considers the recommendations for action made in the United Nations Forum on Forests process. A new forest law is being drafted that will legislate for, regulate and supervise the management of national forests for single and multiple uses in accordance with principles of sustainability, diversification in the use of community goods and services, and participation. In addition, the Organic Environmental Law and the Organic Territorial Management Law are being revised and amended. Under a 2001 resolution, the commercial harvesting from natural forests of caoba, *Cedrela odorata* (cedro), *Anacardium excelsum* (mijao), *Cordia alliodora* (pardillo) and *Tabebuia spectabili* (pau d'arco) has been banned for six years.

The domestic timber trade is regulated by the 1966 Forest Law for Soil and Water (*Ley Forestal de Suelos y de Aguas*) and the international trade by the Fiscal Law (*Ley de Timbre Fiscal*). The latter includes tariff instruments for the control of imports and exports and stipulates that logs harvested from natural forests cannot be exported. Industrial logging (since 1978; Decree 269) and mining (since 1989; Decree 2,552) are prohibited by legal regulations in the state of Amazonas, the second-largest state after Bolívar.

Institutions involved in forests. Forests are under the jurisdiction of MARN, which was created under the Organic Environmental Law in 1999. Nevertheless, and particularly in the forest area south of Orinoco, there is a lack of clarity in the relative roles and responsibilities of various institutions, in particular between MARN, the Ministry of Agriculture and the Ministry for Energy and Mining (*Ministerio de Energía y Minas*). MARN has established the General Directorate of Forests to look after the administration, classification and sustainable management of forests. The Directorate

is tasked with developing action plans for strengthening the classification of areas for permanent forest production and the control of timber production.

Decentralization is a process that was proposed in the Law of Decentralization in 1989 and reinforced by principles embodied in the 1999 constitution. However, natural resource management and, in particular, forest management, remain under the control of a centrally organized forest service – with the exception of urban forestry, which is managed directly by the municipalities.

The Association of Forest Engineers, the forestry university in Merida and other professional organizations play important roles in the monitoring of forest resources. The Venezuelan Association for the Conservation of Natural Areas (*Asociación Venezolana para la Conservación de Áreas Naturales* – ACOANA), the Foundation for the Defence of Nature (*Fundación para la Defensa de la Naturaleza* – FUDENA) and other conservation NGOs, as well as organizations such as the Federation of Indigenous People and Bioguayana, are national bodies with strong links to international NGOs such as Conservation International, The Nature Conservancy and WWF. They are becoming increasingly engaged in the forest debate.

Status of forest management

Forest for production

Timber harvesting in natural forests is done on a relatively small scale in Venezuela and there is still a great deal of experimentation with forest management regimes. Under the new national forest policy, the integrated co-management of forests will involve multiple land-uses and the production of timber, NWFPs and environmental services. This new approach is being tested through 'integrated community forest management programs' (*programas de manejo integral comunitario del bosque*) in forest reserves such as Ticoporo and Caparo in the Llanos region. Under the term 'territorial management of forest areas' (*manejo territorial de áreas forestales*) SFM for timber production is being tested in the Imataca Forest Reserve in the Guayana region.

Two kinds of permits for timber production are available: forest concessions, granted for areas of more than 5,000 hectares, and annual logging permits, for areas smaller than 5,000 hectares. Forest concessions are granted for 20–40 years in forest reserves and forest lots, the latter established by MARN. Forest lots are special FMUs designated for long-term forest management in those parts of the country where forest reserves have not been classified in the past. The forest concession policy lacks clarity; concessions are officially granted at public auction, but information about the process is not publicly available and the criteria for awarding concessions are not transparent^c. Concessionaires often struggle to comply with the forest law, but there is no public information on how and to what extent they fail to comply^c.

Because nearly all forest reserves north of the Orinoco River are deforested, all forest concessions are now south of the Orinoco in the Guayana region. As of mid 2003, 14 forest concessions were operating in forest reserves and in forest lots over a total of 1.21 million hectares^c. All concessionaires are Venezuelan nationals. Concession management is based on fully-fledged forest management plans (*planes de ordenación y manejo forestal* – POMFs) that include an inventory of commercial timber species; high-grading, in which only the most valuable species are extracted, is commonplace (GFW 2002). By law, all concessions must be managed by professional forest engineers and trained foresters. Harvesting in concessions is carried out on the basis of an annual cutting plan approved by MARN. Concessionaires are required to establish line enrichment planting after harvesting at a distance between strips of 30–50 m. Annual logging permits require a simplified management plan prepared by a forest engineer.

Silviculture and species selection. The minimum cutting diameter for all cutting permits in natural forests is 40 cm at breast height. At least 20 species are harvested from natural forests in volumes exceeding 50,000 m³ per year; some of the most commonly harvested species include those shown in Table 2. Others include *Copaifera officinalis* (aceite), *Tabebuia rosea* (apamate), *Hymenaea courbaril* (algarrobo), *Catostemma commune* (baramán), *Sterculia apetala* (camoruco),

Table 2 Some commonly harvested species for industrial roundwood (2001–2003)^c

Timber species	Remarks
<i>Pinus caribaea</i> (pino caribe)	From plantations, 53% of the total harvest
<i>Pithecellobium saman</i> (samán)	From open forests, about 13% of total harvest
<i>Bombacopsis quinata</i> (saqui saqui)	From the Llanos region, about 10% of total harvest
<i>Erismia uncinatum</i> (moreillo)	From the Guayana region, about 9% of total harvest
<i>Hymenaea courbaril</i> (algarrobo)	From the Guayana region, about 8% of total harvested

Carapa guianensis (carapa), cedro, *Simarouba amara* (cedro blanco), *Ceiba petandra* (ceiba), *Brosimum alicastrum* (charo), *Pterocarpus officinalis* (drago), *Hura crepitans* (jabillo), *Qualea dinizii* (guarapo), *Spondias mombin* (jobo), *Nectandra* spp (laurel), *Anacardium excelsum* (mijao), *Mora excelsa* (mora), *Erismia uncinatum* (moreillo), *Piptadenia* spp (palo blanco), *Cordia alliodora* (pardillo), *Manilkara bidentata* (purguo), *Tabebuia serratifolia* (puy) and *Peltogyne pubescens* (zapatero). *Pithecellobium saman* (samán) and *Bombacopsis quinata* (saqui saqui) are the main species remaining from the scattered forests north of the Orinoco region.

