

7. Stakeholders in the Congo Basin Forest Sector¹

Introduction

Because of its diverse resources, the forest sector involves a wide variety of stakeholders at different levels and with interests that are often more divergent than convergent. The identification of these players is a prerequisite for the development of any sustainable management approach to the forests of Central Africa. This identification is important for communication, assuring the mutual recognition of the rights or duties of stakeholders and supporting their involvement in the management process, from decision-making and implementation to the monitoring and evaluation of impacts.

While information on the various players can be found in numerous documents relating to Central Africa and/or of broader interest (for example: Bahuchet *et al.* 2001; Borrini-Feyerabend *et al.*, 2000; Colfer *et al.*, 2000; Doumenge *et al.*, 1994; Forests Monitor, 2001), we owe the first general overview of actors concerned with the forests of Central Africa and West Africa to the FORAFRI project (Gami & Doumenge, 2001). The summary presented here is based on this work, augmented and reshaped for the purposes of this document on the forests of the Congo Basin. It is not exhaustive, nor is it the only one that could be produced. The criteria for the categorizations are clarified further on, but it should be emphasized from the start that this summary is not the result of in-depth research, but rather of practical reflections and a synthesis of the authors' knowledge.

This chapter provides an overview of the diverse players involved in the forest sector, their respective roles and their interests in the management of the forests of Central Africa. It should be elaborated in future evaluations of the regional institutional landscape, particularly in the next 'State of the Forest' report in 2007.

Methodology: categories adopted

In this chapter, we present the players with a direct role in or having significant impact on the management, exploitation and conservation of Central African forests. Other stakeholders may have a more indirect or less appreciable impact on forest management. In most cases, we have not taken these additional stakeholders into account.

However, in forest-dominated countries like Gabon or Equatorial Guinea, which stakeholders and what activities are not linked to the forest, or

do not have a direct or indirect impact on these resources? For example, a foreseeable fall in revenue from oil can lead to renewed interest in the forest. Off-shore oil activities can impact mangroves and the entire coastal area as a result of pollution by hydrocarbons. Although we are aware of these links, we merely mention their existence without going into the details of these other fields of activity.

The categorization adopted in this chapter is based on a multifaceted approach:

- 'Functionality' relates to the role of these players in the management process. Some make decisions; others implement them or provide financial support for the management and administration of forests (Figure 7.1).
- 'Institutionalization' refers to how players are structured in organized groups that are recognized, to a greater or lesser degree, as separate entities or interest groups (public bodies, private companies, NGOs or associations, etc.).

In the following exercise, we occasionally emphasize institutions or networks of interest at a regional scale, however, we have not been able to detail the institutional landscape of each country due to a lack of space.

Finally, the main purpose of this chapter is to paint a regional picture of institutions in the forest-environment sector. It is not an attempt to develop an in-depth analysis of the theoretical or actual roles of each group of stakeholders and possible deviation from these roles. Such an



Figure 7.1. The main groups of stakeholders in the forest sector in Central Africa.

¹ This chapter was written by N. Gami and Ch. Doumenge.

analysis has already been outlined in Gami & Doumenge (2001). Certain issues are addressed, but the development of such a comprehensive analysis would require more time and space than provided for in this report on the forests of the Congo Basin.

Political stakeholders

Political decision-makers are the principal players in the formulation and implementation of forest policies at the international, regional, national, provincial and local levels. They define the general framework within which the other stakeholders act and therefore have a substantial impact on all players. They in turn are influenced by the other players in proportion to their degree of organization and their lobbying capacity. Political stakeholders are also subject to the traditional relations that define the links between these 'elites' and their base, or their networks of contacts (client-centered relations).

Whether it is a question of country representatives in international organizations or regional and national political stakeholders (Prefects, Governors, Departmental or Provincial Councilors, Ministers, State Representatives in regional institutions, etc.), the main task of all these personalities is to define or support (as in the case of Prefects, Governors, etc.) the different forestry and environmental policies at their level of responsibility. However, most of them have little more than a basic knowledge of forestry or the environmental field. To be well informed, their decisions must be based on the opinions of competent technicians. It should be noted that the current criteria for appointing representatives of the different countries in regional bodies are not in any way based on objective criteria from a technical point of view (for example the lack of open invitations for applications for important posts, etc.).

Political stakeholders, including first and foremost the Heads of State of Central Africa, are increasingly aware of the key role they can play in the sustainable management of natural resources and the development of the human societies that they represent: *'The Heads of State proclaim: ...their commitment to the principle of biodiversity conservation and the sustainable management of the forest ecosystems of Central Africa...the right of their peoples to be able to count on the forest resources to support their endeavors for economic and social development'* (Yaoundé Declaration, 17 March 1999, at the First Summit of the Heads of State of Central Africa on the conservation and sustainable management

of tropical forests, included in the COMIFAC Treaty, 2005). For the societies of Central Africa, the role of these leaders and their voluntarism are, and will continue to be, fundamental for the effective implementation of sustainable management of forest resources. These fine words and noble intentions cannot be given tangible form without a firm and constant commitment by the political players, particularly the region's Heads of State (Doumenge & Ndinga, 2005).

Box 7.1. Central Africa Forest Commission (COMIFAC)

COMIFAC, initially the Conference of Ministers of Central Africa before becoming a subregional intergovernmental institution, now brings together ten Central African states. It was created in December 2000, following the 1999 Summit of the Heads of State on the forests of Central Africa held in Yaoundé (Cameroon) and the signing of the Yaoundé Declaration. COMIFAC, headed by the Council of Ministers, is the political and technical body for orientation, coordination and decision-making with respect to conservation and sustainable management of the forest ecosystems of Central Africa. It harmonizes and coordinates the forest and environment policies of its Member States.

Adopted by the Council of Ministers, the COMIFAC 'Plan de Convergence' defines the common intervention strategies of the States and partners in the development of Central Africa as related to conservation and sustainable management of forest ecosystems and savannahs. The strategic priorities are:

1. harmonization of forest and taxation policies
2. knowledge of the resource
3. management of ecosystems
4. conservation of biological diversity
5. sustainable exploitation of forest resources / combating poverty / socioeconomic development / monitoring / timber sector / subregional timber market
6. strengthening of capacities / participation of players / information / training / consciousness-raising
7. research-development
8. development of financing mechanisms
9. cooperation and partnerships

COMIFAC works in close cooperation with other regional and/or African institutions, including:

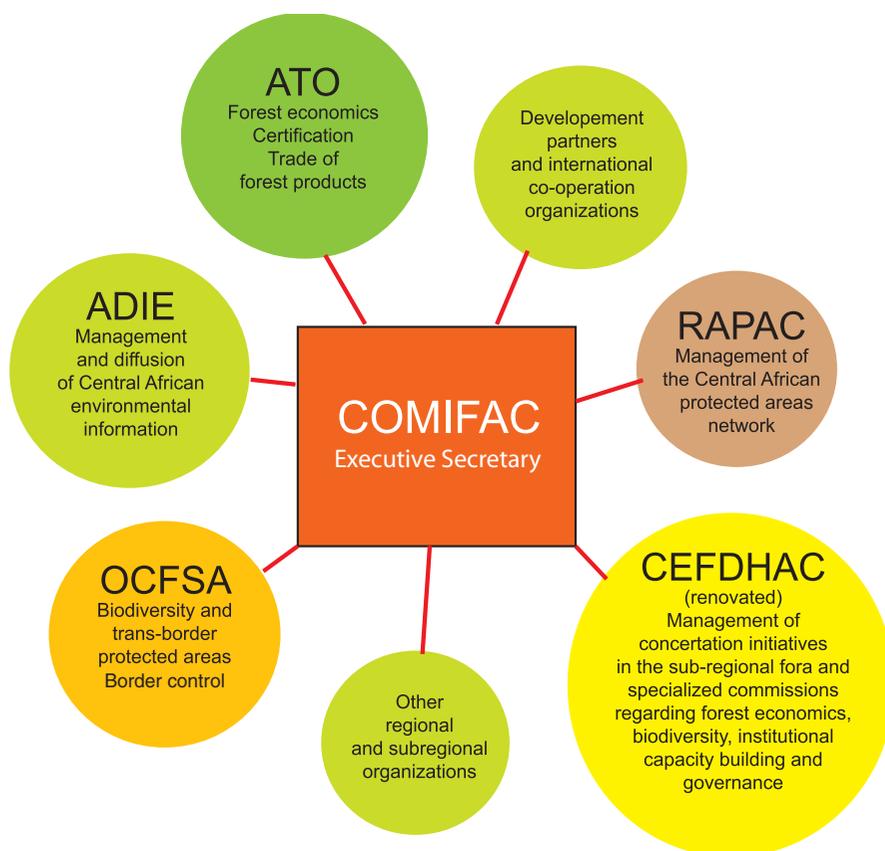
African Timber Organization (ATO), *Agence intergouvernementale pour le développement de l'information environnementale* (ADIE), *Organisation pour la conservation de la faune sauvage en Afrique* (OCFSA), *Réseau des aires protégées d'Afrique centrale* (RAPAC), *Conférence sur les écosystèmes de forêts denses et humides d'Afrique centrale* (CEFDHAC).

Apart from these regional institutions, COMIFAC also works with the different partners involved in the conservation and sustainable management of the forests of the Congo Basin.

To find out more: <http://www.comifac.org/accueilfr.htm>

Sources: Nagahuedi (2005), Hakizumwami & Ndikumagenge (2003) and COMIFAC (2006).

Figure 7.2. COMIFAC relational scheme.
 Source: COMIFAC (2006): Title IV,
 Article 31 of the Statutes.



Box 7.2. African Timber Organization (ATO)

Created in 1976, the ATO is an international cooperation and consultation body concerned with the forest economy and the trade in timber. Its objective is to encourage its member states to study and coordinate their activities in these fields in order to enable them to benefit more from their forest products.

The ATO is headquartered in Libreville (Gabon) and brings together 15 member countries producing African timber. In Central Africa, the member states are: Cameroon, CAR, the Republic of Congo, DRC, Gabon, Equatorial Guinea and Sao Tomé & Príncipe.

The ATO detailed its main objectives at its creation:

- ensuring a continuous exchange of information and mutual support among the member countries in regards to their policies on logging, conservation and exploitation of forest resources
- encouraging the formulation of national policies aimed at conservation and sustainable utilization of their forest ecosystems
- coordinating the industrialization policies of the member countries
- harmonizing their policies on reforestation, forest management and the environment

The organization's activities mainly revolve around the industrial timber exploitation sector. For several years, the ATO has been addressing questions such as the definition and promotion of principles, criteria and indicators of sustainable forest management.

Source: Christy et al. (2003) and Hakizumwami & Ndikumagenge (2003).

The Summit of Heads of State on the forests of the Congo Basin held in Brazzaville in February 2005, in conjunction with the Treaty deriving from it, represents some of the strongest commitments at the highest level to the sustainable management of forests in Central Africa.

This commitment was reflected in the creation of COMIFAC (Box 7.1 and Figure 7.2). The Commission strengthens the existing regional bodies such as the ATO (Box 7.2), an institution dealing with trade, processing and industrial exploitation of timber, which for several years has taken an interest in questions beyond simple logging, including both forest management and certification. Among the other regional initiatives and institutions, CEFDHAC (Box 7.3), the conference of ministers and multi-stakeholder forum, has made it possible to decompartmentalize the debates on the forests and the environment among public stakeholders, NGOs and the private sector. The existence of this forum has instigated reactions from various stakeholders, both in the sense of better collaboration and in resistance to change. The Summit of Heads of State of Central Africa (which took place in Yaoundé, Cameroon, in 1999) and COMIFAC came into being following the waves caused by CEFDHAC. The latter also supported the creation of a net-

work of parliamentarians on the sustainable management of forest ecosystems in Central Africa. This single network is aimed at encouraging and structuring the involvement of parliamentarians in regional and national debates on the forests (REPAR-CEFDHAC).

Stakeholders in forest management

Players in this category have in common an active participation and even a direct interest in the management of forest resources. Some live in, and depend on, the forest at a local level (rural populations). Others depend on the forest, but are impacted also by external concerns (industrial loggers). Still others do not depend directly on the forest, but are responsible for their management (administrations).

Water, forest and environment administrations

The water, forest and environment administrations do not obtain their revenue directly from the forest, at least in theory, but they do guarantee it is well managed. They must supervise and penalize any failure to comply with the established rules (loggers, farmers, hunters, etc.). These administrations are responsible for implementing, through technical directives, the forest policies decided on by the governments. They have traditionally had a fundamental role in the management of forests and the environment because in all the countries of Central Africa the forests belong to the State, which manages them through its institutions. They are represented from the central level (central administration) to the local level (operational services on the ground). Every country has its own institutional arrangements, either grouping closely related sectors within the same Ministry or spreading them out in several independent entities (for example, the services in charge of the forests and the environment are currently dissociated in Cameroon whereas they form part of the same Ministry in Gabon). It should be emphasized that corruption of the agents in these services by certain loggers who do not comply with the country's laws is a deplorable practice.

In the case of timber exploitation, management is delegated to the private sector (see further on). Application of laws and policies remains the responsibility of the administration, for example through the supervision of management plans and creation of logging arrangements. The lack of financial and human resources, as well as the

Box 7.3. CEFDHAC and REPAR

The Conference on the Ecosystems of Dense Tropical Rainforests of Central Africa is a sub regional organization bringing together States, national and sub regional non-governmental organizations, the private sector and other parties involved in management of the forests of Central Africa. It is the only forum where all the players in the forest-environment sector can get together, exchange points of view and develop a common vision and partnerships. CEFDHAC gives concrete expression to the desire of the parties involved to achieve a common vision of conservation and utilization of the forests in the region. Its goal is to encourage these players to conserve their forest ecosystems and ensure sustainable and equitable utilization of the resources that they contain.

It sees itself as a forum with multiple roles:

- a forum for guidance through the linking-up of all the groups of players involved in the region
- a forum where all ideas and reflections lead to decisions by the authorities involved in environmental and forest matters in Central Africa
- a forum for consultation and exchanges of experiences open to all those involved in the forest sector with a view to equitable and sustainable management of forest ecosystems in Central Africa

CEFDHAC has initiated and supports various networks, such as the Network of Parliamentarians for the sustainable management of Forest Ecosystems in Central Africa (REPAR), created in Libreville in 2002. The objectives of this network are to enable parliamentarians in the region to share their respective national legislative experiences in the management of forest ecosystems, to deliberate on common themes, to encourage consideration for the interests of local communities in the preparation of legislative texts relating to the environment, to contribute through concerted legislative action to the safeguarding and sustainable management of the forest ecosystems of Central Africa and to make the CEFDHAC Member States aware of the need to apply international conventions on the environment. REPAR plans in November 2006 to convene in Yaoundé (Cameroon) the second international conference on the involvement of parliamentarians in sustainable management of the forest ecosystems of Central Africa.

To find out more: <http://iucn.org/places/brac/programme/cefdhac/cefdhac.htm#brazzaville>

Sources: UICN-BRAC (2006) and CEFDHAC (2006).

influences of trends in international thinking (privatization, decentralization, equitable revenue-sharing, etc.) and national approaches, can cause administrations to move away from the mentality of a 'forest State', and instead of managing the forest territory as a whole, administrations become then more concerned with the definition of rules and standards, supervision, penalties, and even technical support in specific circumstances (Karsenty, 2005). While there are now provisions for the delegation of management to rural communities – such as in Cameroon, Gabon and the Republic of Congo – community forests are often slow to establish or may encounter numerous dif-

Box 7.4. RAPAC (*Réseau des aires protégées d'Afrique centrale*)

Created in May 2000 in Yaoundé, within the context of the institutionalization of the ECOFAC program, RAPAC is a regional association that brings together the agencies in charge of protected area management in seven Central African countries. Each member of RAPAC is appointed by his corresponding Ministry. RAPAC is a technical body that specializes in the management of protected areas. Its main objective is to promote conservation and the rational management of the natural resources of Central Africa, particularly through the management of protected areas in its member countries. Seven countries are currently associated with RAPAC: Cameroon, CAR, the Republic of Congo, Gabon, Equatorial Guinea, São Tomé & Príncipe and Chad.

At present there are eight protected areas affected by RAPAC:

- Dja Faunal Reserve (Cameroon)
- Odzala National Park (Republic of Congo)
- Lopé Faunal Reserve (Gabon)
- Monte Alén National Park (Equatorial Guinea)
- Ngotto Forest (CAR), the future National Park of Mbaéré-Bodingué
- the protected area covered by the 'village hunting areas' development project (CAR)
- Obo Nature Park (São Tomé & Príncipe)
- Zakouma National Park (Chad)

Any administration in charge of protected areas in the region and any protected area itself may join RAPAC. Research and/or training institutions, environmental NGOs and private operators concerned with the management of natural resources can also become RAPAC members.

By gathering effectively managed protected areas into a network, RAPAC hopes to enhance the results achieved, create synergies and promote the efficient allocation of funding earmarked for the management of protected areas. Their objective is to make RAPAC a technical tool that uses an overview of initiatives pertaining to the management of protected areas in Central Africa to help develop a regional strategy.

To find out more: <http://www.rapac.org/Presentation.htm>

Source: RAPAC (2006).

faculties in becoming established.