Planted forest and trees outside the forest.

Plantations were mainly established in the 1980s; today the management of existing planted forest is more important than the establishment of new plantations. Pino caribe plantations provide more than 50% of the country's total roundwood production^c. Besides these and various tropical eucalypts and teak, hardwood species are planted mainly in natural forest in enrichment lines using, among others, teak, moreillo, pardillo, mijao, cedro and caoba.

Forest certification. As of December 2005, Venezuela had one certified planted forest of pino caribe; this covered an area of 139,650 hectares and belongs to the multinational Terranova Company (FSC 2005). Natural-forest certification has not yet attracted much interest because the entire production is used to satisfy the high-price domestic market, which is not demanding certified timber at this point.

Estimate of the area of forest sustainably managed for production. MARN (2000) estimated that 77% of the volume of timber harvested – 40% from areas under POMFs and 37% from plantations

of pino caribe – was derived from sustainably managed sources and therefore met the ITTO Year 2000 Objective. The estimate of sustainably managed natural-forest PFE given in Table 3 is more conservative and corresponds to timber concessions that have been managed according to forest management plans for more than 20 years. Detracting from the overall status of forest management is the generally weak enforcement of forestry regulations, particularly given that commercial logging is far from the centres of control; illegal logging, hunting and encroachment are reportedly widespread (GFW 2002).

Timber production and trade. Nearly the entire volume of timber production serves the domestic market. Total industrial roundwood production in 2003 was 1.06 million m³, of which 638,000 m³ came from conifers (ITTO 2005); in 1999, conifers accounted for 910,000 m³ of the 1.66 million m³ total log production (ITTO 2004). In the last decade, there has been a shift in production from natural forest to plantations and to regulated forest concessions with POMFs. In 1993, nearly 55% of production came from cutting licences in natural forests, 35% from forest concessions and 15% from plantations; in 2000, 40% of wood production came from plantations, 40% from concessions and only 20% from cutting licences^a. Production of sawnwood is between 240,000 m³ and 300,000 m³ per year. The bulk of industrial roundwood production (about 65%) is used for pulp and paper. Exports of primary timber products are negligible, but imports of forest products have grown to over US\$20 million per year recently, mostly comprising sawnwood, plywood and particleboard. Hardwood from Roraima state in the Brazilian Amazon is increasingly important because of a new and well-maintained road system.

Table 3 Management of the production PFE ('000 hectares)^{c,d}

Natural					Planted		
Total	Allocated to concessions/ under licence	With management plans	Certified	Sustainably managed	Total	With management plans	Certified
13,000	3,120	1,480	0	480	863	727	140

Non-wood forest products. Between 30 and 50 NWFPs are important and used at local, regional and national levels. Among them are different palm products for food, construction, medicine and handicrafts, including the fruits of *Bactris gasipaes* (pejibaye), *Mauritia flexuosa* (mori che palm) and *Dipteryx odorata* (sarrapia). Other products are pepper, cinnamon, bamboo, nutmeg, aniseed, cumin, ginger, cucumber and resins. Many of them enter the national market and, ultimately, international trade. Mamure, a local liana (*Heteropsis spruceana*), has been used for a long time as a raw material for furniture but is now threatened by overuse. Palm heart (palmito) from *Euterpe oleracea* is an important export product; it is now increasingly planted. The value of palm hearts exported in 2002 exceeded US\$150,000^a.

Forest for protection

Soil and water. A significant area of forest is set aside for the protection of soil and water within the ABRAEs. These forests are classified under 'normative protection' (*protección normada*) and include:

- protection zones (*zonas protectoras*): 12.7 million hectares;
- watershed reserves (*reservas hidráulicas*): 1.17 million hectares;
- reserves for dams and reservoirs (*zonas de reserva para construcción de presas y embalses*): 7,800 hectares;
- protected areas for public infrastructure (*áreas de protección de obras públicas*): 133,400 hectares;
- critical areas for restoration (*áreas críticas con prioridad de tratamiento*): 4.5 million hectares; and

- environmental rehabilitation and protection areas (*áreas de protección y recuperación ambiental*): 2,350 hectares^a.

Forests in the Guayana region help to regulate the flow of water for the Guri Dam, which provides 70% of the nation's electricity. The most extensive protected areas are located in the Andean mountain belt, where forest is important in watershed protection. Some attention has recently been accorded to payments for environmental services, but so far there has been no real action.

Biological diversity. Venezuela harbours a significant portion of the world's biodiversity, ranking in the top 20 countries in the number of endemic plants, birds, amphibians and reptiles. More than 8,000 plant species have been recognized as endemic, as have some 122 amphibians, 66 reptiles, 40 birds and 15 mammals. Twenty-eight mammals, 25 birds, 13 reptiles, 68 amphibians and 69 plants are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species; of these, 14 mammals, 21 birds, 61 amphibians and one plant are found in forests (IUCN 2004). Six plants are listed in CITES Appendix I and 221, including *Swietenia macrophylla* and *S. humilis*, in Appendix II (CITES 2005).

Protective measures in production forests. The draft new forest law would require that 10% of the managed production forest be protected as a preservation zone, with emphasis on areas along watercourses and swamps. So far, there are no prescriptions for RIL.

Extent of protected areas. The estimated total area contained in reserves compatible with IUCN categories I–IV is 17.9 million hectares, as follows:

- national parks (*parques nacionales*): 13.6 million hectares;

Table 4 Management of the protection PFE ('000 hectares)

Total	Attributed to IUCN categories I-IV	Allocated for soil and water	With management plans	Sustainably managed
20,600	20,600	1,740	7,210*	n.d.

* Extrapolation based on the estimated 35% of protected areas in IUCN categories I-IV that have management plans or instructions for use (Bevilacqua et al. 2004)

- natural monuments (*monumentos naturales*): 4.27 million hectares; and
- wildlife refuges (*refugios de fauna silvestre*): 53,500 hectares; (Bevilacqua et al. 2004).