In the case of protected areas, management often remains in the hands of State agencies; it is rarely delegated, except to sport-hunting companies. In truth, even if joint management or the transfer of management becomes an unavoidable political objective, making it a reality remains far behind the declared intentions. In an institutional landscape marked by a diverse set of stakeholders, numerous standards, official or unofficial, and multiple layers of management, the agents responsible for protected areas, often supported by international NGOs, adopt various attitudes and strategies more or less beneficial for the management of protected areas. These attitudes include: a

determination to apply the official standards at the risk of conflict with the other parties concerned; the use of standards to defend particular interests; or the use of the official standards and the agent's position to build social capital to the benefit of his own professional goals (Nguingui, 2004). At the regional level, a recently formed body bringing together representatives of the administrations of several countries, RAPAC, has as its objective to promote the development and good management of protected areas in the region (Box 7.4).

Public or parapublic organizations

In some countries, management of protected areas is entrusted to a public organization with management independence. Such is the case in the DRC, with the ICCN (*Institut congolais pour la conservation de la nature*) and in Equatorial Guinea, with the INAP (*Institut national des aires protégées*). In Gabon, the CNPN (*Conseil national des parcs nationaux*) is a special structure, a coordinating agency that is directly attached to the Presidency and includes all the Ministers immediately or more indirectly concerned with management of national parks. This agency guides policies and strategies, but does not have the means to handle the management of the parks. However, a bill is currently being prepared for the creation of a 'national parks agency'.

In Cameroon, all aspects relating to forest management and silviculture are dealt with by ANAFOR (Agence nationale de développement des forêts), formerly ONADEF (*Office national de développement des forêts*). Among other public or parapublic organizations are the national mapping institutes, SNBG (*Société nationale des bois du Gabon*) which has exclusive rights to market okoume and ozigo, and forest plantations or agro-industrial companies that may have a major impact on forests. In Gabon and Cameroon, some of these bodies have been privatized (Hévégab-Gabon, Hévécam-Cameroon, for example).

Private industrialists

Industrial loggers are also included in this group of 'managers', because of both their primary role logging industrial timber and the increasingly important role they must play in ensuring the survival of the forest ecosystems (Cassagne *et al.*, 2004). The logging sector is one of the motors of the national economies of the countries of Central Africa. The last fifteen years have seen great changes in this sector, with logging activities spreading to even the most remote forests,

the switch of the majority of timber sales from Europe to Asia and the growing numbers of Asian companies moving into the region.

As in many cases (NGOs, rural populations, etc.), this category comprises a wide variety of operators, including companies harvesting timber in the forest, operators involved in its processing and dealers solely concerned with international trade. There are also small domestic companies and firms belonging to large international groups active in other socioeconomic sectors that each have their own objectives and practices more or less in keeping with the principles of sustainable exploitation of forest resources (Bikié *et al.*, 2000; Colomb *et al.*, 2000; Forests Monitor, 2001; Gami & Doumenge, 2001; Christy *et al.*, 2003; Ruiz Perez *et al.*, 2005). Finally, a whole section of forest exploitation is carried out, to various degrees of legality, by small operators working on a non-industrial scale. This is the case in Cameroon with the development of the rattan cane sector or the market for the *Gnetum africanum* plant (sold in neighboring Nigeria). These activities develop in the informal economy without any legal exploitation standards to ensure sustainable management of the resource.

Some of these stakeholders are grouped together in national associations: APMEC (*Associação dos pequenos e médios empresários de Cabinda*, Angola), GFBC (*Groupement de la filière bois au Cameroon*), AEFNA (*Association des exploitants forestiers nationaux du Cameroon*), UNICONGO (Congo), SYNFOGA (*Syndicat des producteurs et industriels du bois du Gabon*), and FEC (*Fédération des entreprises du Congo*, DRC). By joining together, players provide States with valid interlocutors and can also more easily participate in discussions on important aspects related to the management of harvested forests.

In terms of surface area, the major portion of forest concessions and permits are in the hands of large industrial groups of European origin (Danzer, Rougier, Timber, Thanry, Wijma, etc.) or, more recently, Asian origin (Man Fai Tai, Rimbunan Hijau, Taman Industries, etc.). To get established the latter have either created new companies or taken over old companies with European capital (for example Vicwood, a company dominated by Hong Kong Chinese interests bought out the Cameroonian subsidiaries of Thanry, a company with French capital; Forests Monitor, 2001). These large Asian groups, operating in the form of a network, moved into Central Africa in large numbers in the space of just a few years. Whatever the cultural origin of the networks (Asian, Lebanese or Italian), the

performances achieved appear to be the result of speed, mobility of capital, a very flexible structure of non-contractual groups or associations of companies, a vision of logging on a world scale and incorporation in large financial networks extending beyond the forestry sector (Roda & Mabiala, 2005).

Some of these large groups exist through subsidiaries in various countries. They operate at the local level (logging sites), where they are often the only rural development player or are regarded as such by the rural populations, and are formally represented in the capital of the country (since the subsidiaries do not always bear the name of the parent structure). For instance, Thanry has a subsidiary in Gabon - CEB (*Compagnie équatoriale des bois*), simultaneously timber is represented by CIB (*Congolaise industrielle des bois*) in northern Republic of Congo, etc. As the forestry sector is generally one of the largest employers in countries of the region and as a source of significant foreign exchange, all these big groups have considerable socioeconomic weight. They also have national and even international political connections.

Some of these companies are active in international forest forums, particularly through the IFIA, an association bringing together the biggest European forestry companies (Box 7.5). Some of these companies have adopted a code of professional ethics for sustainable management of forest concessions that was developed by the IFIA with the support of CEFDHAC. They are also involved in setting up management plans and more sustainable harvesting plans (as is the case of CEB, Leroy-Gabon or Rougier in Gabon, CIB in northern Republic of Congo, etc.). Other companies have gone further by joining in the forest certification process, but it should be noted that generally the world of industrial logging in Central Africa still lacks transparency and suffers from numerous privileges favoring illegal or 'mining-type' logging.

Private artisans

Within the organized private sectors, we have identified three types of stakeholders who have an important role: backers/sponsors (usually from the urban elite), middlemen and transport operators, and producers. In actual fact, the term 'producers' covers a wide diversity of players: chainsaw owners and other individual timber producers; charcoal makers; hunters (either locals or outsiders); farmers and gatherers of non-timber forest products (NTFP), including plants and animals for medical-magic purposes, etc.

Box 7.5. Interafrican Forest Industries Association (IFIA)

Founded in 1996, IFIA brings together, through various associations, approximately 300 forestry companies operating in Africa. In the Congo Basin, its members are present in Cabinda (Angola; APMEC), Cameroon (GFBC and AEFNA), CAR, the Republic of Congo (UNICONGO), Gabon (SYNFOGA) and DRC (FEC). IFIA is made up of forestry companies belonging to big international groups such as Danzer (IFO in the Republic of Congo; SIFORCO in DRC), Sonae through Isoroy/Plysol (Leroy Gabon), Rougier (SFID in Cameroon, Mokabi in the Republic of Congo and Rougier in Gabon), Thanry International (CEB in Gabon), tt Timber (CIB in the Republic of Congo; GIB in Gabon), Wijma (Wijma Douala in Cameroon), etc., as well as medium-sized companies operating within a single country (Likouala Timber in the Republic of Congo, Panagiotis Marelis in Cameroon, SBL in Gabon, SODEFOR in DRC, etc.).

IFIA's has numerous objectives:

- to make an active contribution to the economic and social development of the host countries by exploiting the forest resource in a sustainable manner
- to support a communication and information network linked to the interests of its members and other professionals
- to represent the industry's interests at the international level
- to promote sustainable exploitation of the forests
- to promote better governance and professional ethics among administrative, industrial and commercial partners
- to be active in the economic and social sectors of countries where its members are established through, for example, the promotion of local industrialization, job creation, staff training, the development of social infrastructures, etc.

To find out more: about IFIA (<http://www.ifiasite.com/index.php?rub=Présentation&langue=fr>), the Danzer Group (<http://www.danzer.de/fr/02/02.html>), the Sonae groups (<http://www.sonae-industria-tafisa.com/fra/index.htm>), Isoroy (<http://www.isoroy.fr/pages/index.htm>) and Plysol (<http://www.plysol.fr/>), the Rougier Group (<http://www.rougier.fr/>), the tt Timber Group (http://www.tt-timber.com/servlet/control/wtk_page/PublicSite@fr/wtk_invoker/PublicSiteMenu/menuid/21105/) and Wijma (<http://www.wijma.com/english/home/index.asp>).

Source: IFIA (2006).

Consulting firms

We will deal more specifically with consulting firms in the section on consultants, even though some of them can be directly involved in management operations at times, more or less replacing state operators if the latter relinquish the task. Such was the case, for example, with the implementation, by Agreco, of the ECOFAC program (Conservation and Rational Utilization of the Forest Ecosystems of Central Africa) in support of protected areas in the region. In another area, the company SGS (*Société générale de surveillance*, of which SGS-Forestry forms a part) is standing in for Cameroonian or Congolese administrations to monitor the timber trade.

Trade unions

Workers are generally affiliated with recognized trade unions in their own countries. Some trade unions such as SYNFOGA in Gabon have already been mentioned above, in the section on the private forest sector. In the DRC, the FEC brings together various socioeconomic sectors, with forestry and timber professionals representing only a part.

Non-governmental organizations (NGOs)

NGOs also fall more specifically within the group of support-advice players. However, some of them, national or international NGOs with field projects, can be directly involved in management actions (for example WWF - Worldwide Fund for Nature or WCS - the Wildlife Conservation Society). NGOs may serve to make up for certain deficiencies in State services. Some national organizations directly involved in conservation and sustainable local exploitation of forests have gathered together within a network going beyond the confines of the Congo Basin, the RAAF (*Réseau africain d'action forestière*; CEFDHAC, 2006). At present, NGOs like WCS are intervening effectively in Gabon, the Republic of Congo and DRC in the management of protected areas and the development of ecotourism. With their external financing, these NGOs play a part in strengthening local skills by training young cadres in the conservation of natural resources.

Local Populations

In this category we place a particular emphasis on forest populations, be they Bantus or Pygmies. These rural populations live in the forests and are entirely, or at least largely, dependent on forest resources for their survival. This is not the case with the administrations, a number of private forestry operators or politico-administrative officials holding forest permits as insurance for their retirement or the loss of their job. Harvesting forest products or clearing the forest for agriculture provide forest populations with an income enabling them to meet their daily needs (food, health, education, habitat, rituals, etc.).

Among the Bantus, special mention must be made of the phenomenon of 'elites', because even though they may live a long way from the forests they retain considerable power over local decisions about the forests. The elite may be a son of the village who has become a member of parliament, Minister or major State administrator at

the national level. At the local (village) level, the elite may be the village schoolteacher, nurse, etc. The village or provincial elites act as links between the population and the 'grande élite' living in the city. Generally, no important decision involving the village may be taken without the opinion of the elites living in the city.

The rural populations are considered here from the angle of local users of natural resources: village communities using their land for subsistence or commercial purposes and outsiders. The latter subset is involved in profit-making exploitation with a structured organization in networks: bushmeat in all countries; rattan in Cameroon and Gabon; *Gnetum* or Koko in CAR, etc. These are examples of the city-forest interface.

Although still in its early stages, forest management is now moving towards greater involvement of the local populations (management in partnership). This involvement usually takes place in one of two ways: the initiative can come from the population or the administration. In this context, the role of the elites must not be forgotten or minimized. The Lossi Gorilla Sanctuary in the Republic of Congo is one such an example, while additional examples exist in Cameroon.

The processes of management relocation, or management in partnership, encourage populations to structure themselves into organized groups which can be made officially responsible for the management of resources. These groups can contribute towards the regulation of land use for subsistence and commercial exploitation purposes and the establishment of controls on outside populations involved in commercial exploitation (hunting, gathering, agriculture). However, kinship relations (clan, lineage) and marriage alliances can make collective decisions approved by the administration difficult to apply because of the cultural obligations of acceptance and sharing that come with these alliances.

The creation of community or communal forests, as provided for in Cameroon, is inevitably complicated by this phenomenon. This is even more true when the associative culture to which governmental processes turn (sometimes through NGOs), to enable the appointment of representatives of the community and limit membership of this community to people physically present on the territory in question at a given moment, do not form part of the traditional culture of forest peoples. Setting controls on the use of resources in a given territory must therefore involve the identification of, and organizational support to, interest groups (hunters, gatherers, gold-panners, farmers, etc.).

Other examples of attempts to give official status to the collective regulation of land management come from the Congo and are within the context creating and managing protected areas. The *Association des enfants des terres de Lossi* (AETL), for example, was at the center of the creation of the first community-initiated protected area on the basis of customary law - the Lossi Gorilla Sanctuary. These examples remain tenuous because local players remain susceptible to the influence of elites, politicians and/or private operators.

Interesting case studies involving the inclusion of indigenous communities in the management of natural resources and the defense of their rights come from southwest Cameroon. In Cameroon, local NGOs CED (*Centre pour l'environnement et le développement*) and PS (Planet Survey), backed by an international NGO FPP (Forest People Project), were able to help Bagyeli Pygmies obtain citizenship, land and participation in meetings of the multi-partner platform set up for their promotion. Over the last few years, some minority groups, traditionally with little presence in regional debates, have set up regional networks enabling them to prepare common positions, make their voices heard and act in a more coordinated manner: the *Réseau des femmes africaines pour le développement durable* (REFADD) (Box 7.6) and the *Réseau des populations autochtones et locales pour la gestion durable des écosystèmes forestiers d'Afrique centrale* (REPALEAC), set up within the framework of CEFDHAC.

Consultancies

Consultants have important technical, scientific and practical knowledge on conservation and the sustainable exploitation of forests within a changing world context. They play a key role in the definition of laws and regulations, in support of the political stakeholders, and in the implementation of these texts, in support of managers. Dialogue and the construction of common frameworks should drive the support provided by these actors.

Public organizations

Some international organizations, particularly within the United Nations system, play an important role in international debates on forests and are also involved at the national level in defining forest policies and strategies. Examples are the FAO (Forestry Department of the United Nations Food and Agriculture Organization)

and the UNDP (United Nations Development Programme), along with the WCMC (World Conservation Monitoring Center).

The world secretariats and national representatives of some international conventions also play a 'watchdog' role, but may also play a role in providing technical and financial support for the fulfillment of the commitments entered into by the various States. Apart from the Convention

on Biological Diversity (CBD), the Convention on Climate Change, the Convention to Combat Desertification and the International Convention on Trade in Endangered Species (CITES), this is particularly true in the cases of the Ramsar Convention and the World Heritage Convention. The secretariats of the latter two Conventions are housed in the IUCN and UNESCO (United Nations Organization for Education, Science and Culture); the IUCN provides scientific and technical support to both of them. CITES is advised by the IUCN and all the associated specialist groups (African elephant, primates, etc.) and is widely supported by an international trade monitoring network (Traffic) that was created on the initiative of IUCN and WWF (Worldwide Fund for Nature).

At the national level, the technical departments of the Ministries responsible for applying the legal texts and managing forests also play an assistance/advisory role among political stakeholders in the preparation of these same texts. With some recent developments, particularly those associated with making local communities responsible for forest management, these departments tend to move away from a managerial role towards one of technical assistance/advice, monitoring and evaluation and disciplinary measures.

The semi-public organizations include, for example GTZ (*Deutsche Gesellschaft für Technische Zusammenarbeit*), a company created by the German government to help apply the country's cooperation policy. As such, GTZ is more of a support organization than a funding agency.

Private companies and consulting firms

The main role of these groups is to support local stakeholders and train them in the sustainable management of resources. Unfortunately, they often carry out the work for which they are contracted themselves without providing sufficient training for the development of local skills and transferring their activities to nationals. This is a problem that must be resolved if Central Africans are to assume for themselves the sustainable management of their countries' resources.

These players generally have international headquarters well away from the region (Europe and Canada, in particular), but occasionally set up regional representations or subsidiaries. This is the case with ONF International (*Office national des forêts*), which teamed with Luso Consult (Sylvafrica, with headquarters in Libreville, Gabon) to create a subsidiary in central Africa aimed at logging companies and the implemen-

Box 7.6. REFADD (*Réseau des femmes africaines pour le développement durable*)

Created in June 1998 in Bata, Equatorial Guinea, on the occasion of the second CEFDHAC, REFADD is a network of primarily women's NGOs working in the field of sustainable management of natural resources. The REFADD member countries are: Burundi, Cameroon, CAR, the Republic of Congo, Gabon, Equatorial Guinea, DRC and Rwanda.

REFADD has set itself the task of 'promoting the effective participation of African women in sustainable development through their involvement in programs for the sustainable management of natural resources and biodiversity conservation in Central Africa'.

REFADD has outlined the specific objectives of the network:

- to identify strategies that favor the participation of NGOs (mostly women's) in the formulation, implementation and monitoring of national and regional sustainable development programs
- to make humanity aware of the determinant role that women can play in the sustainable management of natural resources
- to promote the strengthening of the capacities of NGOs through training and information with a view to the participation of local populations in general, and women in particular, in the decision-making process on questions connected with sustainable development
- to improve communications, dialogue and synergies among NGOs and the players involved in the sustainable management of natural resources in Central Africa
- to reconcile conservation needs with development through the promotion of alternative activities and the strengthening of the capacities of the members (financial, technical and institutional support)
- to develop strategies to seek sustainable financing
- to share the lessons learned at national, sub regional, regional and international levels

Representatives of the network regularly participate in regional and international processes related to the environment and forests. The network has set up various micro-projects to combat poverty and to promote biodiversity conservation: optimum use of non-timber forest products (Cameroon), mushroom growing (Burundi), breeding of greater cane rats (Cameroon), conservation of the Mukura forest reserve (Rwanda), obtaining micro-credits for women (Republic of Congo), training of peasants in agroforestry (Bas-Congo, DRC), fauna management and action to combat illegal logging in forest concessions (various countries).