This area amounts to about 20% of the national territory, making Venezuela one of the world's leading conservation nations. Aside from forests, it includes high mountain ecosystems and other non-forested areas. UNEP-WCMC (2004) estimated the total area of forests in protected areas conforming to IUCN protected-area categories I-IV to be 20.6 million hectares (even higher than the Bevilacqua et al. 2004 estimate of the total area in such reserves), of which 14.0 million hectares are lowland evergreen broadleaved rainforest.

Although the declared protected area is huge, only about 15% has land-use and zoning plans. In addition, many conservation sites are subject to unresolved land claims by indigenous groups who may have been living there before the reserves were officially declared.

Estimate of the area of forest sustainably managed for protection. Of the 265 special areas with protection status, 70 have a forest management plan (Bevilacqua et al. 2004). Thirty-five per cent of the protected areas in IUCN protected-area categories I-IV have a management plan or instructions for its use (*reglamentos de uso*) (ibid.); however, insufficient information was available to estimate the area of protection PFE sustainably managed (Table 4), although a large part of the estate is intact and faces little development pressure.

Socioeconomic aspects

Economic aspects. Forests provide less than 0.5% of GDP^a. Data on the number of people employed in the forest sector were not available for this report.

Livelihood values. NWFPs are essential for the livelihood of all indigenous peoples living in the Guayana and Amazon regions. Wildlife and fish still supplement the protein needs of a large part of the population in the states of Bolivar and Amazonas. Wildlife also provides raw material for handicrafts and medicine. Intensified hunting and fishing with new techniques and in-migration into frontier areas may well increase pressure on some animal species.

Social relations. The development of natural forests has a great social effect in the Guayana region, characterized by a relatively small and mainly indigenous population. The two main economic activities are logging and mining for gold and diamonds. These have brought improved health and education services to local people and induced a trend towards settlement. Logging and mining have also brought non-indigenous settlers (*colonos*) into the region, who use natural resources to supplement their subsistence needs and cash income. This has increased the likelihood of conflicts and pressure on the existing forest resources, especially along access roads and around settlements. North of the Orinoco River, particularly in the Province of Barninas bordering Colombia, nearly all forest reserves have been encroached by *colonos*. It is not yet clear how such illegal occupation will be handled or if the concept of forest reserves in these areas will be abandoned.

Summary

Venezuela still possesses vast unexploited forest resources in its two largest states of Bolivar and Amazonas. Relatively modest logging concessions and cutting permits have been granted over the past 35 years. Instead of increasing the harvesting of natural forests, plantation forestry has been developed for many years. Today, much of the

domestic need for industrial wood is met by planted forest. The country's forest-related laws contain strong environmental provisions, and a large proportion of its territory is in designated protected areas (although in some places under tenurial dispute by indigenous communities). However, there is a gap between the legal provisions and their implementation in the field. SFM for production and conservation has not yet been fully achieved; the enforcement of forestry regulations is considered to be far from optimal, and illegal logging, hunting and encroachment are reportedly widespread. Nevertheless, a basis has been laid for the development of SFM and effective forest conservation.

Key points

- The PFE comprises an estimated 13 million hectares of natural production forest and 20.6 million hectares of protection forest. There is also a substantial plantation estate (about 863,000 hectares).
- It is estimated that at least 480,000 hectares of the natural-forest production PFE is managed sustainably; insufficient information was available to estimate the extent of the protection PFE so managed.
- The forests north of the Orinoco River are heavily degraded and encroached. South of the Orinoco River, Venezuela still has extensive and timber-rich forest resources with good potential for SFM.
- The monitoring of forest resources and implementation of forest management are both deficient, particularly in more remote areas.
- There is a lack of clarity in administrative roles and responsibilities for forests, in particular between MARN, the Ministry of Agriculture and the Ministry for Energy and Mining.
- The new national forest policy is not yet finalized or backed up with effective legislation, and the forest concession policy lacks clarity.
- Wood production is shifting from natural forest to plantations and to regulated forest concessions with management plans.
- Despite regulations to the contrary, logging in natural forests concentrates on the most valuable timber species.

- The long-term viability of the protection PFE depends on the continuous provision of financial resources and acceptance by local stakeholders.

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 - ^c Information derived from the report of, and discussions with participants at, a training workshop on ITTO criteria and indicators, held 30 August – 4 September 2004, Ciudad Bolívar, Venezuela, attended by 47 people from government, civil society and the private sector.
 - ^d ITTO estimate
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ACRONYMS

A&D	Alienable and disposable <i>Philippines</i>	ATO	African Timber Organization
AAC	Annual allowable cut	BFD	Bureau of Forestry <i>Philippines</i>
ABRAE	Area Bajo Régimen de Administración Especial (land managed for special purposes according to special laws) <i>Venezuela</i>	BOSCOM	Proyecto Fortalecimiento Forestal Municipal y Comunal (communal forestry program) <i>Guatemala</i>
ACCA	Asociación para la Conservación de la Cuenca Amazónica (Amazon Watershed Conservation Association) <i>Peru</i>	C&I	Criteria and indicators
ACOANA	Asociación Venezolana para la Conservación de Areas Naturales (Venezuelan Association for the Conservation of Natural Areas) <i>Venezuela</i>	CAR	Central African Republic
ADB	Asian Development Bank	CAT	Convention d'aménagement et de transformation (managing and processing agreement) <i>Congo</i>
AFC-COHDEFOR	Administración Forestal del Estado-Corporación Hondureña de Desarrollo Forestal (State Forestry Administration) <i>Honduras</i>	CATIE	Centro Agronomico Tropical de Investigación y Enseñanza (Tropical Research and Higher Education Centre) <i>Guatemala</i>
AM	Arrêté ministériel (ministerial decree) <i>DRC</i>	CBFM	Community-based forest management
ANAFOR	Agence Nationale de Développement des Forêts (National Agency for Forestry Development) <i>Cameroon</i>	CBFMA	Community-based forest management agreement <i>Philippines</i>
ANAM	Autoridad Nacional del Ambiente (National Environmental Authority) <i>Panama</i>	CERFLOR	Certificação Florestal (Brazilian forest certification system)
ANCON	Asociación Nacional para la Conservación de la Naturaleza (Association for the Conservation of Nature) <i>Panama</i>	CFAD	Concession forestière sous aménagement durable (forest concession under sustainable development) <i>Gabon</i>
ANP	Área natural protegida (protected area) <i>Mexico</i>	CFC	Community forest committee <i>Ghana</i>
ASL	Agrupaciones sociales del lugar (local social groups) <i>Bolivia</i>	CIB	Congolaise Industrielle des Bois <i>Congo</i>
ATIBT	Association Technique Internationale des Bois Tropicaux (International Technical Tropical Timber Association)	CIEF	Centro de Informacion Estrategica Forestal (Center for Strategic Forestry Information) <i>Peru</i>
		CIFOR	Center for International Forestry Research
		CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
		CNIAF	Centre National d'Inventaire et d'Aménagements des Ressources Forestières et Fauniques (National Inventory and Forest Management Centre) <i>Congo</i>