Sources: REFADD (2006) and CEFDHAC (2006).

tation of their management plans. For similar purposes, we also find consulting firms working essentially from their base (FRM – Forêts, Ressources, Management in France, for example) or, on the contrary, installed in the region (Terea, in Gabon, for instance).

In the environment sector, consulting firms sometimes form partnerships with other institutions, notably semi-public organizations or NGOs. These temporary associations or partnerships are common within the implementation framework of large scale, integrated projects that require diverse expertise and significant financial resources.

Non-governmental organizations

There are several international NGOs working in Central Africa. They have their headquarters in the major industrialized countries of Europe or America. Even though the link between conservation and local development is increasingly integrated in the policies and projects of these organizations, the entry point for their actions is either biodiversity conservation (CI, IUCN, WCS, WRI, WWF, etc.) or the protection and promotion of the development of forest populations (RAN – Rainforest Action Network, Survival International, FPP - Forest People Program, etc.).

Development or humanitarian NGOs have also been working for many years in Central Africa, where they support the populations, small NGOs and local associations. Some of the numerous NGOs present or active in the region that are more or less directly concerned with forest and the environment include: *Association française des volontaires du progrès* (AFVP), *Amis de la terre*, CARE-Congo in DRC, SNV (*Stichting Nederlandse Vrijwilligers*), etc.

The extreme variability of these organizations, in institutional terms (organizations of volunteers, professional NGOs, denominational associations, etc.), in terms of objectives (humanitarian, support for local development, support for the development of human skills, etc.) and in terms of activities merits a more detailed analysis than is possible to conduct within this report (Redford *et al.*, 2003; Olivier, 2004). Some of the big international NGOs have regional or national representations (IUCN-BRAC, WCS, WWF-CARPO, etc.), while others only assign personnel to field projects or work in the form of field missions.

To complicate this landscape even further, some NGOs are not individual entities but rather loose collections whose various parts can

act in the region either in a coordinated manner or otherwise. Such is the case for the ‘nebulous’ World Wide Fund for Nature, with WWF-US, WWF-Belgique, WWF-Netherlands and WWF-International, all working directly or supporting projects in the region. The IUCN is also a unique case because it is both a non-governmental organization and a governmental organization, which has some of the States in the region as members. It is also the reference international organization for everything concerning protected areas and endangered species. Its activities are coordinated in Central Africa by the *Bureau régional de l’Afrique centrale* (BRAC), based in Yaoundé.

These large organizations are present from the level of world or regional political debates right through to the management of conservation-development projects in the field (WWF Minkébé project in Gabon; WWF Campo Ma’an project in Cameroon, for example).

At times, some of these NGOs may team up for varying periods of time in order to implement common projects, sometimes in a partnership with other institutional players. Such is the case with WWF and the IUCN, which have collaborated to set up the Traffic network in support of CITES and the monitoring of international trade in biodiversity, including that of timber. Likewise, several large NGOs (AWF, CARE, CI, WCS, WRI, WWF, etc.) have joined forces with American federal agencies (USFWS, USDA-FS, etc.) for implementation of the CARPE program; CARPE is the financing channel for the US government under the CBFP.

Another rather hybrid actor that should be mentioned is the International Technical Timber Association (ATIBT), which is concerned with the development and sustainability of the tropical timber sector. It supports the private logging sector and plays a role in offering advice or transferring information to private players. ATIBT brings together stakeholders from various international organizations, research institutions, training institutions and the private sector.

While national development NGOs have been present in some countries for several decades (Cameroon and DRC in particular), national environmental NGOs have only developed since the Rio Conference in 1992. Without going into all these NGOs in detail, it should be noted that most of them do not really operate as NGOs because they do not have the necessary financial means (subscriptions too low or not collected). However, in recent years some national or local NGOs have established growing reputations for their commitment and conscientiousness. In some countries

they are becoming credible and active partners, either in political debates or in the field.

Most of the national or local NGOs that are genuinely committed to conservation and sustainable development are supported by international NGOs or regional projects. In such cases, they are required to apply the policies of these large NGOs that provide the funds. They are often NGOs concerned with environmental education and public awareness (*Les Amis du Pangolin in Gabon; l'Alliance nationale pour la nature* (ANN) in the Republic of Congo; Planet Survey and the CED in Cameroon), but may also be involved in ecotourism and monitoring turtles (ASF – *Aventure sans frontières*, in Gabon). These NGOs sometimes carry out activities in the field, but can also play a technical assistance/advisory role. Some local NGOs have made it their specialty to support self-help organizations at the grassroots level (PIL – *Promotion des initiatives locales*, Kivu, DRC; Planet Survey – Project Promo Bagveli within the Department of the Ocean in southeast Cameroon) or to promote the transfer of information and education (BEST – *Bureau d'études scientifiques et techniques*, Kivu, DRC).

Networks

We have already presented a few networks: REPAR, RAPAC and REFADD, but it is worthwhile returning to this concept, given the strong interest in this flexible institutional form which enables the stakeholders in each country to be brought together and regional synergies to be developed among the groups of stakeholders concerned (CEFDHAC, 2006).

Apart from the networks that have already been mentioned, it is worth mentioning the Tropical Trees Network (supported by the Silva association), which has set up national groups in various countries in the region. Its objective is the exchange and dissemination of practical information on the use and management of natural resources in dry and humid tropical areas, mainly in Africa. The collaborative management network, created by an IUCN-GTZ project, aims to link up people working on projects implementing collaborative management initiatives in protected areas in Central Africa. This network has led to the establishment of an additional platform by linking up the teachers in forestry schools in the region.

Research Institutions

Research institutions are financially dependent on a main funding agency, public body, NGO or private entity. This dependence weighs heavily on the type of research carried out and also on the efficiency of the institutions. The public institutions of Central Africa are generally inefficient, although this is less true in Cameroon than in the other countries. They often lack financial and human resources and are largely dependent on external financing and cooperation. To help resolve this problem, the FORINFO project, financed by France, aims to obtain financing for research and training scholarships and supports the research networks in the region.

A summary of the main national public research institutions is given in Table 7.1. The research carried out at these centers and/or institutes is basic or applied research, although primarily the latter. In addition to these institutions, some Ministries also have their own research units, as is the case with the CNRF (*Centre national de la recherche forestière*) in the Republic of Congo. Some institutions have research stations in the field (Ipassa-Makokou, an IRET station in Gabon (Figure 7.3); Lwiro and Irangi, CRSN stations in Kivu, DRC) or manage permanent experimentation sites (Mbaïki, Boukouko, La Lolé in CAR, Oyan in Gabon, Ngoua 2 in the Republic of Congo, etc.).

At the international level, the specialist research center run by CGIAR (Consultative Group on International Agricultural Research), CIFOR (Center for International Forestry Research), is active in the Basin with a regional office in Yaoundé, Cameroon. This body carries out forest research within a multidisciplinary framework and in partnership with local institutions. The other CGIAR centers that should be mentioned here are: the World Agroforestry Center (ICRAF), the International Plant Genetic Resources Institute (IPGRI) and the International Institute of Tropical Agriculture (IITA).

Apart from these international centers, additional public research centers and institutes have a mission to work in and collaborate with tropical countries. Such is the case with CIRAD (*Centre international de recherche agronomique pour le développement*), IRD (*Institut de recherche pour le développement*), MNHN (*Muséum national d'histoire naturelle*) in France, Kew Gardens (Great Britain) and centers in Belgium and Missouri (United States), etc. Certain Western universities also work in collaboration with the countries of the region (University of Montpellier

or Bordeaux in France, for example). Some of these institutions have regional or national representations (CIRAD, IRD, etc.), while others collaborate with the national institutions via research field trips of different durations, joint supervision of thesis writers, etc.

Various networks of researchers and research institutions have been set up in recent years: CORAF-forest, FORNESSA (Network for forest research in Sub-Saharan Africa) and AFORNET, for example. The development of forest research in Sub-Saharan Africa is also supported by the Special Program for the Developing Countries of IUFRO, the International Union of Forest Research Organizations (IUFRO-SPDC), and through a network of European researchers, the ETFRN (European Tropical Forest Research Network), which includes people working in Europe and from the African continent on matters relating to tropical forests.

Training

Teachers and instructors play a fundamental role in training younger generations to meet current and future needs in human skills. The main players in this field are the institutions in the public sector: the universities and forestry and environmental colleges at national or regional levels (Table 7.2). Most universities have departments dedicated to forest or agro-forestry sciences. The only really regional institution is the *Ecole régionale post-universitaire en aménagement intégré des forêts tropicales* (ERAIFT), based in Kinshasa

Table 7.1: Public research institutions in Central Africa.

Country	Institutions and centers for forest research
Cameroon	IRAD (Institute of Agricultural Research for Development)
	IRMPM (<i>Institut de recherches médicales et d'étude des plantes médicinales</i>)
	IRGM (<i>Institut de recherche géologique et minière</i>)
Republic of Congo Public research is carried out in 15 research establishments, of which 10 are under the supervision of the <i>Délégation Générale à la recherche scientifique et technologique</i> (DGRST)	CRFL (<i>Centre de recherche forestière du littoral</i>)
	CRFO (<i>Centre de recherche forestière d'Ouessou</i>)
	CRHM (<i>Centre de recherche hydrobiologique de Mossaka</i>)
	GERDIB (<i>Groupe d'étude et de recherche sur la diversité biologique</i>)
	STARDI (<i>Station de recherche biologique et forestière de Dimonika</i>)
	CERVE (<i>Centre d'étude sur les ressources végétales</i>)
	CRAL (<i>Centre de recherche agronomique de Loudima</i>)
	CERGECE (<i>Centre de recherche géographique et de production cartographique</i>)
	CRESSH (<i>Centre d'étude et de recherche en sciences sociales et humaines</i>)
	CRCRT (<i>Centre de recherche sur la conservation et la restauration des terres</i>)
Gabon Research is under the supervision of the Ministry of Higher Education, Research and Technological Innovation. Research is coordinated by the <i>Centre national de recherche scientifique et technologique</i> (CENAREST), which groups together the five aforementioned centers.	IRAF (<i>Institut de recherche agronomique et forestière</i>)
	IPHAMETRA (<i>Institut de pharmacopée et médecine traditionnelle</i>)
	IRET (<i>Institut de recherche en écologie tropicale</i>)
	IRSH (<i>Institut de recherche en sciences sociales</i>)
	IRT (<i>Institut de recherche technologique</i>)
DRC INERA has officially been given a mandate to coordinate all applied agronomic research, including forest research, for which it does not have any resources. Among the research centers, CRSN-Lwiro is the one with the best forest research facilities. Apart from the main universities, there are also services or establishments that carry out some forest research as a supplement to their main mission.	INERA (<i>Institut national pour l'étude et la recherche agronomique</i>)
	CRSN-Lwiro (<i>Centre de recherche en sciences naturelles de Lwiro</i>)
	CREM-Mabali (<i>Centre de recherche en écologie et foresterie de Mabali</i>)
	University of Kinshasa
	University of Kisangani
	ICCN (<i>Institut congolais de conservation de la nature</i>)

Source: Doumenge et al. (2001).



Figure 7.3. The IRET station at Makokou (Gabon).

(DRC), which trains higher education students in the fields of the environment and the management of natural resources. Others, such as the *Ecole de Faune de Garoua* or CRESA Forêt-Bois in Cameroon (*Centre régional d'enseignement spécialisé en agriculture – Forêt-Bois*), are nationally managed even though they take in and train students from other countries.

Several of these institutions got together a few years ago to form a regional network, RIFFEAC, which facilitates exchanges and inter-institutional cooperation. Several institutions are directly supported by projects financed through international funding agencies (support project for ENEF-Cap Estérias and ERAIFT, financed by the European Union).

Technical and practical training is also provided by other operators in the private sector or civil society. The ECOFAC program, also funded by the EU, has set up a training center in Cameroon for managers of protected areas. This center has a regional vocation. NGOs such as WCS train and participate in the training of field technicians and personnel (field botanists, guards for protected areas, for example). As for the national NGOs, they tend to concentrate on environmental education programs and/or training in the field of rural development, as opposed to the forest sector.

While private companies may be concerned with research, they have generally invested little, if anything, in the region. Forest research is financed and even directly guided by NGOs such as WCS, an American NGO specializing in scientific research to support the conservation of biodiversity.

Funding agencies, financial institutions, and private funders

Although they do not always have the appropriate technical abilities, funding agencies and other financial institutions play a key role in the orientation of forest management. This is particularly true in the case of large financial institutions such as the World Bank or the IMF (International Monetary Fund).

Multilateral funding agencies

These funding agencies intervene within the framework of multilateral cooperation. Several are linked to the United Nations system. A non-exhaustive list includes: the World Bank, IMF, ADB, FAO, UNDP, UNESCO, the European Union, etc. While some of these agencies manage their own funds ('primary' funding agencies), others have limited resources and thus channel funds from elsewhere ('secondary' funding agencies). This is the case with FAO and ITTO (International Tropical Timber Organization). Other sources of financing exist through the establishment of international funds, in particular the Global Environment Facility (GEF), administered by the World Bank, UNDP and UNEP.

Bilateral and national funding agencies

Within the context of bilateral cooperation in the forest sector, the following agencies should be mentioned: the European Union, which has financed, and continues to finance, numerous actions such as the ECOFAC program; *Ministère français des affaires étrangères* (MAE), *Agence française de développement* (AFD) and PROPARGO, France; the United States Agency for International Development (USAID), which is currently contributing to the CBFP via CARPE; Department For International Development (DFID), United Kingdom; Canadian International Development Agency (ACDI); DANIDA, Denmark; etc.

Funding is primarily in the form of grants, although certain bodies can make loans, either to States or to the private sector (for example the AFD and PROPARGO). Other funding mechanisms exist, involving bilateral funding agencies in particular, but they remain little, or not at all, used (debt-for-nature swaps, Trust Funds, etc.). It should also be noted that France has set up the *Fonds français pour l'environnement mondial* (FFEM), which provides support in the form of grants for activities involving conservation or

the sustainable exploitation of biodiversity and is complementary to the activities of the above-mentioned GEF.

In this region, the Ministries in charge of forests are key Ministries for the development of these countries. These Ministries are of strategic importance because they generate and manage their own funds generated by the exploitation of forest products, essentially timber. The Republic of Congo has set up a forest fund that reinvests the taxes collected into the Ministry's operations, specifically into facilities and bonuses for forest managers. While funding for forest management is fairly substantial, this is not the case for the conservation (management of protected areas), research, and training sectors, despite the fact that these sectors are important to the futures of these countries.

Private funders

Within this category are the large logging groups and oil or pharmaceutical companies who have financed – or potentially could finance – research or training activities in support of their own activities or for the development of external projects. In southern Republic of Congo, for example, the oil companies BP (British Petroleum) and Chevron have financed a number of studies which have allowed a conservation-development project to be set up in the Conkouati Reserve (studies financed by the oil companies, project financed by the GEF). In Gabon, Shell has financed the macro-propagation of cuttings to rehabilitate sites degraded by oil exploration and exploitation, as well as biodiversity inventories in the Gamba complex of protected areas.

Table 7.2. Training in the forest sector in Central Africa.

Country	Training institutions
Region	ERAIFT (<i>Ecole régionale post-universitaire en aménagement intégré des forêts tropicales</i>)
Cameroon	University of Dschang and CRESA-Forêt-Bois (<i>Centre régional d'enseignement spécialisé en agriculture – Forêt-Bois</i>)
	University of Yaoundé I
	University of Douala (Faculty of Sciences)
	University of Ngaoundéré
	<i>Ecole de faune de Garoua</i>
	ENEF-Mbalmayo (<i>Ecole nationale des eaux et forêts de Mbalmayo</i>)
Central African Republic	ISDR (<i>Institut supérieur de développement rural</i>)
Republic of Congo	Marien Nguabi University: - Faculty of Sciences, - Faculty of Arts and Social Studies (Geography Department), - <i>Institut de développement rural</i> (IDR), mainly the department of forestry techniques.
	<i>École normale supérieure</i> (ENS)
	ENEF-Mossendjo (<i>Ecole nationale des eaux et forêts de Mossendjo</i>)
Gabon	Omar Bongo University: - Geography Department, - <i>Laboratoire universitaire des traditions orales</i> (LUTO).
	USTM (<i>Université des sciences et techniques de Masuku</i>)
	ENEF-Cap Estérias (<i>Ecole nationale des eaux et forêts du Cap Estérias</i>)
DRC	University of Kinshasa: - Faculty of Science, - Faculty of Agronomic Sciences, - Faculty of Social Sciences, - Faculty of Pharmacy.
	University of Kisangani: - Faculty of Science, - Faculty of Agronomic Sciences, - Faculty of Social Sciences, - <i>Centre universitaire de Bukavu</i> .
	IFA (<i>Institut facultaire d'agronomie</i>)

Conclusion

This chapter reviews the diversity of the stakeholders in the forest sector of the Congo Basin and highlights the pre-eminent role of state institutions in decision-making and forest management.

This diversity has an influence on management issues because the stakeholders' interests are often divergent. Given this situation, emphasis should be placed on the important role played by COMIFAC to ensure that the interests of the different players converge towards responsible and sustainable management of the natural resources of Central Africa. Some of the players, such as Greenpeace, Forest People Program and Rainforest, intervene to remind others of the importance of taking into consideration indigenous peoples in their natural resource management policies.

While the private industrial sector is increasingly emerging as a legal or de facto manager of forests under concession, the involvement of national NGOs and rural populations remains minimal. The main reasons for this reality are their low degree of organization (even though this is improving); their weak influence and low capacity (for example, to counterbalance the influence of the private industrial sector or certain international NGOs); and continuing poor skills (although these are emerging). Relationships of power and influence among all these players are complex and do not always lead to the sustainable management of resources. The private sector generally gives priority to economic profitability rather than the sustainable management of the resource. This trend is being minimized at present, thanks to the support of certain international NGOs which are putting pressure on governments.

One of the key elements necessary to allow the region's populations to take their development into their own hands is the training of young experts in forestry and the environment. This must be made a priority if sustainable management of the forests of the Congo Basin is to be guaranteed for present and future generations. In particular, it is necessary to strengthen RIFFEAC by updating the programs in colleges, encouraging exchanges of experiences among teachers/researchers in forestry colleges or universities and promoting closer relations between scientists, trainers and the labor market.

Certain difficulties associated with communications among stakeholders and the identification of appropriate partners when setting up projects, along with the often skewed distribution of infor-

mation among certain actors (concerning the sustainable management of forests and mutual awareness of stakeholders), could be partly resolved by the creation of a database on the players in the forest sector. This database should include profiles of institutions and a notation of appropriate contacts. It should be accessible via the Internet and should also provide links to the websites of the institutions in question.

As indicated at the beginning of this chapter, it was not our intention to develop an exhaustive analysis of the stakeholders in the forest sector, of their roles, interests or activities and of how they work. This needs to be done in the future, but such an analysis will require a more complete set of information than is currently available. The creation of a database, as suggested, would allow an exhaustive review of the stakeholders in the forest sector of the Congo Basin to be carried out on a regular basis. This '**observatory of institutions**' would make it possible to follow the development of the activities of a particular institution or, more generally, to follow the changes in the roles played by the various categories of stakeholders in management of the forests. This would also allow some institutions, both national and international (Ministries in charge of forests, ATO, national NGOs, etc.), to become more familiar with each other and provide greater clarity of the regional institutional landscape.

This type of observatory could also be designed to serve as an '**observatory of skills**', addressing the following questions: who does what and in which domain within the countries of the Congo Basin? The work started in 2002 by the FORAFRI project and ADIE to create a database of individual skills in forestry and environmental research in the region could be used as a basis for this latter aspect of database development.

8. A Comparison of Forestry Legislation and Regulations in the Six Forest Countries of Central Africa¹

Land status

In all the countries of the subregion, forests are governed by what is known as the ‘*régime de domanialité*’ (literally the ‘domanial regime’) which essentially means State ownership of the forests. Several countries make a clear distinction between the ‘public domain’ and the ‘private domain’, with some countries having a specific category entitled the ‘national domain’, which generally corresponds to a category defined by default.

The domanial regime and ownership

The ‘public domain’ is generally distinguished from the ‘private domain’ by the fact that the goods in the public domain are for everyone’s use, like roads or airports, whereas those in the private domain are owned by a public entity (State, community, etc.); consequently, the forests owned by public entities, such as the State, generally form part of the private domain of these entities, even though some legislators class them as being in the ‘public domain’ (see DRC). The other distinguishing criterion stems from the nature of the law applicable to property: administrative law for the public domain, common, or private law for the private domain.

In certain cases in Africa (Cameroon) there exists a third category: the **national domain**. The national domain is a collective asset held by the

State, for which private appropriation is possible under certain conditions. However in Cameroon, the creation of a national domain was seen as an exercise in nationalization of land hitherto held according to customary law. The privilege of redistribution of land in the national domain, which is conferred upon the State explicitly or implicitly (as in Cameroon), partly justifies this perception. Jurists agree that it is difficult to talk about State ownership of land in the national domain. The texts use ambiguous expressions within an administrative vocabulary, such as State ‘control’ over this land.

Legal frameworks for the distribution of forested land

Cameroon

The legal framework for the classification of land in Cameroon (Table 8.1) uses the distinction ‘permanent domain versus non-permanent domain’, which is the equivalent of the categories ‘classified domain’ and ‘protected domain’ used in other African countries. It is recognized that the local authorities have the possibility of including forests among their private assets. The legislator has chosen to place community forests in the national domain, in other words in the category of non-permanent forests. Private forestry is possible. As noted by M. Kamto (2001), ‘*it is possible legally to acquire ownership of a part of the national*

¹ This chapter was written by A. Karsenty.

Table 8.1. Legal framework of land tenure in Cameroon.

Purpose of land – as defined by the overall land-use planning objectives	PERMANENT FOREST DOMAIN (forests classified or awaiting classification)		NON-PERMANENT FORESTS (referred to as ‘agro forestry band’ in the zoning plan)	
	DOMANIAL FORESTS	COMMUNAL FORESTS	COMMUNITY FORESTS	OTHER FORESTS
Administrative designation				
Legal status	(State-owned, private domain)	(private domain of the municipality)	(Part of the national domain)	(national domain, privately owned forests)
Allocation	production forests, protected forests, etc.	production forests, protected forests, etc.	Defined by a management agreement for a period of 15 years between the village and the forestry department	Areas assigned for use (private forests) or awaiting assignment (registration for the benefit of individuals or communities)

domain in the first category by planting forests: a person having developed a portion of the national domain in the form of a forest plantation may become the owner if he obtains a permanent concession on this portion. However it should be noted that Article 15 of Order 74-1 establishing the land tenure system constitutes an obstacle to direct access to ownership of forests in the national domain by persons and legal entities under private law (forestry companies, for example), in so far as these forests form part of the second category the national domain, i.e. 'land free of all effective occupancy'. These persons can only be concessionaries thereof'.

Republic of Congo

A particular conception of the public domain can be clearly seen in the system adopted by the Republic of Congo (Table 8.2). In the legal tradition inspired by French law, the public domain cannot be transferred, as opposed to in the private domain, but private plantations may be established as a result of actions carried out in areas belonging in the public domain. This is equivalent to relinquishing it to a private person, since even unplanted trees become the property of the operator². In Cameroon, the legislator has provided for a specific category (the national domain) to overcome this difficulty. In the absence of this legal facility, the Congolese legislator admits that at least part of the forest resources in the public domain can be relinquished and lead to the establishment of private plantations.

Within the context of the subregion, two Articles (36 and 37) are particularly interesting

and innovative: the planter acquires exclusive, transmissible use of land (under *jus tertii*), but not ownership of the land. This right ceases if the land is abandoned or cleared. Here we have a provision that potentially creates a framework for encouraging private/farmer plantations.

Gabon

In Gabon dissimilarity with the Cameroonian Code concerns classified forests ('forêts classées'): since Act 1/82 of 22 July 2002, the so-called Waters and Forests Orientation Act, classification has been used for preservation purposes and not, as was the case previously, production (Table 8.3). Furthermore, classification brings them into the State-owned public domain (and not the private domain, as was the case until then). It is the protected 'domanial' forests, containing production areas, which constitute the State-owned private domain.

With Act 016/01, the distinction between private domain/public domains is no longer mentioned. Article 13 merely states that 'any forest forms part of the national domain and is the exclusive property of the State'.

These provisions raise the following issues:

- The affirmation of the State's 'exclusive' ownership of all forests, natural or artificial (the text does not make any distinction in this respect), leaves no place for the development of **private forestry**, which could be suitable for the development of forest plantations by individuals, companies or even communities.
- The code refers to implementation texts de-

² Art. 36: Any person, of Congolese or foreign nationality, or legal entity under Congolese law that plants forest trees on land within the non-permanent forest domain acquires exclusive use of the planted land and ownership of the trees thereon, subject to:

- *jus tertii*,
- the number of trees planted exceeding that of trees not resulting from planting,
- the limits of the planted land being clearly established.

Art. 37: The rights acquired through application of the provisions of Article 36 above are transmissible, in accordance with the law. They cease with clearing of the land, abandonment or perishing of the stand (...)

Table 8.2. Legal framework of land tenure in the Republic of Congo.

National Forest Domain					
State-owned Forest Domain (*)				Forest domain of private persons	
Permanent forest Domain			Non-Permanent Forest Domain (public domain, unclassified protected forests)	Private Plantations	Private forests
Private domain of the State (must be classified)	Private domain of local or territorial authorities (classification, plantation or transfer)	Private domain of public entities	Public domain	<div style="text-align: center;"> (... which can come from the public domain) </div>	

(*) 'Falling within the competence of the State', Art. 4. The legislator carefully avoids talking about State ownership, i.e. he has a conception of domaniality closer to the idea of the collective heritage of the Congolese and consistent with the idea that individuals may create property rights through certain forms of development (here planting).

fining the conditions for the registration of production forests (texts which, as far as we know, have not yet been drafted). Presumably it is only after this registration that forestry concessions will acquire a firm legal status and the State-owned private domain will be legally established over the forest areas concerned (unless under Gabonese land tenure law brings the private domain under the registration system, as was the case during the colonial period).

- This institutional framework does not take account the possibility of public institutions other than the State being able to have exclusive ownership of a private domain, particularly rural **local authorities** which could be called upon to manage forests in their immediate surroundings.

Democratic Republic of Congo

DRC has adopted a distinction between classified forests and protected forests, with the former corresponding to the objectives of conservation and not logging (Table 8.4).

Based on the land tenure law, which derives from land concessions, the forestry law has adopted the forestry concession as an exclusive means of access to forest resources. It will no doubt be necessary to define several categories of concessions depending on whether they are granted within the future permanent forest domain or outside of it, and whether, in each case, the appropriate management instrument is defined (management plan for concessions in the permanent forest domain, simple management plan³ for community forests and concessions granted in the non-permanent domain).

Central African Republic

CAR has not defined sufficient categories to establish a meaningful legal framework. The fundamental distinction is that between a State-owned forest domain and a community or privately owned domain. The State-owned domain must be established through classification. Plantations created by private individuals on land belonging to them, in accordance with the regulations, become their property. However, subsequent clearing of the land is only possible with the authorization of the administration. According to the code (Art. 53): 'A forest belongs to a territorial community when it is the subject of a classification decree on behalf of this community or when it has been reforested and managed by the latter'.

As in DRC, the definition of forests is very wide (Art. 2: 'all areas covered by vegetation for-

Table 8.3. Legal framework of land tenure in Gabon.

Purpose of land – as defined by the overall land-use planning objectives	PERMANENT FOREST DOMAIN		RURAL FOREST DOMAIN	
	Administrative designation	CLASSIFIED DOMANIAL FORESTS	REGISTERED DOMANIAL PRODUCTION FORESTS	FUTURE COMMUNITY FORESTS
Legal status (according to Act 1/82)	Public domain	State-owned private domain	State-owned private domain	State-owned private domain
Allocation	Protection forest Recreational forest Reforestation zones Production forests, sensitive or adjacent to the rural forest domain	Production forest Including forests conceded as CFAD or PFA	Production (through the community forest regime)	Freely negotiated permit for clear felling Areas awaiting assignment or conversion

mations are called forests'). This implies that the forest regime is applied to a very extensive area.

Equatorial Guinea

The legal framework is outlined in Table 8.5.

Overall summary

Forests are largely public property in Central Africa. Several laws allow the establishment of private forests, generally through planting, except in DRC where natural forests situated on land concessions are recognized as the property of the land concessionaries. In practice, private forestry is virtually non-existent. Four countries (Cameroon, Equatorial Guinea, Gabon and DRC) have adopted legal provisions permitting community forestry, with community forests established in Cameroon and Equatorial Guinea. But only Cameroon has provided for the possibility of the local authorities (here, the municipalities) having a private forest domain. Finally, the real legal status is not always in step with the legislators' intentions: the establishment of a permanent forest domain involves the effective classification of forests or an equivalent formal legal

³ These simple management plans would be based on a few fundamental rules such as the minimum felling diameter according to species.

Table 8.4. Legal framework of land tenure in the DRC.

Ecological definition	FORESTS		
Use	Conservation (target 15% of national territory)	Permanent and non-permanent exploitation	Permanent exploitation
Domanial status	PUBLIC DOMAIN	STATE-OWNED PRIVATE DOMAIN	STATE-OWNED PRIVATE DOMAIN
Legal classification	CLASSIFIED FORESTS	PROTECTED FORESTS	PERMANENT PRODUCTION FORESTS
Type of exploitation	Limited to research activities	Traditional (by virtue of rights of use) Community forestry concessions	Forestry concessions
Main management instrument	Management plan	Management plan for forestry concessions	Management plan for forestry concessions
Responsibility for management	State	Operator	Operator Community under administrative supervision
Customary rights of use	Restricted	Recognized	Discontinued

instrument to place specific forest areas in the intended category. Only Cameroon has begun a thorough classification process for the forests in the southern part of the country.

There is a duality between ‘modern’ law and the customary laws, which largely govern social relationships and everyday practices regarding access to land in all the countries of the subregion. The link between land tenure law, land access practices as governed by customary law and forest laws constitutes a legal and institutional challenge that these countries will have to address.

Access to forest resources

Access to resources is achieved through different systems, the best known being that of the forest concession, which is a form of private management of public property. To combat illegal logging, the governments have substantially reduced the number of permits based on volume, which often led to fraud by systematically exceeding the permitted volumes. These types of permits are also vehicles for tax fraud (avoiding surface area taxes) or for getting around quotas imposed on conces-

Table 8.5. Legal framework of land tenure in Equatorial Guinea.

Purpose of land – as defined by the overall land-use planning objectives	<i>Domínio de Producción Forestal</i> (Forest production domain)			<i>Domínio de Conservación o Protección</i> (Conservation and protection domain)	
Administrative designation	<i>Bosques Nacionales</i> (National Forests)	<i>Bosques Comunes</i> (Community Forests)	<i>Parcelas Forestales</i> (Wooded Plots)	<i>Áreas Protegidas</i> (Protected Areas)	<i>Bosques de Protección</i> (Protection Forests)
Allocation	Production of construction timber through concessions system	Multiple uses by village communities	Production of construction timber through authorizations	Conservation, research, etc.	

sions (processing or species quotas). However this policy puts artisanal and other small-scale operators in a precarious position, and often results in them turning to the informal logging sector and straying outside the law.

In 1999, Cameroon suspended the different existing permits by volume (personal authorizations to fell 30 m³, timber recovery authorizations allowing operators to remove logs that they find 'abandoned' in the forest, auctions, timber salvage felling, etc.), although some permits were still issued locally by the authorities in the non-permanent domain⁴. This suspension has since been lifted. In Gabon, permits by volume essentially concern the freely negotiated permit, by which Gabonese citizens are allowed to fell up to 50 trees. The administration admits that it is very difficult to check whether this number is respected (OIBT, 2005). Abolition of the 'construction timber permit' in the Republic of Congo brought protests from small-scale operators. In the Republic of Congo there are also permits for logging plantation timber (State-owned plantations). The forestry code in CAR allows 'special logging permits' to be issued for a maximum area of 10 ha.

Logging permits based on surface area

The period for which permits are issued (Table 8.6) varies from 15 years renewable (Cameroon and Equatorial Guinea) to 99 years (CAR). Ideally, the duration of permits should be close to the duration of the rotation period, but the renewal clause nevertheless gives the investor a certain level of security.

Allocation methods

Forestry permits are granted on a discretionary basis by the administrations according to different criteria, such as investment projects, the foreseen social impact of activities, or presence in the country. The exception is in Cameroon, where an **award mechanism** was introduced in 1996 for both concessions and the sale of felling rights. It is a two-stage process:

- The pre-selection phase is when possible forestry offenses attributable to the applicants are examined, technical abilities are presented and solvency is assessed. The elimination mark is 65 out of 100.
- The second phase involves the examination of technical and financial offers received. The technical note counts for 30% and the financial offer (which corresponds to the amount

Table 8.6. Different types of logging permits in Central Africa

	Large surface area	Limited surface area	Other categories
Cameroon	Concessions	Sale of felling rights (≤ 2,500 ha)	Communal forests Community forests (≤ 5,000 ha)
Gabon	Forestry Concessions under Sustainable Management (CFAD)	Associated permits (PA) (≤ 150,000ha when associated with CFAD, ≤ 50,000 ha when managed by the holder)	
Republic of Congo	Management and processing agreements (CAT), Industrial processing agreements (CTI)		
DRC	Concessions		Community concessions
CAR	Logging and management permits		
Equatorial Guinea	<i>Contratos de Arrendamiento por Aprovechamiento Forestal</i> (Rental contracts for use of the forest)		<i>Bosques comunales</i> (Community forests)

proposed by the tenderer through the annual forestry fee - RFA - based on the area conceded) counts for 70%. The financial offer is announced in public and the results declared immediately after the total number of points is calculated. The successful tenderer must place a bank guarantee with a banking establishment corresponding to one year's RFA payment. He has the right to give up the concession within a certain period, in which case it goes to the tenderer who came in second place. The whole process is monitored by an independent observer appointed by the government. The observer provides his opinion on the procedures and reports to the government and various institutions on how the operations were conducted.