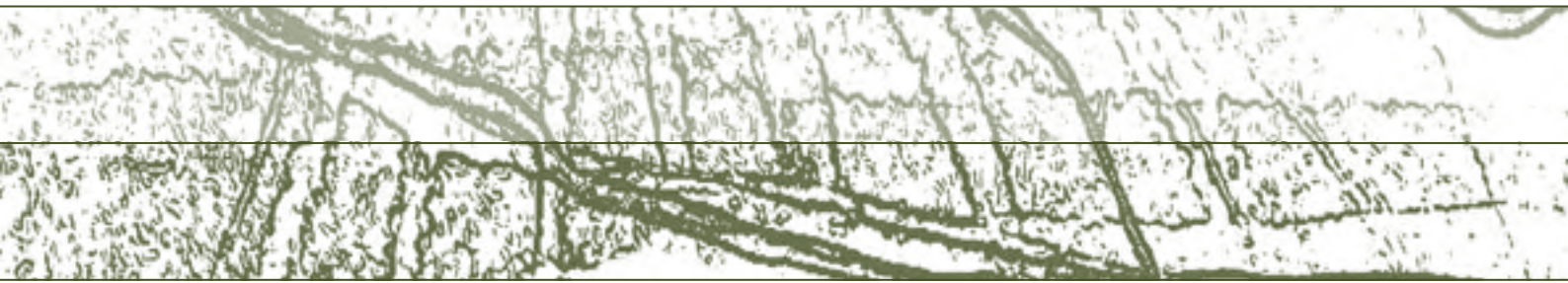
CNPN	Conseil National des Parcs Nationaux (National Council for National Parks) <i>Gabon</i>	DRC	Democratic Republic of Congo
COMIFAC	Commission en Charge des Forêts d'Afrique Centrale (Commission in Charge of Forests in Central Africa) <i>CAR</i>	DRE	Direction des Ressources en Eau (Directorate for Water Resources) <i>DRC</i>
CONAFLOP	Comissão Coordenadora do Programa Nacional de Florestas (Coordinating Commission for the National Forestry Program) <i>Brazil</i>	EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária (Agricultural Research Corporation) <i>Brazil</i>
CONAFOR	Comisión Nacional Forestal (National Commission for Forests) <i>Mexico</i>	ENRO	Environment and natural resources office <i>Philippines</i>
CONAMA	Conama Conselho Nacional do Meio Ambiente (National Council for the Environment) <i>Brazil</i>	EPA	Environmental Protection Agency <i>Guyana</i>
CONAP	Consejo Nacional de Areas Protegidas (National Council of Protected Areas) <i>Guatemala</i>	ESNABIO	Brazilian National Policy and Strategy for Biodiversity
CONIF	Corporación Nacional de Investigación y Fomento Forestal (National Corporation for Forestry Research and Development) <i>Colombia</i>	FA	Forestry Administration <i>Cambodia</i>
CVD	Comité Villageois de Développement (Village forest committee) <i>Togo</i>	FAO	Food and Agriculture Organization of the United Nations
DENR	Department of Environment and Natural Resources <i>Philippines</i>	FC	Forestry Commission <i>Ghana</i>
DFC	Direction de la Faune et Chasse (Directorate of Fauna) <i>DRC</i>	FCFA	Franco Communauté Financière Africaine
DFW	Department of Forestry and Wildlife <i>Cambodia</i>	FDA	Forestry Development Authority <i>Liberia</i>
DGEF	Direction Générale des Eaux et Forêts (Directorate for Forests and Water) <i>Gabon</i>	FDA	Forest development agency <i>India</i>
DGF	Direction de la Gestion Forestière (Directorate of Forest Management) <i>DRC</i>	FDF	Federal Department of Forestry <i>Nigeria</i>
DIARF	Direction des Inventaires, des Aménagements et de la Régénération des Forêts (Directorate of Forest Inventory, Management and Regeneration) <i>Gabon</i>	FHCL	Fiji Hardwood Corporation Limited
		FLONA	Floresta Nacional (national forest) <i>Brazil</i>
		FMA	Forest management agreement <i>PNG</i>
		FMB	Forest Management Bureau <i>Philippines</i>
		FMU	Forest management unit
		FOB	Free on board
		FONABOSQUE	Fondo Nacional de Desarrollo Forestal (National Forestry Development Fund) <i>Bolivia</i>
		FONDEFOR	Fondo de Protección y Desarrollo Forestal (National Fund for Forest Development and Protection) <i>Panama</i>