The forestry code of DRC indicates that concessions must be awarded through a tendering process, although freely negotiated agreements are still possible 'on an exceptional' basis (Art. 83 and 86). A decree laying down the details of the award procedure is in preparation; it is based on

⁴ If these permits, officially suspended, are still being issued by decentralised ministerial structures, it is because the agents, whose basic pay is insufficient, benefit financially from their being issued; a release from MINEF from 14-9-2000 states that for 'sales by auction' 75% of the revenue goes to the State with 25% being paid to agents via a special fund.

the Cameroonian mechanism. In the meantime, there is a moratorium on the awarding of new concessions, introduced by a decree of 14 May 2002, but it has not been fully observed. In May 2005 CAR adopted an award mechanism similar to that of Cameroon, with a different weighting (40% for the technical offer, 60% for the financial offer), which must be applied in cases of concessions being re-awarded following withdrawal or bankruptcy (Decree 011/MEFCPET/CAB/SG of 20 May 2005).

Permits reserved for domestic operators

Apart from permits by volume, the legislation reserves some zones or categories of surface area permits for nationals. This is the case in Gabon, for 'first zone' permits (areas along the coast) and for associated forestry permits (PFA). In Cameroon, some of the forest management units (UFA) put out to tender are reserved for domestic operators. This has not always been the case, as invitations to tender between 2000 and 2001 were open to all applicants. As for sales of felling rights, those which are issued for the permanent domain are reserved for nationals (Art. 44-2), but not those for the national domain (Art. 53). However, few or no felling rights are issued for the permanent domain and in 2005 the government reserved quotas of felling rights for Cameroonian nationals for the national domain.

The permits reserved for nationals are often subcontracted or 'leased' to foreign operators who possess the logging resources that domestic operators, few of whom are real professionals, often lack. The major drawback to this form of subcontracting is that it breaks the chain of responsibilities in forest management and, since the 'lessee' can change, it does not favor the development of a long term vision. With the exception of a few rare cases, reserving surface area permits for nationals has not really succeeded in developing a class of domestic entrepreneurs in Cameroon.

The role of local populations

Community and communal forests

Local populations can benefit from community forests in Cameroon, Equatorial Guinea, Gabon and DRC. In Cameroon, 67 community forests have been established since 1997 (out of 180 applications received), amounting to some 240,000 ha (GFW, 2005). It appears this number is set to rise to over 80 forests by the end of 2005. Since 2002, communities have had a **right of first refusal** on future sales of felling rights in the

national domain. In CAR, although the forestry code does not mention this possibility, a pilot project has been initiated for the establishment of 6 community forests. In Gabon, the government envisages establishing community forests within the framework of pilot projects (OIBT, 2005). The forest code in DRC indicates that communities can benefit from forest concessions on forested land 'held by virtue of customary law' (Art. 22) within the protected domain, but no community concession has been established to date. However while in Cameroon only artisanal logging has been authorized theoretically in community forests since 2001, the forestry code in DRC stipulates that logging in community concessions can be entrusted, by contract, to a artisanal operator (Art. 112) or a 'third party' through a logging contract (Art. 113-3).

In Cameroon, a ceiling of 5,000 ha has been placed on the surface area of community forests and these forests must have a simple management plan validated by the administration; in DRC, as of yet no implementing text has fixed a ceiling on the area of community concessions. In Cameroon, the local populations should also benefit from logging in communal forests through fees paid to the municipality by the holder of the permit.

Rights of use

The populations retain their rights of use in forests designated for logging, with the explicit exclusion of agriculture in DRC. But these rights of use can be restricted in permanent forests by specific regulatory texts. Article 25 of the Gabonese Code states 'The texts on the classification of a forest or management plans for a production forest must provide for a sufficient area within which the resident populations can exercise their customary rights of use'. Hunting rights are regulated by ad hoc texts. Article 42 of the Congolese code specifies: 'The rights of use are reserved for the satisfaction of the personal needs of their beneficiaries. The products deriving therefrom may not be the subject of commercial sales'. But this type of provision is rarely observed anywhere in the country.

Local allocation of tax revenue

In Cameroon, the local populations adjacent to concessions receive 10% of the annual forestry fee (RFA), which is based on the surface area of the concession and determined by the award mechanism. The funds are paid by the municipality to a management committee set up within

each beneficiary community. A recent study refers to the difficulties that the beneficiary villages have in receiving all the amounts due to them from the municipalities (Ngoumou Mbarga, 2005). The municipalities in Cameroon receive 40% of the RFA from concessions and sales of felling rights located in the municipality's territory⁵. This represents just over 5.5 billion FCFA annually. In the CAR, 30% of the felling tax is allocated to the local authorities and 25% of the reforestation tax (Art. 58 of the 1998 Finance Act), which represents about 1.5 billion FCFA in theory.

In Gabon, the general conditions of certain logging deeds for large concessions provide for the payment of 1,000 FCFA per m³ of felled timber to the resident populations. A territorial scale of distribution for the *'finages'* (area of influence of each village) has been defined for the allocation of these fees. The administration could extend this provision in the general conditions to all concessions in the near future. In the Republic of Congo, 50% of the surface area tax goes into a special fund created at the Treasury for regional development.

General conditions

A large proportion of transfers of funds and payments in kind for the benefit of the local populations are achieved through the general conditions (*'cahier des charges'*) system. These general conditions contain various clauses providing for social transfers or initiatives of a socioeconomic nature chargeable to the concessionaries. The planned beneficiaries are not only village communities but also sometimes neighboring public communities (administrative entities) or even local administrative authorities and the forestry department. In the Republic of Congo, the transfers made through the general conditions system have become substantial (Karsenty and Pierre, 2005)⁶. In DRC, there are no fixed conditions yet, but informal transfers in cash or in kind for the benefit of the local populations and local authorities are frequent and negotiated (or imposed) on a case-by-case basis.

Forest management systems

Forest management is compulsory for industrial logging permits. The forestry laws are steadily incorporating technical elements such as the choice of species, minimum dimensions, different inventory protocols and the implementation of management plans. The laws and regulations often contain provisions indicating principles for

fixing minimum felling diameters (MFDs), the rotation duration or inventory standards. Gabonese law is particularly precise on these matters. But in order to be really operational, and to enable the administrations to assess the management plans proposed to them, these principles must be completed according to specific technical management standards. These national management standards or directives are available in Cameroon and in CAR. In Gabon, they are available to the players involved but still have to be made official through a decree.

In these three countries, the need for flexibility on the part of operators is taken into account by keeping the cutting units (*'assiette de coupe'*) open for 2 or 3 years in order to allow them to adapt to commercial or technical uncertainties. On the other hand, it is not possible to open up more than one cutting unit a year: thus 'retrospective' flexibility is possible, but cannot be accompanied by 'prospective' flexibility where the logging activities get ahead of the planned rotation cycle.

The national standards or directives also allow managers to define different 'management' MFDs (DME-A) from the 'legal' MFDs (DME-L). But while the DME-A can be higher than the DME-L, they cannot be lower. This is not because of forestry concerns, but in order to limit the risks of offenses occurring in a context where the traceability of timber remains difficult.

The extent to which biodiversity is taken into account in logging concessions is often limited to little more than action to combat poaching in the concession, an aspect negotiated during the preparation of the general conditions. While management plans classically provide for a series of protection zones, they are still frequently limited to areas that can not be logged, such as steep slopes, rocks or marshes. Very few concessions have incorporated genuine ecological zoning or have agreed to protect biodiversity in actual production areas.

Centralized management or delegation of functions?

Two approaches appear to coexist as regards implementation of management plans. On the one hand, given their new forest codes, the Republic of Congo and CAR appear to have opted for a centralized operational method with the State ensuring implementation of the plans. The Cameroonian law has also followed this approach, however, one of the implementing decrees has opened the way for the delegation of this function to companies. Poor quality plans prepared by

⁵ When a logging deed covers several municipalities, each of them receives a separate check, the amount of which is calculated according to the surface area of the forest concerned.

⁶ Concessionaries ask for the level of transfers indicated in the general conditions to be adjusted according to the amount of the forest tax that is paid, which varies from country to country. With the general increase in tax pressure in recent years, economic operators are demanding strict limits on the scope of transfers and other initiatives. So far this has not succeeded in the Republic of Congo.

the public body ONADEF convinced companies that it was in their interests to perform this function themselves, often entrusting this task to specialized consultancies. In the Republic of Congo, the shortage of trained personnel and the obvious lack of financial capacities within the administration in charge of forests led to the choice of delegated management⁷. The only exception has been CAR, due to the relatively limited surface area to be managed (3 million ha), shared among six concessionaries, and the creation of a management unit supported by a project financed by AFD. This unit prepares the management plans of forestry companies, involving them in the preparation of the different stages, while working to take into account their choices and strategies. In other countries (except for DRC where the process is only just beginning), many companies have recruited forest managers to create in-house management units working alone or with the support of specialized consultancies. The **internalization** and **appropriation** of forestry management is a process that companies must go through.

Effectiveness of legislations on forest management systems

Application of forest management planning rules and provisions varies from country to country and even within the same country. Little information is available on fulfillment of management obligations by concessionaires in Equatorial Guinea, and the absence of a detailed reference to this subject in the official documents available leads us to suppose that these provisions are only followed to a limited extent. In DRC, there is a notable shortage of applicable regulatory texts on the subject of forest management, although this does not prevent large companies from preparing their own management plans with a view to certification. A similar situation exists in the Republic of Congo, where several large companies in the north of the country have prepared, and one of them is implementing, a management plan despite the absence of national standards. However, a number of companies, in the north and especially in the south, have not adopted this approach.

Cameroon and Gabon are in contrasting situations, with some concessionaries involved in the management process, while many logging companies or simple permit holders, remain completely outside the process, for financial or other reasons.

In CAR, the situation is more uniform because of the decision to set up a national management

unit. However, genuine appropriation of forest management by beneficiary companies must still be demonstrated (which raises the question as to what the situation would be if the project came to a halt).

The legislations provide for penalties going as far as withdrawal of the permit for non-compliant holders. In Gabon, withdrawal is envisaged for numerous permit holders – mostly ‘associated permits’ held by individuals rather than genuine forestry companies – who have not started any forest management work (and who are often in arrears with payment of their taxes). The end of 2005 was to be a landmark date for the government’s decision (OIBT, 2005).

A particular problem is posed by the ineffectiveness of the compulsory simple management plans for community forests in Cameroon. They are rarely observed and for some operators this category of forest has become a way of extracting illegally cut timber or avoiding payment of certain taxes.

Taxation and pricing systems

While the other countries – apart from DRC – have not followed Cameroon in adopting the tendering principle, they are all set on reforming their systems of forest taxation, generally in the direction of an increase in tax pressure.

Increase in the cost of access through the surface area fee

In Cameroon, the tendering mechanism led to the annual forestry fee, based on surface area, rising to an average of 2,724 FCFA/ha on concessions up to 2004. However, the latest allocation process in 2005 resulted in much lower offers, with the average offer from tenderers amounting to 1,355 FCFA/ha. On sales of felling rights, the average offer accepted was 8,265 FCFA/ha in 2005, also well down on the average of 26,000 FCFA before the latest allocation process.

In Gabon in 2002, the government proposed an annual surface area forestry tax of 1,000 FCFA. This measure was to have been applied at the beginning of 2003, but in the face of strong reactions, a rate of 600 FCFA was decided on, with only 300 FCFA for companies that had finalized their management plans. This was a transitional measure, as indicated in the Forestry Policy Letter (*Lettre de Politique Forestière*) of 2004.

In the Republic of Congo, the government introduced a surface area tax of 350 FCFA per ha for the northern zone and 500 FCFA for the

⁷ In *delegated management*, the State entrusts functions of a general interest to a third party: an individual, a local authority, a local community or a private public company. In this case, delegation is accompanied by precise commitments, generally in the form of terms and conditions setting out the rights and obligations of the entity to which the functions are delegated. Delegated management is contractual, unlike devolution and decentralization.

southern zone. At the same time, it raised felling and export taxes substantially, which brought a fierce reaction from operators. Agreements were reached in May 2003 that reduced the different taxes by about 20%.

In DRC, where there are some very large concessions (with low logging intensities) of 2 and 3 million hectares, the government has undertaken a tax reform which will see the surface area tax increase in stages until 2007 (from \$0.10 to \$0.50 per ha) in return for a reduction in incidental taxation and the abolition of excessive levies on the sector by state owned companies. In this country, where potentially productive forests covers more than 55 million hectares, forest taxation in 2002 brought in less than 2 million dollars for the State. Since the implementation of new tax measures, over 4 million hectares held by companies that did not have the capacity to exploit them have returned to the public domain. There is also a tax on annual cutting units, which contributes to the Forest Fund budget.

In CAR, the 'annual rent' (surface area tax) rose successively from 125 FCFA/ha (before 1998) to 300 FCFA (between 1998 and 2003) and then to 500 FCFA per ha in mid-2003. A surtax of 500 FCFA should be applied as from 2007 for companies that have still not signed a provisional management agreement with the Ministry of Water and Forests.

These surface area taxes apply to the whole area of the concession, including the non-productive areas. With the development of management plans defining the production runs, it is only now possible to levy the tax on these, to the exclusion of other production runs. DRC has introduced this principle in its new tax system.

Other taxes

All the countries heavily tax exports of logs, with the dual objective of tax generating revenue and providing an incentive for local timber processing. Some countries have introduced surtax mechanisms: in Cameroon, it is a fixed surtax on exported logs (in addition to an exit tax of 17.5% of the FOB value); in the Republic of Congo, there is a progressive surtax on exported logs above the authorized maximum quota of 15% per concession. The taxable value is calculated on the basis of FOB values determined by the administration, but it generally poorly reflects variations in prices due to an insufficient frequency of audits and a lack of information on markets. CAR and DRC⁸ have adopted a FOT (Free on Truck) or EXW (Ex-Works) basis for calculating export

taxes, deducting an average transport cost per m³ from the FOB value. The other countries modify the level of these taxes by dividing up the territory into 3 or 4 zones reflecting the degree of remoteness. But in all cases, fine zoning that reflects real transport costs rather than simply distance would be necessary in order to achieve a better balance of logging operations over the territory. It would also help to combat 'skimming' – selection of highest value specimens only - in forests where access is difficult.

Processed products are taxed less or are even tax exempt, as in Gabon. In Cameroon, a tax is levied on rough lumber entering the factory, in order to exercise better control over flows of processed timber and to encourage savings in materials. The Republic of Congo differentiates the level of export tax according to the degree of processing.

Felling taxes are based on the FOB value of the species, on a market price listing well below the FOB price, in CAR, or on a 'bracket' value (purchase price for okoume from operators set by the SNBG) in Gabon. In DRC, lower rates have been introduced for the main species being promoted, tola (*Gossweilerodendron balsamiferum*). Felling taxes are pre-calculated and prepaid in the Republic of Congo on the basis of annual felling authorizations. This ensures good tax collection, but discourages risk-taking as regards diversification of the species that are logged (since only species that can be marketed will be exploited). In the other countries, the felling tax is less well controlled and collected. However, it plays a structuring role as regards controls in the field (one of the reasons for controls in the forest being to check that felled trees have indeed been taxed). Furthermore, the possibility of varying the rates according to species allows the felling tax to be used as an incentive, although this potential has yet to be fully explored.

Allocation of taxes and fees

The principle of a single budget structure is progressing slowly. While it is well applied in Cameroon, where most of the revenue passes through the Treasury before being reallocated to the institutions in charge of forest management, the DRC still works with pre-allocated taxes – particularly for the Forestry Fund. The Republic of Congo has even taken a step backwards after trying in 2003 to work on the principle of a single fund structure and subsequent reallocation of the necessary sums to the forest administration institutions. Faced with a situation where it had

⁸ In DRC, only for calculation of the reforestation tax paid on exports, which fuels the forestry fund and, in principle, for the felling tax.

become extremely difficult to obtain reallocation of the agreed upon sums, once they had been paid to the Treasury, the Ministry in charge of forests once again took over the collection of forest taxes (surface area and felling taxes) in 2004. However, a decree (No 7702 of 5 December 2005) re-established the principle of a Single Treasury (*'unicité de caisse'* – a system where all public sector finance, whether central or local, is handled by a single national Treasury). This stipulates that checks are to be made out in the name of the Director of the Treasury from a special account and that reallocation to the Forestry Fund of part of this revenue, up to the full amount of the Forestry Fund (as decided by Parliament and fixed by the annual Finance Act), is to be by standing order.

Overall analysis

With the introduction of the tendering mechanism in Cameroon, the price for access to the resource was largely fixed by the interplay of competition and no longer by administrative decisions. Moreover, publicity for the process helped to increase transparency in a sensitive field. Nevertheless, the majority of the established profession has never really accepted this principle of an RFA fixed through a tendering process. The heterogeneity of the forests under concession (frequency and distribution of species, quality and unproductive areas) is not always well estimated by the current types of surveys or large-scale reconnaissance inventories. Also public information is so limited that tenderers are never able to have access to the same level of information. The ability to adapt to a resource which is different from that expected depends on several factors (capital available, accessible markets, industrial capacities, etc.) and the operators themselves are not always able to control these. They do not have perfect information, they have relatively limited forecasting abilities and they may make mistakes in their evaluations. This increases risk-taking by companies when it comes to tendering, especially as the fee proposed for the duration of the contract is fixed whereas the price of timber varies considerably from year to year⁹.

The changeover from 'exit' taxation (taxes concentrated on exports) to more balanced taxation between the upstream and downstream ends of the sector is criticized by some in the private sector who consider that the surface area fee represents a fixed cost whereas the logging business is unpredictable and timber prices are unstable. However, the introduction of surface area taxes seems inevitable in these countries that are pursu-

ing the objective of drastically reducing exports of logs in favor of industrialization. In so far as tax revenue was essentially based on these exports, it is necessary to accept that the center of gravity of tax collection must be shifted¹⁰. However in Africa, the uneven distribution of information between companies and administrative departments is such that it cannot be left to a corporation tax to 'collect the economic rent' from the exploitation of a natural resource. As for felling taxes, these are more often subject to massive fraud as the rate increases.

A review of the impacts of tax reforms is necessary. This could lead to improvements in the existing mechanisms by introducing, among other things, greater flexibility (adaptation to the fluctuation in prices and to transport costs) and incentives (promotion of secondary species), especially as over the last couple of years the sector has been hit by increases in the price of diesel (around 30%) and in international freight charges in 2004 (from \$25 to peaks of \$60-80 for a 40-foot container), but has not been able to pass on these increases in the price of the timber sold.

⁹ On the other hand, the Cameroonian government has not provided a mechanism for index-linking to the rate of inflation, which has been 2-2.5% a year on average in Cameroon since 2000.

¹⁰ Transferring taxes to exports of processed products (sawn timber, etc.) would run counter to the widely shared objectives for the development of the timber industry.

Regulation of trade in forest products and timber processing

The legislation in these countries reflects a common desire to promote local timber processing, but the means of achieving this objective differ. Since 1999, Cameroon has banned exports of logs of numerous species with a high commercial value, with the exception of two secondary species (so-called 'promotion' species), Ayous (*Triplochyton scleroxylon*), which is the main species harvested, and Azobé (*Lophira alata*). However, logging of these two species is subject to a surtax and, since 2002, export authorizations.

In the Republic of Congo, the forestry code (Art. 48) indicates that 'products from natural or planted forests must be processed in the Republic of Congo' and that 'first-stage processing of timber shall be close to the felling site'. A transitional provision allows operators to export, with a ministerial authorization, 15% of their production in the form of logs. Subsequent texts have introduced a progressive surtax for exports above this threshold and this is effectively applied.

The Gabonese code is less demanding: it indicates that 'the level of processing of local production must rise to a level of 75% during the decade following the date of promulgation of this Act' (Art. 227). In DRC, the code specifies that only the holders of a processing unit may export logs 'for a maximum period of 10 years' after logging begins and 'subject to a quota not exceeding 30% of production' (Art. 109). In Equatorial Guinea, operators must process 60% of their harvest. In CAR, the forestry code requires holders of permits for 3 or more years to process 60% of their production. This was raised to 77% by a recent Finance Act. In none of these 3 countries are the regulatory measures really applied.

It should also be noted that in Gabon there is a measure prohibiting exports of Longhi (*Gambeya africana*) as logs, which indirectly benefits the slicing company using this species¹¹.

SNBG monopoly on Okoume (*Aucoumea klaineana*) in Gabon

Okoume, the main species produced in Gabon, and Ozigo (*Dacryodes buettneri*) were for a long time the subject of a log export monopoly for SNBG (*Société nationale des bois du Gabon*), which used to buy the logs from foresters and allowed them production quotas (with a guarantee of purchase). Processed logs were not covered by

this mechanism. The government decided to do away with this SNBG export monopoly on the first of January 2006.

Overall analysis

The imposition of identical compulsory processing quotas for each operator is a relatively effective measure (if it is applied uniformly to all concessionaries) from a quantitative point of view (volume processed). However, it is a much less effective measure from an economic point of view because (i) it does not take into account the comparative advantages of each company in timber processing (some are more efficient than others) and thus may lead to loss of potential value and (ii) it hinders the necessary movement towards specialization among concessionaries, which is intended to lead to the creation of large-scale processing units benefiting from economies of scale¹² and procuring part of their supplies from concessionaries that are more concerned with sustainable logging.

The formula of an annual *national quota* to be distributed among the different operators seems to be a more appropriate option from the point of view of economic efficacy; however, it does pose the problem of the distribution of this overall quota among potential exporters. The three allocation possibilities are (i) free distribution of export entitlements (either equally or weighted in accordance with particular technical criteria), (ii) selling them at a price fixed administratively or (iii) auctioning of export entitlements, which would then replace export taxes.

Means of Application

The degree of application of legislation varies considerably from country to country and according to the different laws and regulations, with some, as we have seen, being less well applied than others. The human resources at the disposal of the Ministries in charge of forests are fairly limited with more at the central level than in the provinces. Even when human resources are deployed in the forest areas, the agents are generally confronted with a limited number, or total absence of, vehicles (such as in DRC) and fuel to enable them to carry out their checks. Consequently in most cases agents are dependent on transport provided by the forestry operators, who are the subjects of the controls¹³.

- In Cameroon, the Ministry of the Environment and Forests (MINEF) had a staff of 1,800; the government decided to

¹¹ By guaranteeing it a purchasing monopoly on this species.

¹² Even though it is also desirable to have a collection of small and medium-sized companies specializing in different production segments.

¹³ This situation has been mentioned for the Republic of Congo (REM, 2005) and DRC (Cirad, 2003).

split this Ministry into two entities of about 900 people each: one dedicated to forests and fauna (MINFOF) and the other to the environment. This staff is ageing and recruitment restrictions in public services, linked to the adjustment process, cannot guarantee that this number can be maintained. Moreover, a recent study (I&D, 2001) indicated that 82% of personnel were in the regional centers, but only 28% in forestry posts (480 people). For the eastern province, where the great forests are located, the ratio was 176,000 ha of harvestable forest per agent. The MINEF budget (with its 1,800 agents) was around 14 billion FCFA per year at the beginning of the 2000s, 75% from external financing (projects implemented by MINEF). The institutional audit (I&D, 2001) noted that *'...a relationship of dependence has become established between agent and operator. The latter often 'helps' the agent to make it to the end of the month or to deal with a difficult situation (illness, return to school, etc.), in exchange for the agent not being too fussy about regulations being ignored'*. As regards equipment, information collected by GFW going back to early in the 2000s mentions five 4 x 4 vehicles and 28 motorcycles for all five forest provinces. This is very low and constitutes a major constraint to the efficiency of agents (I&D, 2002).

- In Gabon, the total staff of the Ministry of Forests, Fisheries and the Environment numbers 781. The Directorate-General for Forestry Economics had a staff of 281 in 2003, at least half of whom were based at headquarters. In the year 2000, the ratio of agents assigned to controls/areas allocated to logging was 1 per 86,400 ha according to GFW data (2000).
- In the Republic of Congo, a study (REM, 2005) indicated that 60% of agents were concentrated in the central services and only a hundred or so were in the control brigades, which corresponds to one agent to supervise 100,000 ha of harvestable forests. The average salary of these agents is around 30,000 FCFA a month (excluding bonuses).
- In CAR, the Ministry in charge of forests has about 350 agents (FOSA-FAO national prospective report, 2001), with a high concentration at the local level.
- In DRC, the Ministry in charge of forests is grossly under-equipped, with the provincial delegations having virtually no resources and agents entirely dependent on economic operators for their travel and even for their subsistence.
- No data is available for Equatorial Guinea.

The low salaries and the lack of material and human resources are a common situation in these countries. Lack of motivation among agents is a common phenomenon, particularly in categories B and C (middle management, technical agents) in the field (Pousse E. & F., 2006). The agents are frequently dependent on the economic operators, but it should also be emphasized that the incentive systems (in the form of direct or retroactive bonuses) for penalized offenses encourages agents to penalize in order to make a transaction; a system which gives the administration a preponderant role to the detriment of legal proceedings. Consequently, **there is a risk of offenses not being penalized as a function of their gravity with respect to environmental management considerations, but rather as a function of how advantageous the transaction is for the agent.**

In recent years, there have been two parallel phenomena encouraged by funding agencies:

- The use of independent observers for controls in the field, whose role is to carry out joint control missions with the forestry administration to be followed up by published reports. This task was entrusted to the NGO Global Witness in Cameroon in the early 2000s and in 2005 the NGO Resources Extraction Monitoring (REM) carried out a feasibility study at the request of the Congolese government in the Republic of Congo. It is also important to mention the role of Global Forest Watch (GFW). GFW is attached to WRI, has offices in the subregion and prepares interactive maps centered on the utilization of forests, presumed illegal logging and other useful data.
- A move towards the privatization of control systems, firstly at the level of timber exports and increasingly in forestry controls in the field. These tasks are entrusted to specialized private companies (SGS-Forestry) and controls are being split up between the administrative structure and the private structure.

Thus, one of the sovereign powers – that of controls – is being 'delegated' increasingly to private companies, although without losing the traditional administrative structures carrying out the same tasks. Is this partial 'duplication' of public tasks by the private sector a viable solution? It is at the very least an expensive solution for those being controlled, even those that are in order. Dual checks cost money (additional export tax) and time (twice as much for 'paperwork' and other time-consuming chores). The alternative would be a thorough reform of the administrative system to make it more efficient or the introduc-

tion of criteria for management, remuneration, penalties and advancement (drawing on examples from the private sector) in the administration's control units (special corps). These control units would operate autonomously, but there would be a strong incentive for administration agents to join this corps and, in the event of poor performance, they would run the risk of their returning to the normal administrative system.

Summary and prospects for harmonization

The legislations of the countries of Central Africa have been renewed over the last ten years. Many factors now allow advances to be made towards sustainable forest management.

The forestry codes contain numerous similar clauses regarding management plans, for example, but remain somewhat dissimilar on many issues. The question of the status of forests is largely influenced by the juridical traditions of each country and the link-up with national land tenure laws. According to good legal logic, classification should be regarded as a prerequisite for management because it sets the geographical limits of the forest that is conceded. Uncertainty as to the limits gives rise to problems of a fiscal nature (concessionaries pay for an area which will perhaps be reduced in size) and of a technical nature (basis for the management plan). Cameroon has fallen behind in the classification of forests, but has prepared a land use plan for forested land which allows the players to be closely involved in both the short and long term. Other countries such as Gabon, the Republic of Congo and CAR, which are planning classified forests, will also be faced with this problem. All these countries will have to formulate land use plans based on zoning proposals that will strengthen the rule of law, which is often more theoretical than real when it comes to the legal status of land.

Community forestry has become well established in Cameroon and Equatorial Guinea but has yet to be implemented in Gabon or DRC. Forestry codes in CAR do not cover it, but a pilot project aims to fill this gap. Nothing has been announced in the Republic of Congo. Only Cameroon has explicitly provided for forests belonging to the local authorities. While the guidelines for forest management are common to all the countries, only Cameroon, CAR and Gabon have produced operational national standards. DRC and Equatorial Guinea have made little progress towards effective forest management, in spite of the stipulations of their national laws.

As regards industrialization, while the objectives for the development of local processing may converge, the means applied are not the same; the guidelines of the Gabonese code exist side by side with the partial ban on exporting logs in force in Cameroon or the substantial financial penalties on non-quota exports in the Republic of Congo. Cameroon stands out for its competitive tendering mechanism whereas elsewhere the allocation of permits remains largely discretionary.

Forest taxation systems have moved closer together with the recent waves of reforms, marked in particular by the introduction or strengthening of the surface area tax system and the increase in tax pressure. However, they remain different in terms of tax levels and structures, with a greater burden at the upstream end of the sector in Cameroon and downstream (exports) in Equatorial Guinea, Gabon and CAR. Few incentives are contained in the tax systems in force, other than lighter taxation for processed products. Gabon is halving the surface area tax for managed permits, while CAR and, to a lesser degree, Cameroon and DRC are partly adjusting export taxes according to transport costs. DRC has introduced interesting provisions favoring the promotion of abundant secondary species, cutting by half certain taxes on Tola (*Gossweilerodendron balsamiferum*) and perhaps on other secondary species in the near future.

One of the weaknesses of the legislations is the **absence of clear and secure frameworks for small-scale logging and processing**. These constitute a popular and growing economic activity meeting real needs that can not be met by the more export oriented industrial companies¹⁴. To combat illegal logging, the governments have cancelled or suspended permits by volume, which were often diverted from their intended use, but which allowed small-scale sawmills to operate within a regulatory framework. Many of these players are thus 'criminalized' and continue to operate in the informal economy; this leads to a loss of control by the authorities over entire areas of this activity, whose impact on forest resources can be significant, and causes permanent legal insecurity for these economic players. Furthermore, in the absence of clearly established property laws relating to forest resources in farmers' fields (wood plots, fallow fields) situated in areas of non-permanent forest, supplies to small-scale sawmills cannot be organized on the basis of contractual agreements with farmers in forest areas (whereas such agreements would encourage the latter to plant trees and conserve wooded resources on their land).

¹⁴ *Estimations for Cameroon (Plouvier et al., 2002) and DRC (Djire, 2003) suggest that the volume of logs harvested by these activities surpasses a million m³ for each of these countries.*

The application of laws also varies considerably from country to country and in terms of the clauses. Management obligations apply to all concessions, but not all the latter have a management plan (far from it in fact). It is true that there have been long delays between passing of the laws and the appearance of the implementing texts, and national management standards only exist in three of the six countries. The fact remains that governments hesitate to apply their laws; the decision by Gabon to grant a tax discount to companies doing no more than complying with the law by developing a management plan may seem surprising, but clearly shows that social and political considerations act as brakes when it comes to applying dissuasive measures, such of cancellation of a logging contract for noncompliance with the law. **The paradox is that this lax approach on a key issue exists side by side with extremely particular provisions whereby the administration penalizes operators for not rigorously following the felling plan in the cutting units** (felling a legally harvestable species not initially provided for in the plan) **without there being any clear benefit in terms of sustainable management.** Mention should also be made of the influence of the system of transactions connected with 'disputes', which allows agents to collect a substantial percentage (25% in Cameroon and 30% in the Republic of Congo, according to their respective codes) that goes to the Forestry Fund, which is often the source of additional bonuses for agents. This practice enables the forestry administration to benefit considerably from fines collected on a transaction whereby once the transaction has been requested no further legal action is taken (*'sollicité, éteint l'action publique'*; Art. 146 – 2 of the Cameroonian code). This results in regulatory systems that are sometimes unnecessarily complex and a host of preliminary authorizations that generate more opportunities for offenses. An alternative concept for this juridical/regulatory mechanism would be to allow the field operators greater leeway by clearly defining the range of prohibited activities (proven risk to the environment or to health) and considering all the others to be legal.

The question of the subregional harmonization of legislations and policies

On the seventh of June 2004, the government representatives of the countries of Central Africa adopted a convergence plan aimed at harmonizing their policies. Several themes were addressed, including policies and taxation, with the objective of developing 'forest management standards [which are] compatible'; ensuring that 'the different taxation systems are harmonized and compatible with the requirements of sustainable management of forests'; and carrying out environmental impact studies 'before any major intervention in forests'. The plan provides for numerous comparative studies, a subregional consultation forum and the centralization of information at COMIFAC. The cost of the component 'harmonization of policies and taxation' was estimated at over 14 billion FCFA for the period 2004-2006 and 56 million dollars for the ten-year period 2004-2013. Financial resources are a limiting factor for the implementation of this plan and at the Summit of Heads of State in January 2005 in Brazzaville the idea of a financing mechanism based on 'the levying of a tax on revenue from all exported forest and wildlife products'¹⁵ was adopted. The percentages collected would go into a subregional fund that would finance COMIFAC. This mechanism 'would free the member countries of the constraints connected with the annual payment of equal contributions to COMIFAC'. However, this formula can be interpreted in two ways: (1) the allocation to this fund of a fraction of the taxes that already exist or (2) the creation of a new tax (like the levies introduced in Cameroon, CAR and the Republic of Congo to finance the structure - private or mixed - for controls on exported forest products). The latter solution would exacerbate the existing tax pressure on companies.

The question of harmonization of policies or the 'compatibility' of standards remains ambiguous, in so far as the content of these terms has not been politically and technically explained. As regards management standards, the forest management models adopted by companies are based on the same principles: selective logging with natural regeneration, possibly assisted, and similar rotation durations (between 25 and 30 years) on plots whose areas are determined as a function of their potential for sustained harvesting. The inevitable spread of certification in the subregion is going to bring management practices closer together, from both the forestry and social points

¹⁵ *Putting in place an independent financing mechanism for COMIFAC.* (Working document from February 2005).

of view. Because it was instigated by forest companies and private management or certification structures, convergence is thus already well under way. Its development should be based on the need to take more explicit account of ecological criteria resulting from forestry research.

From the social angle, whether it be redistribution mechanisms (through provisions in the 'general conditions' documents), locally appropriated taxation, community forests or local authority forests, convergence is slower and is encountering institutional differences that extend beyond the strict framework of the forestry sector (extent and means of decentralization). To these must be added the specific local political agendas and different governance methods of the countries concerned.