FORIG	Forest Plantation Development Centre, the Forestry Research Institute of Ghana	IC	Intercooperation
FPL	Fiji Pine Limited	ICCN	Institut Congolais pour la Conservation de la Nature (Congolese Institute for the Conservation of Nature)
FRIM	Forest Research Institute of Malaysia	ICEM	International Centre for Environmental Management
FRIN	Forestry Research Institute of Nigeria	ICL	incidental cutting licence <i>Guyana</i>
FRUA	Forest resources utilization agreement <i>Liberia</i>	IDB	Inter-American Development Bank
FSC	Forest Stewardship Council	IFB	Industrie Forestière de Batalimo <i>CAR</i>
FSI	Forest Survey of India	IFMA	Industrial forest management agreement <i>Philippines</i>
FSP	Foundation for the Peoples of the South Pacific	IIAP	Instituto de Investigación de la Amazonía Peruana (Peruvian Amazon Research Institute) <i>Peru</i>
FUDENA	Fundación para la Defensa de la Naturaleza (Foundation for the Defence of Nature) <i>Venezuela</i>	IIFM	Indian Institute of Forest Management
FUNAI	Fundação Nacional do Índio (Indian National Foundation) <i>Brazil</i>	IMAZON	Instituto do Homem e Meio Ambiente da Amazônia (Amazon Institute of People and the Environment) <i>Brazil</i>
GDP	Gross domestic product	INAB	Instituto Nacional de Bosques (National Forest Institute) <i>Guatemala</i>
GEF	Global Environment Facility	INCRA	Instituto Nacional de Colonização e Reforma Agrária (National Colonization and Agrarian Reform Institute) <i>Brazil</i>
GFC	Guyana Forestry Commission	INDERENA	Instituto de Desarrollo de los Recursos Naturales Renovables <i>Colombia</i>
GFW	Global Forest Watch	INPA	Instituto Nacional de Pesquisas da Amazonia (National institute of Amazonian Research) <i>Brazil</i>
GGMC	Guyana Geology & Mines Commission	INRENA	Instituto Nacional de Recursos Naturales (National Institute for Natural Resources) <i>Peru</i>
GIS	Geographic Information System	IPK	Izin pemanfaatan kayu (log exploitation permit) <i>Indonesia</i>
HKV	Houtkapvergunningen (communal wood-cutting permit) <i>Guyana</i>	ITTA	International Tropical Timber Agreement
HPH	Hak pengusahaan hutan (forest concession rights) <i>Indonesia</i>	ITTC	International Tropical Timber Council
HPHH	Hak pemungutan hasil hutan (forest products collection rights) <i>Indonesia</i>		
HTI	Hutan tanamaan industri (industrial forest plantations) <i>Indonesia</i>		
IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute of Environment and Renewable Resources)		

ITTO	International Tropical Timber Organization		Economy, Inland Waters and Fishing in Charge of the Environment and Nature Conservation) <i>Gabon</i>
IUCN	World Conservation Union		
JCP	Joint certification program <i>Indonesia</i>	MERF	Ministère de l'Environnement et des Ressources Forestières (Ministry for Environment and Natural Resources) <i>Togo</i>
JFM	Joint forest management <i>India</i>		
LBB	Lachtwet en BosBeheer (forest service) <i>Guyana</i>	MINEF	Ministère des Eaux et Forêts (Ministry for Water and Forests) <i>Côte d'Ivoire</i>
LEI	Lembaga Ecolabel Indonesia (Indonesian Ecolabel Institute)		
LOC	Landowner company <i>PNG</i>	MINEF	Ministère de l'Environnement et des Forêts (Ministry of Environment and Forests) <i>Cameroon</i>
MAE	Ministerio del Ambiente (Ministry of Environment) <i>Ecuador</i>		
MAFF	Ministry of Agriculture, Forestry and Fisheries <i>Cambodia</i>	MINFOF	Ministère des Forêts et de la Faune (Ministry of Forests and Fauna) <i>Cameroon</i>
MAGA	Ministerio de Agricultura, Ganadería y Alimentación <i>Guatemala</i>	MLF	Ministry of Lands and Forestry <i>Ghana</i>
MARN	Ministerio de Ambiente y Recursos Naturales (Ministry for Environment and Natural Resources) <i>Guatemala</i>	MMA	Ministerio de Medio Ambiente (Ministry of the Environment, Water Resources and Amazon) <i>Brazil</i>
MARN	Ministerio del Ambiente y de los Recursos Naturales (Ministry of the Environment and Natural Resources) <i>Venezuela</i>	MOEF	Ministry of Environment and Forests <i>India</i>
MAVDT	Ministerio de Ambiente, Vivienda y Desarrollo Territorial (Ministry of Environment, Housing and Territorial Development) <i>Colombia</i>	MoF	Ministry of Forestry <i>Indonesia</i>
MDF	Medium density fibreboard	MPFD	Master plan for forestry development <i>Philippines</i>
MEFCPET	Ministère des Eaux, Forêts, Chasses, Pêches, Environnement et du Tourisme (Ministry of Environment, Water, Forests, Hunting and Fishing) <i>CAR</i>	MPUE	Ministry of Public Utilities and the Environment <i>Trinidad and Tobago</i>
MEFE	Ministère de l'Economie Forestière et de l'Environnement (Ministry of Forestry Economy and Environment) <i>Congo</i>	MTCC	Malaysian Timber Certification Council
MEFEPEPN	Ministère de l'Economie Forestière, des Eaux, de la Pêche, Charge de l'Environnement et de la Protection de la Nature (Ministry of Forest	MTE	Myanmar Timber Enterprise
		MTIB	Malaysian Timber Industry Board
		NAP	National Afforestation Program <i>India</i>
		NCFC	National Committee on Forest Certification <i>Ghana</i>
		NFAP	National Forestry Action Plan <i>Fiji</i>
		NFB	National Forest Board <i>PNG</i>
		NFC	National Forestry Council <i>Malaysia</i>
		NFDC	National Forestry Development Committee <i>Nigeria</i>
		NFP	National forestry policy <i>Malaysia</i>