As far as taxation is concerned, the points of convergence can be easily identified, both as regards tax pressure per m³ of timber (weighted by average transport costs, which vary from one country to another) and as regards the taxation structure (distribution between upstream and downstream ends, tax base). The beginnings of convergence can be clearly seen in the direction of the reforms carried out over the last ten years, often influenced by the World Bank. However there are still tangible differences and the subject of taxation, where governments are the least inclined to abandon what they consider to be their sovereign attributes, will continue to be a sensitive topic in the national political debate.

Export and import policies for forestry products have moved closer together, but the methods differ with some countries being more inclined to use a ban on exports of logs and others favoring tax incentives. The question of the free movement of goods within the CEMAC area will constitute a significant test for the five member countries (DRC forms part of SADEC): according to this common market treaty, no export duties will be paid on logs produced in a country or on other forestry products intended to be consumed or used as raw materials. Article 179 of the Forestry Code of the Republic of Congo stipulates that: '... the holders of logging contracts must supply, as a priority, extracted timber to industries installed on the national territory' whereas the community logic dictates that the relevant distinction should be between the CEMAC area and outside. However, it is hard to imagine the countries looking kindly upon industries in one CEMAC nation obtaining their supplies of logs from another country in the CEMAC region, thus creating industrial employment on the other side of the border. Clearly this is a significant constraint to integration and the

distribution of labor at the community level.

Harmonization of legislation should be a means to simplify certain elements in the laws and regulations and to accent rules that are really important from the point of view of sustainable management of forest resources and the associated social aspects. This would make it possible to adapt the legislation to the capacity of the State and society in order to actually implement them. It would also reduce any ambiguities that may lie in their interpretation and would streamline 'adjustment' procedures to reduce the risks of arbitrary application of clauses that are too strict. This would reassure the different players in the sector and encourage long term commitment.

Legislative and Institutional Aspects	Cameroon	Gabon	Republic of Congo	Democratic Republic of Congo	Central African Republic	Equatorial Guinea
<i>Date of forestry law</i>	1994	2001	2000	2002	2000	1997
<i>Land Use Zoning Plan</i>	Yes, in the southern part of the country	In progress of preparation	No	First tests in progress	Planned	Land classification map published in 1999 by the CUREF project and validated
<i>Permanent Forest Domain (legally established, not established)</i>	38 classified UFAs (as of 30 June 2005), process in progress for 57 others	No (few classified forests)	No, classification of forests is planned	'Permanent production' forests are planned	No (no classified forests)	No
<i>Regime for allocation of concessions (mutually negotiated agreement/invitation to tender/invitation to tender with financial component)</i>	Invitation to tender, with technical pre-selection, then technical offers (30%) and financial offers (70%)	Mutually negotiated agreement, 45% of areas are on 'lease'	In theory: invitation to tender. Technical criteria such as industrialization project. No 'financial offer' component	Moratorium on new allocations pending the development of a tendering procedure combining technical and financial criteria	Since May 2005: invitation to tender as in Cameroon, but 40% for technical criteria and 60% for financial criteria	Mutually negotiated agreement
<i>Duration of concessions</i>	15 years, renewable once	Renewable rotation (generally 30 years)	15 or 25 years renewable	25 years	For the life of the company	15 years renewable
<i>Management obligation</i>	Yes. A management plan must be prepared during the 3-year provisional agreement, but several provisional agreements have passed the specified 3 years	Yes (partly applied). Surtax for non-application	Yes. Process progressing in the north, but non-application in the south	Yes (since new code). Will take several years	Yes. Only country where plans are implemented jointly by a public structure (PARPAF project) and the concessionaries.	Yes (not applied)
<i>National management standards</i>	Since 2002: Decree 222/A/MINEF of 25 May 2002	Since 2003, pending official confirmation by decree	No, but operational directives	No	Technically validated and applied since 2001. Regulatory text in course	No
<i>Proportion of logs required to be processed in country</i>	Local processing of 100% for category 1 species and logging authority subject to payment of surtax for category 2 and 3 species. Annual export quotas provided for – but not applied – for some species (Ayous and Azobé)	No legal restriction, but objective of stepping up local processing.	On a 'transitional basis': 85% of the production of each company; rule not uniformly applied. Complete prohibition provided for in the code. Progressive surtax above 15% of logs exported.	70% of the production of each company since the new code. Difficult to apply in the short term.	60% by the permit holder (code of 2000) The 2000 Finance Act raised this threshold to 77%	Only 60% local processing required, below which exporters pay a tax penalty. Seems to be rarely applied.
<i>Areas under management</i>	48 UFAs (i.e. 42 concessions) have a management plan validated by the administration, representing a total area of over 3 million ha	Process started on 6.5 million ha	Two plans completed and awaiting approval; Process started for 5.5 million ha	3 companies have started work leading to management plans (total of 677 million ha)	A management unit (PARPAF project) is preparing the plans for the country's 6 concessionaries. 2.8 million ha in process	Pilot management inventory for a concession of 50,000 ha through the CUREF project
<i>Concessions with certification</i>	1 ESC certified concession (December 2005). FSC certification process in course for 2 concessions	2 concessions certified according to the Dutch 'Keurhout' system, 2 ISO 14000 certified companies	1 concession certified according to the Dutch 'Keurhout' system. FSC certification process in course for the same company	0	Certification process Origin & Legality Standard (OLB-EUROCERTIFOR) in course for 1 concession	0
<i>Ceiling on areas that can be accumulated</i>	200,000 ha per company (several large groups hold over 200,000 ha and up to 600,000)	600,000 ha, but 3 companies alone own 700,000 ha	No ceiling	500,000 ha (except for acquired rights, some groups or companies have almost 3 million ha)	No ceiling	50,000 ha (a Malaysian company, Shimmer International, holds about 500,000 ha)
<i>Community or local forestry</i>	Community forests (5,000 ha max.): 59 approved, 225,615 ha Communal forests (one to date): 16,250 ha, but planned for over 600,000 ha (UFA applied for by municipalities)	Community forests provided for in the 2001 Act. Nothing concrete to date	Nothing provided for	Recognized 'Local community forests'. No ceiling on area. Decree to come with detailed rules. The 'decentralized entities' will also be able to obtain forests	6 pilot community forests (backed by project) but nothing provided for in the present code; a draft is in course	'Communal forest' where the State recognizes a right of permanent use for the rural communities

Table 8.7. Comparison of forestry legislations across Central Africa.

Taxation	Cameroon	Gabon	Republic of Congo	Democratic Republic of Congo	Central African Republic	Equatorial Guinea
<i>Estimated average tax pressure per m³ of product (FCFA/m³)</i>	30,000 (exported Ayous logs), i.e. 28.5% of FOB 36,500/m ³ sawn timber, i.e. 14% of FOB	About 26,000 for exported logs (28% of FOB) on a managed permit, 27,000 on an unmanaged permit (29% of FOB). Veneers: from 12,700 (managed permit), i.e. 5.4% of FOB, to 14,400 (unmanaged), i.e. 6.1% of FOB Sawn timber: from 19,700 to 22,800	From 21,618 (South) to 23,137 (North) or 11.6% to 14.6% for a 'panier export' (exported goods) FOB value per zone Sapelli export logs North: 19,300 to 34,350 (according to surtax) Okoume export logs South: 18,240 to 29,800 27,200/m ³ sawn sapelli	39 \$/m ³ (2004), i.e. 14.4% of the FOB value of a 'panier export' (exported goods) comprising 70% export logs and 30% sawn timber 33.8 \$/m ³ exported sapelli, i.e. between 12% and 19% of FOB 41.7 \$/m ³ sawn sapelli, i.e. 8-10% of FOB	About 26,500 for exported sapelli logs (i.e. 17.6% of FOB) and 34,900/m ³ of sawn timber, i.e. 11.8% of FOB	41,000/m ³ of exported okoume logs, i.e. 39% of FOB 31,000/m ³ of veneer (about 15%)
<i>Amount of surface area tax (concessions)</i>	Minimum: 1,000 FCFA/ha Average recorded since 1996: about 2,700 FCFA/ha	600 FCFA/ha in 2000 300 FCFA/ha only for companies engaged in the management process	350 FCFA/ha (North) 500 FCFA/ha (South) Discount of 20% on average to account for surface area that is actually exploitable.	0.0014 \$/ha up to 2002 0.067\$/ha in 2003 0.10 \$/ha in 2004 0.20 \$/ha in 2005 0.50\$/ha in 2007 Tax in annual logging permits: \$2 in 2004, \$10 in 2005	500 FCFA/ha/year	Between 2,500 and 3,000 FCFA/ha according to area
<i>Felling tax</i>	2.5% of FOB LM minus 20%	3%, 5% or 9% (depending on the zone) of an administrative price of the 'bracket value' type	3% FOB LM value	1.25% of Ex-Works value (EXW: FOB minus average transport cost of \$50 or \$80)	7% of administrative value (FOB LM minus 40%)	80% of the 'standing value' (defined as worth 8% of FOB)
<i>Exit duties on logs</i>	17.5% FOB value + surtax according to species	17% of FOB value	From 8.5 to 10%, according to zone (4) with an administrative FOB value fairly close to real prices	6% administrative value (fairly far removed from real prices) + 4% of EXW value (FOB minus average transport cost) as reforestation tax	10.5% FOT value (reduced FOB) + reforestation tax: 11% of administrative value	30% of official FOB value
<i>Exit duties on processed products</i>	Replaced by a tax on logs entering the factory (2.25% FOB on incoming logs)	No	From 0.5% to 4.5% of an administrative FOB value - poorly reflecting real prices	In 2005 (planned): 1% non-dried timber, 0% dried In 2006 (planned): 2% non-dried timber	4.5% FOT value for certain species only	10% of official FOB value
<i>Incentives or other specific measures</i>	None	Reduced surface area tax for managed permits No export taxes on processed products	Surface area tax on estimated surface that is actually exploitable	Surface area tax on production runs only (after management). Reforestation and felling tax lower for remote areas (EXW). Export taxes reduced by 50% for promotion species (tola, etc.) No export taxes on dried sawn timber	Surface area tax on estimated surface area that is actually exploitable. Export taxes lower for more remote areas	None
<i>Revenue for Treasury and Forestry Fund (in billions of FCFA)</i>	25 (2000-2001)	19.8 (2001)	12 (2003)	\$2 million (2002) (about 1.2 billion FCFA)	8.335 (2001)	Not available

Table 8.8. Comparison of forestry taxation in the countries of Central Africa.

9. Central African Forest Cover and Cover Change Mapping¹

Introduction

Mapping Central African vegetation began in the 1930's following the completion of the first botanical and ecological studies. These mapping efforts were based on aerial photography interpretations coupled with numerous ground-based observations. National and regional maps were mainly derived from the compilation of local studies, resulting in compatibility problems such as the matching of contiguous map edges. The UNESCO/AEFTAT/UNSO (White, 1983) potential vegetation map of Africa is the result of a long effort to mosaic existing maps and standardize existing documents with local experts. The vegetation map of Africa produced by the *Institut de la carte internationale de la végétation* is also based on the compilation of information existing at the national level, and on the interpretation of Landsat mosaics for transition zones.

For the past ten years, Central African vegetation maps, and forest cover changes estimates, have been primarily derived from satellite imagery, which provides undeniable benefits: simultaneous data acquisition over very large areas, repeated acquisition (for a better monitoring of seasonal and inter-annual ecosystem evolution), better geographic accuracy, and observations in wavelengths beyond the visible range (increase of thematic information). These innovative projects have demonstrated not only the possibilities for improving vegetation mapping, but also revealed limitations that need to be taken into consideration when mapping Central Africa.

- In particular, the quasi-permanent **cloud coverage** over numerous areas of the Basin (Atlantic Coast, South Congo) poses difficulties for accurate mapping. There are two options to overcome cloud coverage: daily acquisition of coarse resolution optical data (SPOT VEGETATION, MERIS, MODIS) or radar observation (ERS, JERS, Radarsat) that are not affected by cloud coverage.
- **Coverage** of the region from high-resolution polar orbiting sensors is rare.
- Another limitation is the absence of a **permanent receiving station** in the region. Mobile receiving stations, portable acquisition systems, and on-board recorders can provide potential solutions to this problem (Box 9.1).
- Difficult access to the field due to limited in-

frastructure impedes validation efforts.

- **Vegetation seasonal effects** require the use of systems with high temporal acquisition frequency (optical systems with coarse spatial resolution).

Forest Cover Mapping

Data and Methods

The most reliable maps for an objective assessment of Central Africa forest cover are derived from moderate (250m, e.g. MODIS) and coarse (1 km, e.g., SPOT) spatial resolution optical satellite data.

Each operational satellite system has advantages and disadvantages for discrimination of forest types. The main parameters to consider are wavelength (for example, observations in the mid-infrared portion of the spectrum—1.6 μm —will provide better indication of vegetation water content), spatial resolution (in particular for areas of human disturbance and areas of high landscape heterogeneity), and observation frequency (in the case of seasonal vegetative cover types or in areas with persistent cloud cover). However, the class definitions of thematic classes for maps derived from satellite imagery are essentially based upon physiognomic-structural vegetation traits, which leads to simplified legends when compared to other, more detailed floristic maps.

Recent technological advances have led to improvements in the spatial resolution, number and range of observable wavelengths (from the visible to radar), and acquisition frequency (for instance using satellite constellations) of satellite-based observations.

Vegetation mapping efforts have evolved from a 4km spatial resolution in the mid-eighties, to, currently, more precise 250m maps that better capture thematic and spatial detail.

For an initial survey of the forest zone of Central Africa, we performed a synthesis of two maps, one produced from SPOT VEGETATION imagery (GLC2000-Joint Research Center), and the other produced from MODIS data (University of Maryland and South Dakota State University). These maps were combined to produce a consolidated map based on the analysis of the strengths and limitations of both products. Topographic information was used to discrimi-

¹ This chapter was written by M. Hansen, D. Devers, Ph. Mayaux, P. Defourny, and G. Duveiller.

nate between altitudinal forest classes in the forest domain.

A more precise thematic map of the Democratic Republic of Congo has just been produced by the *Université catholique de Louvain* (UCL) (Box 9.2), derived from SPOT VEGETATION imagery, but this map does not cover the whole region and was not included in the regional synthesis.

The following vegetation classes were used:

- Dense humid coastal forest (includes evergreen and semi-deciduous formations with an elevation below 300m)
- Mid altitude dense humid forest (300-1000 m elevation)
- Submontane dense humid forest (1000-1600 m elevation)
- Montane dense humid forest (>1600 m elevation)
- Swamp forest and mangroves
- Secondary forest and rural complex
- Dry dense forest and miombo
- Forest – savannah mosaic
- Woodland and parkland savannah
- Shrubland
- Grassland and bare soil
- Swamp grassland

Map Description

The coastal dense forest is found in the western part of Cameroon, in the mainland part of Equatorial Guinea, and in the coastal area of Gabon west of Lambaréné. Mid-altitude dense forest covers the major portion of the Congo Basin from mid-Gabon to Kivu. Submontane forests occur on the edges of the Basin and in several forest blocks, such as on the Chaillu or the Belinga massifs, and feature high biodiversity. Two small mountain forest blocks exist in the Albertine Rift and in the foothills of Mount Cameroon. The central part of the Congo Basin, straddling both Congos, is covered by one of the world's largest inundated tropical forests.

The transition between the forest domain and savannah is relatively abrupt, in the North as well as in the South. This transition zone features marked disturbance and the presence of derived secondary savannah formations. Gallery forests of variable width stand in the Sudanian and Zambezi savannahs. Gallery forests present similar physiognomic characteristics to the dense forest, but cannot be classed in the same category, since they do not have the same ecological function nor the same economic value.

Within the Central African forest block the presence of areas of forest degradation varies from

one region to another. Analysis of these degraded areas provides useful information about land cover change dynamics. In the central part of Cameroon and in Equatorial Guinea, anthropogenic factors have affected large areas, especially in high population density zones. For instance, around Yaoundé, existing forest blocks are continually exploited and persist only in areas not suitable for agriculture.

In eastern Cameroon, CAR, Gabon, and the Republic of Congo, forest fragmentation is much less visible on regional maps. This is due to lower population pressure and consequently less agricultural activity. Forest exploitation in this region, largely selective logging, is not visible at the spatial resolution of either the SPOT or the MODIS sensors.

In the Democratic Republic of Congo, the forest is traversed by a dense road network, dating from the colonial area. The roads are bordered by rural complexes that include villages, food-producing areas, industrial plantations, and fallow areas. During the colonial period, villages were relocated to these transportation corridors, and even if the roads are no longer functional, the villages have remained in place. Degradation along road networks is continually expanding and these networks are the primary spatial indicator of future degradation.

Derived Forest Areas

Two major sources of error affect forest cover statistics derived from coarse and moderate spatial resolution satellite maps: unavoidable classification errors and spatial aggregation, which tends to underestimate finer spatial scale features, especially for maps at 1 km resolution.

The areas of disagreement between the GLC2000 and MODIS maps are found largely in the western area of the forest zone. Around Yaoundé, in Equatorial Guinea, and in the Chaillu Mountains in southern Congo, large forested areas are classified as dense forest by GLC2000 and as rural complex by MODIS. The latter classification is closer to reality.

In Gabon, small rural complex areas randomly appear in the MODIS map and correspond probably to artifacts linked to high cloud coverage.