NFS	National Forest Service <i>PNG</i>	PFA	Permis forestiers associés (associated forest license) <i>Gabon</i>
NGO	Non-governmental organization	PFE	Permanent forest estate
NLTB	Native Land Trust Board <i>Fiji</i>	PINFOR	Programa de Incentivos Forestales <i>Guatemala</i>
NRE	Ministry of Natural Resources and Environment <i>Malaysia</i>	PLANFOR	Plan de Acción Forestal (forestry action plan) <i>Honduras</i>
NRMP	National Resources Management Plan <i>Ghana</i>	PMFS	Plano de manejo florestal sustentável (sustainable forest management plan) <i>Brazil</i>
NWFP	Non-wood forest product	PNAE	Plan National d'Action pour l'Environnement (National Environmental Action Plan) <i>Togo</i>
ODEF	Office de Développement et d'Exploitation des Forêts (Office for Forest Development and Harvesting) <i>Togo</i>	PNF	Programa Nacional de Florestas (National Forest Program) <i>Brazil</i>
ONADEF	Office National de Développement des Forêts (National Forestry Development Agency) <i>Cameroon</i>	PNG	Papua New Guinea
OSINFOR	Organismo Supervisor de los Recursos Forestales Maderables (forest control and supervision agency) <i>Peru</i>	POMF	planes de ordenación y manejo forestal (forest management plan) <i>Venezuela</i>
PAFC	Pan-African Forest Certification	PPA	People's protected area <i>India</i>
PAFN	Plan d'Action Forestier National (National Forestry Action Program) <i>Togo</i>	PROCAFOR	Regional Forest Program for Central America <i>Guatemala</i>
PAFSI	simplified forest management plan <i>Ecuador</i>	PRODEFOR	Programa Nacional de Desarrollo Forestal (National Forest Development Program) <i>Mexico</i>
PAFSU	sustainable management area <i>Ecuador</i>	PRODEPLAN	Programa para el Desarrollo de Plantaciones Forestales Comerciales (Programme for the Development of Commercial Forest Plantations) <i>Honduras, Mexico</i>
PA.NA.M.A.	Fundación Parques Nacionales y Medio Ambiente (National Parks and Environment Foundation) <i>Panama</i>	PROFEPA	Procuraduría Federal de Protección al Ambiente (Federal Office for Environmental Protection) <i>Mexico</i>
PCI	Principles, criteria and indicators for the sustainable management of African natural forests	PTE	Permis de transformation et d'exploitation <i>Côte d'Ivoire</i>
PEA	Permis d'exploitation et d'aménagement <i>CAR</i>	RFD	Royal Forest Department <i>Thailand</i>
PEF	Périmètre d'exploitation forestière (forest harvesting area) <i>Côte d'Ivoire</i>	RIL	Reduced impact logging
PEF	Programa Estratégico Forestal (Strategic Forestry Plan) <i>Mexico</i>	SBB	Stichting voor Bosbeheer en Bostoezicht (Foundation for Forest Management and Forest Control) <i>Guyana</i>
PEFC	Program for the Endorsement of Forest Certification Schemes		

SEFONAC	Servicio Forestal Nacional (National Forest Service) <i>Honduras</i>	SPIAF	Service Permanent d'Inventaire et d'Aménagement Forestiers (Permanent Service for Inventories and Forest Management Planning) <i>DRC</i>
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales de México (Secretariat for Environment and Natural Resources) <i>Mexico</i>	STINASU	Foundation for Nature Conservation <i>Guyana</i>
SERNA	Secretaria de Recursos Naturales y Ambiente (Secretariat for Natural Resources and Environment) <i>Honduras</i>	TCO	Tierras Comunitarias de Origen (indigenous community lands) <i>Bolivia</i>
SFM	Sustainable forest management	TFF	Tropical Forest Foundation
SFP	State forest permit <i>Guyana</i>	TLA	Timber license agreement <i>Philippines</i>
SGS	Société Générale de Surveillance	TPI	Tebang Pilih Indonesia (Indonesian selective cutting)
SIFMA	Socialised industrial forest management agreement <i>Philippines</i>	TPSA	Timber production sharing agreement <i>Philippines</i>
SIFOR/BOL	Sistema Nacional de Información Forestal <i>Bolivia</i>	TPTI	Tebang Pilih Tanam Indonesia (Indonesian Selective Cutting and Planting System)
SINA	Sistema Nacional Ambiental (National Environmental System) <i>Colombia</i>	TPTJ	Tebang Pilih Tanam Jalur (Selective Cutting and Strip Planting System) <i>Indonesia</i>
SINANPE	Sistema Nacional de Areas Naturales Protegidas por el Estado (state system of natural protected areas) <i>Peru</i>	TSA	Timber sales agreement <i>Guyana</i>
SIRENARE	Sistema de Regulación de Recursos Naturales Renovables (Renewable Natural Resource Regulatory System) <i>Bolivia</i>	TSS	Tropical Shelterwood System <i>Nigeria</i>
SMS	Selective Management System <i>Malaysia</i>	TUC	Timber utilization contract <i>Ghana</i>
SNAP	Sistema Nacional de Áreas Protegidas (national system of protected areas) <i>Ecuador</i>	UNCED	United Nations Conference on Environment and Development
SNBG	Société National des Bois du Gabon	UNDP	United Nations Development Programme
SNR	Service National de Reboisement (National Reforestation Service) <i>DRC</i>	UNEP-WCMC	United Nations Environment Programme-World Conservation Monitoring Centre
SODEFOR	Société de Développement des Forêts (Society for Forest Development) <i>Côte d'Ivoire</i>	UNESCO	United Nations Educational, Scientific and Cultural Organization
SPACHEE	South Pacific Action Committee for Human Ecology and the Environment	VDF	Vanuatu Department of Forests
		VFC	Village forest committee <i>India</i>
		WCL	Wood cutting lease <i>Guyana</i>
		WCS	Wildlife Conservation Society
		WRI	World Resources Institute
		WWF	World Wide Fund for Nature



ANNEXES

ANNEX 1

UNEP-WCMC methodology for spatial analysis of forest representation within protected areas in ITTO countries

Analysis incorporated four data sources:

- 1) World Database on Protected Areas (WDPA,** Version 6.2, 2004, Maintained by UNEP-WCMC) that includes information on location and configuration of protected areas, classified accordingly IUCN management categories (see Box 6);
- 2) Global Forest Map (GFM)** developed by UNEP-WCMC in 2000, outlining areas (polygons) where tree cover is predominantly associated with one of 13 tropical forest types (other five temperate forest types identified within ITTO countries);
- 3) Global Vegetation Continuous Fields** from 500m MODIS data 2000–2001 Global Percent Tree Crown/Cover Vegetation Continuous Fields Version: 1.0 (**MODIS dataset**, University of Maryland: Hansen, M.; DeFries, R.; Townshend, J.R.; Carroll, M.; Dimiceli, C.; Sohlberg, R. 2003. 500m MODIS Vegetation Continuous Fields. College Park, Maryland: The Global Land Cover Facility); and
- 4) Digital Chart of the World (DCW,** Environmental Systems Research Institute, Redlands, US) layer for country boundaries delineation.

Analysis involved overlaying the MODIS dataset at its original high resolution (500 m) for identification of forest distribution in greater detail than the UNEP-WCMC Global Forest Map allowed, in order to compare it against the high resolution data (varying from 1:250,000 to 1:1,000,000 in different countries). Areas with tree cover density equal to or greater than 30% (threshold used for considering area as a forest in a process of GFM compilation) were aggregated into a single class – forest. Total extent of forest cover by country was calculated on the basis of overlay of this forest cover with the DCW country outlines, converted into a 500 m grid.

An intermediate dataset presenting forest cover was overlaid with the GFM in order to estimate extent of forest within areas depicted on the GFM. Forests appearing within particular GFM polygons were assigned to particular GFM forest types (Box 2). Due to the higher resolution of the MODIS dataset, considerable amounts of forest were found outside

the GFM forest polygons. These parts of the forest remained unclassified and formed an extra class (Type 20 in Box 2).

Nationally designated protected area (PA) data were split into separate layers, according to IUCN category (Box 6) and were overlaid separately for each category with the forest cover classified as above. To estimate the total extent of forest represented within protected areas, additional GIS operations were applied to eliminate overestimation, which is typical for 'simple total' summarizing operations and originates from the widespread overlaps in extent of protected areas designated for different purpose. Therefore, subtotals and totals for extent of forest within PAs in a statistical table are often lower than a simple sum of areas for different PA categories. This problem does not exist when summarizing country data because there are no overlaps between PAs designated by neighbouring countries.

There were no sources allowing evaluation of the management effectiveness of the PA network at national or regional levels. The most complete information relevant to management status is related to IUCN management categories. In general terms, protected areas in IUCN categories I, II, III and IV have higher protection status in comparison to V and VI categories, although across different countries details of protection regimes may vary considerably for particular PAs. An additional parameter – extent of PAs within IUCN management categories I to VI (spatial total) – has been calculated and presented in a statistic outputs.

Potential future research on the subject of forest protection effectiveness require systematic collection of the information about national legislation related to protected-area functions and specifics of forest protection/management on a case-by-case basis. Similarly, current satellite-derived data on tree cover might be used as a basis for ongoing monitoring of forest cover changes but still require additional country-based data to distinguish between various forest types. It is also very important to collect information on national definitions of forest, methods used for national statistic generation, and mapping approaches in order to directly compare national statistics with information available from uniform global data sources and tools.

ANNEX 2

Timber species and their common names by country

Africa

Scientific names	Common names
<i>Aningeria spp</i>	aniegré (CAR)
<i>Aningeria robusta</i>	asanfina (Ghana)
<i>Antiaris africana</i>	kyenkyen (Ghana); ako (Togo)
<i>Aucoumea klaineana</i>	okoumé (Congo, Gabon)
<i>Borassus aethiopum</i>	rônier (Congo, Gabon)
<i>Butyrospermum parkii</i>	sheabutter (Nigeria), karité (CAR)
<i>Canarium schweinfurthii</i>	aiélé (Côte d'Ivoire, Gabon)
<i>Ceiba pentandra</i>	fromager (Côte d'Ivoire, Ghana, Togo); ghe (Liberia)
<i>Chlorophora excelsa</i>	iroko (Cameroon, CAR, DRC, Congo, Nigeria, Togo); kambala (DRC)
<i>Chrysophyllum spp</i>	aniégré (Côte d'Ivoire); alcasa (Ghana)
<i>Entandrophragma angolense</i>	tiamia (DRC, Congo, Côte d'Ivoire); edinam (Ghana)
<i>Entandrophragma cylindricum</i>	sapelli (Cameroon, CAR, DRC, Congo); sapele (Ghana, Nigeria)
<i>Entandrophragma candollei</i>	kosipo (DRC, Côte d'Ivoire, Ghana, Liberia); omu (Nigeria)
<i>Entandrophragma utile</i>	sipo (Cameroon, CAR, DRC, Congo); lifaki (DRC)
<i>Gambeya africana</i>	longhi (DRC, Congo, Gabon)
<i>Gossweilerodendron balsamiferum</i>	tola (DRC); agba (Nigeria)
<i>Guarea cedrata</i>	bossé (DRC, Côte d'Ivoire, Liberia); guarea (Ghana)
<i>Hallea ciliata</i>	bahia (Gabon); abura (Liberia)
<i>Khaya grandifoliola</i>	acajou (Togo)
<i>Khaya ivorensis</i>	acajou (Côte d'Ivoire); mahogany (Ghana); Lagos mahogany (Nigeria)
<i>Lophira alata</i>	azobé (Cameroon, Côte d'Ivoire, Gabon); ekki (Liberia, Nigeria)
<i>Lovoa trichilioides</i>	dibetou (DRC, Côte d'Ivoire); cedar (Nigeria)
<i>Mansonia altissima</i>	beté (Côte d'Ivoire); bété (Cameroon); mansonia (Ghana); ofun (Nigeria)
<i>Milicia excelsa</i>	iroko (Côte d'Ivoire, Ghana)
<i>Millettia laurentii</i>	wengé (Congo, Gabon)
<i>Nauclea diderrichii</i>	bilina (DRC, Congo)
<i>Nesogordonia papyrifera</i>	kotibé (Côte d'Ivoire); danta (Ghana, Liberia); otutu (Nigeria)
<i>Pericopsis elata</i>	afrormosia (Cameroon, DRC, Congo)
<i>Pterocarpus soyauxii</i>	padouk (Gabon); red wood (Gabon)
<i>Pterygota macrocarpa</i>	koto (Côte d'Ivoire, Ghana)
<i>Pycnanthus angolensis</i>	ilomba (Cameroon, Congo); otie (Ghana)
<i>Pycnanthus kombo</i>	ilomba (Côte d'Ivoire)
<i>Tarrietia utilis</i>	niangon (Côte d'Ivoire, Ghana, Liberia)
<i>Tectona grandis</i>	teak (Côte d'Ivoire, Ghana, Nigeria, Togo)
<i>Terminalia ivorensis</i>	fraké (CAR) ; framiré (Côte d'Ivoire); edo (Nigeria)
<i>Terminalia superba</i>	fraké (Cameroon, Côte d'Ivoire); limba (CAR, DRC, Congo, Gabon); offam (Ghana); afara (Nigeria)
<i>Tieghemella heckelii</i>	makoré (Côte d'Ivoire); makore (Ghana)
<i>Triplochiton scleroxylon</i>	ayous (Cameroon, CAR, Congo, Gabon, Togo); samba (Côte d'Ivoire); wawa (Ghana); obeche (Nigeria)

Asia & the Pacific

Scientific names	Common names
<i>Agathis macrophylla</i>	kauri (Vanuatu)
<i>Agathis vitiensis</i>	kauri (Fiji); dakua makadre (Fiji)
<i>Anisoptera spp</i>	mersawa (Indonesia, Malaysia)
<i>Anisoptera glabra</i>	mersawa (Cambodia, Indonesia); phdiek (Cambodia)
<i>Calophyllum spp</i>	damanu (Fiji), bitanghol (Philippines)

<i>Gonystylus bancanus</i>	ramin (Indonesia, Malaysia)
<i>Hevea brasiliensis</i>	rubber (Indonesia, Myanmar, PNG, Thailand); Malaysian oak (Malaysia)
<i>Intsia bijuga</i>	vesi (Fiji); kwila (PNG); natora (Vanuatu)
<i>Palaquium spp</i>	sacau (Fiji); gutta percha (Malaysia)
<i>Pterocarpus indicus</i>	rosewood (PNG); narra (Philippines); bluwota (Vanuatu)
<i>Santalum spp</i>	sandalwood (PNG)
<i>Santalum album</i>	cendana (Indonesia); sandalwood (Vanuatu)
<i>Santalum austrocaledonicum</i>	sandalwood (Vanuatu)
<i>Santalum yasi</i>	sandalwood (Fiji)
<i>Tectona grandis</i>	teak (India, Indonesia, Malaysia, Myanmar, Philippines, Thailand)

Latin America & the Caribbean

Scientific names	Common names
<i>Alnus acuminata</i>	aliso (Bolivia, Colombia, Ecuador)
<i>Amburana cearensis</i>	ishipingo (Peru)
<i>Anacardium excelsum</i>	marañón (Ecuador); espavé (Panama); mijao (Venezuela)
<i>Bombacopsis quinata</i>	ceiba tolúa (Bolivia); cedro espino (Panama); saqui saqui (Venezuela)
<i>Brosimum alicastrum</i>	charo (Venezuela); ramon (Mexico)
<i>Brosimum utile</i>	amapa (Brazil); sande (Colombia, Ecuador)
<i>Bucida buceras</i>	pucte (Guatemala, Mexico)
<i>Calophyllum brasiliense</i>	santa maría (Guatemala, Honduras); leche de maria (Mexico); jacareuba (Brazil); maria (Panama)
<i>Carapa guianensis</i>	crabwood (Guyana, Suriname); andiroba (Colombia) ; crappo (Trinidad & Tobago); carapa (Venezuela)
<i>Catostemma commune</i>	baromalli (Guyana); baramán (Venezuela)
<i>Cedrela odorata</i>	cedar (Trinidad & Tobago); cedro amargo (Panama); cedro (Bolivia, Colombia, Ecuador, Guatemala, Peru, Venezuela); cedro rojo (Mexico)
<i>Cedrelinga catenaeformis</i>	chuncho (Ecuador); tornillo (Peru)
<i>Ceiba pentandra</i>	kapok (Ecuador); ceiba (Venezuela, Honduras)
<i>Cordia alliodora</i>	vara de humo (Colombia); laurel (Ecuador, Honduras, Panama); cypre (Trinidad & Tobago); pardillo (Venezuela)
<i>Dalbergia retusa</i>	guanciban (Mexico); cocobolo (Panama)
<i>Erisma uncinatum</i>	cedrinho (Brazil); moreillo (Venezuela)
<i>Goupia glabra</i>	kabukalli (Guyana); kopie (Suriname)
<i>Hymenaea courbaril</i>	jatobá (Brazil); locust (Guyana); algarrobo (Venezuela);
<i>Hura crepitans</i>	ochoó (Bolivia); catahua (Peru); jabillo (Venezuela)
<i>Lonchocarpus castilloi</i>	machiche (Mexico); manchiche (Guatemala)
<i>Manilkara bidentata</i>	balata (Guyana); purguo (Venezuela)
<i>Mora excelsa</i>	mora (Guyana, Venezuela)
<i>Peltogyne venosa</i>	purpleheart (Guyana); purperhart (Suriname)
<i>Pinus caribaea</i>	Caribbean pine (Trinidad & Tobago); pino costanero (Honduras); pino caribe (Panama, Venezuela)
<i>Prioria copaifera</i>	cativo (Panama, Colombia)
<i>Quercus spp</i>	roble (Colombia, Guatemala); oak (Panama)
<i>Simarouba amara</i>	marupá (Guyana, Peru); cedro blanco (Venezuela)
<i>Sterculia apetala</i>	sujo (Bolivia); camaruco (Venezuela)
<i>Swietenia macrophylla</i>	mahogany (Trinidad & Tobago); mara (Bolivia, Ecuador); mogno (Brazil); caoba (Guatemala, Mexico, Panama, Peru, Venezuela); kobchi (Mexico)
<i>Tabebuia rosea</i>	apamate (Trinidad & Tobago, Venezuela); oak (Panama); cedro rosado (Colombia)
<i>Tectona grandis</i>	teak, teca (Brazil, Colombia, Ecuador, Guatemala, Honduras, Mexico, Panama, Trinidad & Tobago); teca (Colombia, Ecuador, Guatemala, Honduras, Mexico, Panama)
<i>Terminalia amazonia</i>	amarillo (Panama); cumbillo (Honduras)
<i>Virola spp</i>	cumala (Peru); baboen (Suriname)
<i>Virola koschnyi</i>	palo de sangre (Honduras)
<i>Virola surinamensis</i>	virola (Brazil)

This report presents the most comprehensive analysis of natural forest management in the tropics ever produced. It discusses the nature and assesses the reliability of available data; determines, as far as these data allow, the extent of the permanent forest estate in each ITTO producer member country; examines, for each country, the policy and institutional settings for the adoption of sustainable forest management; estimates the area of forest that is actually managed sustainably for production and protection; and discusses how the situation has changed since an initial survey in 1988 and the significance of these changes for the future. The report finds that significant progress has been made towards the sustainable management of natural tropical forests, although the proportion of the total permanent forest estate under such management is still very low.

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