In CAR, gallery forests identified as dense forest have been reclassified in a special class because they do not have the same ecological and economic roles as dense forest. Gallery forests cover about two million hectares.

In the Democratic Republic of Congo the two maps largely concur with differences attributable

Table 9.1. Forested areas in 1000 ha. Humid tropical forest areas derived from MODIS and GLC2000 maps and from the Global Forest Resources Assessment for the year 2005 (FAO, 2006). FAO estimates originate from harmonized national statistics.

	Forested areas derived from MODIS (1999-2002) and GLC2000 maps	World forest status in 2005 (FAO)
Cameroon	19,639	21,245
CAR	6,250	22,755
Republic of Congo	22,263	22,471
Equatorial Guinea	1,900	1,632
Gabon	22,069	21,775
DRC	108,339	133,610
Central Africa	180,460	223,488

to the different spatial resolution of the SPOT and MODIS sensors.

Compared to FAO (Table 9.1), the main differences are noted in countries that have large areas of wooded savannahs, which are assessed as forest by the FAO (>10% of canopy cover). This is the case of DRC (+23%) and especially of CAR (+264%).

When dense forest is disaggregated by topography and hydrography (Table 9.2), we note that 80% of the forests are located between 300 and 1000 m of altitude, while coastal forests and inundated/swamp forest each comprise about 7% of the forested area. Submontane and montane forests represent only 3.6% of the forested area.

Forest Cover Change

Forest cover change measurements need to take into account the spatial characteristics of change processes in Central Africa and the challenges of acquiring data over humid tropical forests, which are under quasi-permanent cloud cover (Box 9.3).

- Zones of deforestation are relatively small, and their measurement requires data at an appropriately fine spatial scale.
- Forest blocks, in other words 'deforestable' areas, are extensive, but deforestation is not uniformly distributed in time and in space. Change is a distinctly non-random process.
- The time scale of measurement needs to be adapted to the processes and to the spatial distribution of deforestation (Box 9.4).

Table 9.2: Distribution in % by dense humid forest type.

	Coastal forest (0-300m)	Intermediate forest (300-1000m)	Submontane forest (1000-1600m)	Montane forest (>1600m)	Inundated forest and mangroves
Cameroon	14.7%	82.8%	1.5%	0.3%	0.6%
CAR	-	99.6%	0.3%	-	-
Republic of Congo	9.0%	71.1%	-	-	20.0%
Equatorial Guinea	23.3%	76.4%	0.3%	-	-
Gabon	32.6%	66.7%	-	-	0.7%
DRC	0.7%	85.5%	4.4%	1.3%	8.0%
Central Africa	7.5%	81.5%	2.8%	0.8%	7.4%

It is not currently possible to measure forest cover change annually at fine spatial resolutions. With existing data sets, and improved sampling methods, it is possible to update forest cover change dynamics for most of the Basin in 5 to 10 year intervals.

Continental Deforestation Estimates

Remote sensing tools are perfectly adapted to measure deforestation in large and inaccessible areas such as Central Africa. Several strategies have been developed in the past to measure in a precise manner deforestation at the global or continental scale: random sampling (FAO-FRA 1990) or systematic sampling (FAO-FRA 2000) of high spatial resolution imagery, an exhaustive coverage with high resolution optical data (Landsat Pathfinder), and detection of zones of rapid change ('hot spots') with coarse spatial resolution data in combination with expert opinion and use of higher resolution imagery to measure deforestation in these zones (TREES).

According to expert analysis and developed models, the major sites of deforestation are in southern Cameroon and in DRC. High population growth, concentrated in cities like Douala, Yaoundé and Ebolowa, has increased agricultural pressure. Forest access is facilitated by the construction of logging roads by logging companies. In DRC deforestation is concentrated along the road network; the principal cause is the demand for food products in the big cities of the region (Kinshasa, Kananga, Mbuji-Mayi, Lubumbashi, Kisangani, Brazzaville and Bangui).

In areas of higher population density, along existing road networks that are relatively well-connected to urban areas, change is driven by local farmers. In the interior, logging companies, exploiting concessions attributed by the government, open networks of primary and secondary roads that fragment the canopy cover. When the urban demand for food products (cassava, bananas, maize, bushmeat, etc.) is great, people settle along those openings and start trading such products, which results in the colonization of primary forests. If the demographic pressure is low, forest trails can close up in only a few years.

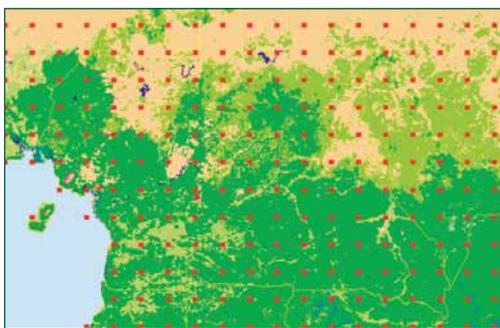


Figure 9.1: Theoretical statistical scheme for the northeastern sector of Central Africa showing the grid used to calculate deforestation and degradation (Source: JRC).

National and Local Deforestation Estimates

Methods

The above mentioned strategies, developed for the most part at the end of the nineties, did not provide national scale deforestation rates, nor did they provide reliable regional scale deforestation rates due to inadequate sampling.

More recently, teams have opted for two different approaches allowing finer measurement of forest cover change: an exhaustive ('wall-to-wall') deforestation mapping of the areas of interest (work in progress at the University of Maryland and South Dakota State University for CARPE in the landscapes— Box 9.5), and a finer sampling scheme of smaller units (Figure 9.1) for which the results have become recently available (Joint Research Center and *Université catholique de Louvain*).

The statistical scheme applied in the JRC/UCL study is a systematic grid sampling of $\frac{1}{2}$ square degrees. Units of observation are 10 by 10 km subsets from Landsat images from the years 1990 and 2000 (± 2 years), which gives an approximate sampling density of 4%. FAO proposes to use this statistical scheme to compute its future global estimates.

National Estimates

The JRC/UCL sampling scheme provides estimates for deforestation with each country. Within all the observation units (10 by 10 km subsets), only images over the forest domain are analyzed. Cloud coverage poses a major problem in the coastal region. As a result only 20 to 30 % of the units can be analyzed in Gabon and Equatorial Guinea. A review of all available images shows that close to 60% of the images do not show any forest cover change between 1990 and 2000. Table 9.3 details the parameters for each country.

The adopted statistical scheme and image availability constraints permit derivation of forest change estimates for relatively large units, such

as countries or landscapes. Regional estimates, as well as first national estimates, have been produced based on the 374 samples. National estimates will be more precise for countries that have many observation units (DRC, Republic of Congo, Cameroon) than for other countries. In the latter case, a higher density of samples should allow for results with the same precision.

Table 9.4 details national estimates of gross deforestation rate, net deforestation rate (=gross deforestation – reforestation), and net degradation rate (transition from dense forest to degraded forest through small canopy openings). The last line of the table refers to FAO estimates. The deforestation rate of Central African countries is estimated at 0.19%/year, with 0.10%/year degradation. The table shows that deforestation is higher in DRC and in Cameroon—recognizing the weak reliability of estimates for Equatorial Guinea. It is worth mentioning that these estimates are prelim-

inary figures and that they will be fine tuned, notably by including confidence intervals. FAO estimates come from statistics provided by national services, which are often based on old estimates or on expert opinions. It is therefore not surprising that they differ from our estimates, which are based on a more homogeneous method. The case of Cameroon clearly indicates this fact.

These estimates could be sensibly improved in a second phase using co-variables, such as road presence, village or the percentage of secondary forests - variables that could be measured on the total population and not only on the samples. Spatial statistical techniques will be used to produce consolidated statistics in the near future.

Landscapes estimates

Deforestation estimates could also be produced for sufficiently large landscapes and for landscapes where cloud cover is low. Table 9.5 synthesizes observation parameters and estimates per landscape. It should be noted that landscapes close to the Atlantic Coast (Lopé, Gamba, Monte Alén) have fewer samples and thus do not allow for accurate estimates. A combined estimate for all the landscapes can nonetheless be proposed to answer the following question: Is deforestation lower within the landscapes or outside of the landscapes? For the 1990-2000 period, this gives us an indication of the threat level with which the landscapes were confronted at the time of their selection. The results are quite clear: the deforestation rates observed within the landscapes (0.078%/year) is less than half of the deforestation rate observed for the region. The only landscape that has a relatively high deforestation rate is Maiko-Tayna-Kahuzi Biega (close to 0.3 %/year).

Forest change has been mapped exhaustively for three landscapes from high resolution satellite data for the same time interval by UMD/SDSU researchers using a wall-to-wall methodology. For Maringa-Lopori-Wamba the estimates are close to the estimates derived from the JRC/UCL methodology (close to 0.1 %/year), while they diverge quite clearly for Salonga (0.074% and 0.038%/year).

Table 9.3: Parameters of analyzed samples.

Country	Theoretical number of samples	Number of samples analyzed	Number of samples with change	% of samples analyzed	% of samples with change
Cameroon	63	29	8	46.0	27.6
CAR	16	12	4	75.0	33.3
DRC	338	266	129	78.7	48.5
Republic of Congo	80	47	13	58.8	27.7
Equatorial Guinea	9	2	1	22.2	50.0
Gabon	63	18	5	28.6	27.8
Central Africa	569	374	160	65.7	42.8

Table 9.4: National annual rate estimates of gross and net deforestation and net degradation for the time interval from 1990 to 2000, based on the JRC/UCL sampling method. FAO estimates are included for comparison. The regional estimates are corrected as a function of the number of subsets actually analyzed in each country. The negative signs represent canopy cover reduction.

	Cameroon	CAR	DRC	Equatorial Guinea	Republic of Congo	Gabon	Central Africa
Gross Deforestation	-0.28%	-0.15%	-0.33%	-0.35%	-0.12%	-0.16%	-0.27%
Net Deforestation	-0.19%	-0.07%	-0.26%	0.41%	-0.03%	-0.12%	-0.19%
Net Degradation	-0.02%	-0.02%	-0.15%	0.52%	-0.01%	-0.09%	-0.10%
FAO Deforestation	-0.90%	-0.10%	-0.40%	-0.60%	-0.10%	0.05%	-0.36%

Conclusions

Satellite remote sensing is an efficient tool to map and monitor vegetation in Central Africa. Nonetheless, in order to maximize its efficiency, a number of conditions have to be met:

- A multidisciplinary approach should be adopted by deforestation monitoring teams, including remote sensing specialists, foresters, ecologists and social scientists.
- Deforestation monitoring should be built on a multi-sensor, multi-scale strategy, which combines remotely sensed data (optical or radar) with ancillary data sources (Box 9.6).
- There is a need for improved and meaningful dialogue between field projects and earth observation-based mapping projects. Field projects can provide the definition of user needs and product validation, while earth observation based projects can provide a wider context for field observations.
- Ongoing collaborations between African and non-African institutions should increase technology transfer to build in-country mapping capabilities.

Box 9.1: Data availability

Remote sensing data is critical for policy makers, environmental managers, and scientists interested in understanding land cover and land use change at the local, national, and regional scale. Satellite imagery is also critical for forestry decision support systems.

Until recently, Landsat, given its low cost and unrestricted license use, has been the workhorse for high resolution (20-30 m) forest cover mapping of Central Africa. Unfortunately, on April 2003 the failure of the Landsat 7 ETM+ scan line corrector resulted in data gaps outside of the central portion of acquired images, seriously compromising data quality for land cover monitoring.

Given this failure, there is an urgent need to explore how the ensuing data gap might be filled at a reasonable cost with alternative sources of data in order to meet the needs for operational decision-making. Possible alternative sources of data include Landsat 5 TM, ASTER, SPOT HRVIR, IRS, CBERS or DMC data. However, none of these data sources are optimal, due to the absence of long term continuity, the excessive cost for large area mapping, or the absence of a receiving station or ground segment. Moreover, since the various data sets have different characteristics, it cannot be assumed that products will be comparable.

The participants to the State of the Forest meeting, held in Kinshasa in March 2006 highlighted the lack of current remotely sensed data for ongoing forest monitoring in the region. The concluding report of that meeting recommends engaging space agencies – such as ESA, NASA, JAXA, CNES – to improve continuity and access to high resolution satellite data. Improved data access policies would allow for a true forest monitoring capability.

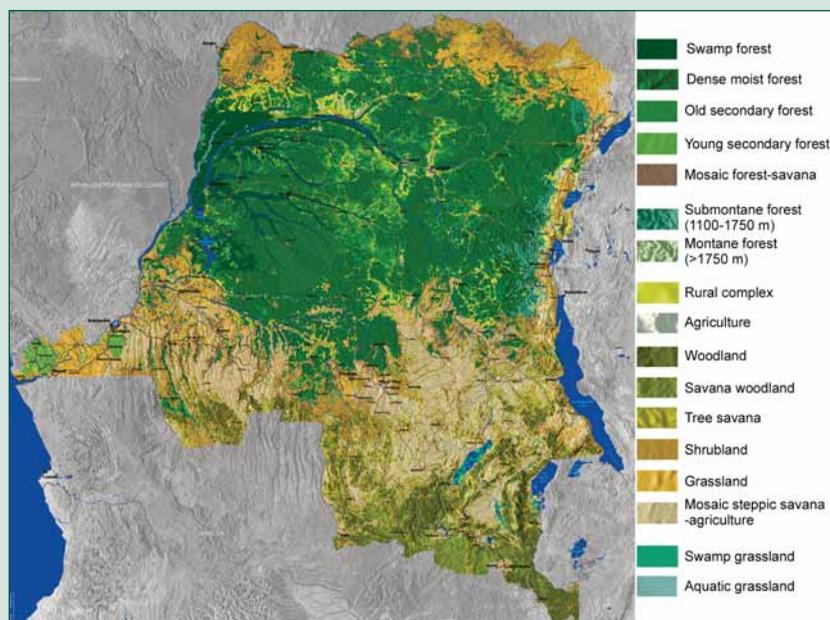
As the science of earth observation monitoring has matured, the providers of the data necessary to make monitoring a reality have not kept pace with the science. In the short term a solution to the current data gap should be pursued. Such an effort would involve the acquisition and compositing of appropriate imagery to generate a mid-decadal data set. This would not only respond to the recommendation of the majority of the stakeholders interested in forest monitoring in the Congo Basin - COMIFAC, National Governments, donors, NGOs, private sectors, observers - but would also respond to the draft Strategic Plans for Global Earth Observation System of Systems (GEOSS), of which CBFP government partners are signatories.

Table 9.5: Landscape annual deforestation rates as estimated for the time interval from 1990 to 2000. The estimate for the entirety of the landscapes is corrected as a function of the number of subsets actually analyzed in each landscape. The negative signs represent canopy cover reduction.

Landscape	Percentage of analyzed subsets	Number of analyzed subsets	Sampling Method (JRC-UCL)				Exhaustive coverage (CARPE-UMD-SDSU)
			Number of subsets with change	Gross deforestation	Net deforestation	Net degradation	
Sangha Tri-National	31.2	5	1	-	-	-	-0.042%
Dja-Minkébé-Odzala (Tridom)	61.3	27	6	-0.079%	-0.003%	0.069%	
Ituri-Epulu-Aru	81.8	9	6	-0.209%	-0.117%	-0.141%	
Monte Alén-Monts de Cristal	36.3	4	1	-	-	-	
Maiko-Tayna-Kahuzi-Biega	73.1	19	8	-0.450%	-0.294%	-0.128%	
Lopé-Chaillu-Louesse	16.7	2	0	-	-	-	
Salonga-Lukenie-Sankuru	80	32	11	-0.114%	-0.074%	-0.040%	-0.038%
Léconi-Batéké-Léfini	33.3	2	0	-	-	-	
Gamba-Mayumba-Conkouati	12.5	1	0	-	-	-	
Lake Télé-Lake Tumba	66.7	30	10	-0.176%	-0.073%	-0.097%	
Maringa-Lopori-Wamba	85	17	5	-0.115%	-0.100%	-0.190%	-0.098%
Total	61.9	148	48	-0.171%	-0.078%	-0.062%	

Box 9.2. A new map of the forests of the Democratic Republic of Congo

This new land use map of the Democratic Republic of Congo produced by the *Université catholique de Louvain* (Belgium) in collaboration with the Joint Research Center (JRC) underlines the impact of the human activities that are widely scattered all over the African forest ecosystems. In total, 17 vegetation types have been identified by ecologists using seasonal information from satellite images acquired in 2000. This map is derived from a temporal series of SPOT VEGETATION images at 1 km resolution. It is the most up-to-date available map giving detailed information for the whole country. The estimated forest area is 1,120,340 sq. km, and represents 47.4 % of the country's territory. Four forest types are categorized: dense humid forest, edaphic forest, old secondary forest and recent secondary forest. These estimates are very close to those obtained by the FAO-Africover project.



These estimates are very close to those obtained by the FAO-Africover project.

Box 9.3. Indicators and factors of deforestation

Some indicators derived from satellite imagery or from geographic information systems enable the detection or prediction of zones of rapid changes.

Forest Fragmentation

Forest cover fragmentation measured using coarse resolution maps is generally superior inside hot spots than outside. However, some highly fragmented regions, such as the Batéké Plateau or the Ogooué Estuary do not correspond to any hot spot zone because their fragmentation is linked to oro-hydrographic or edaphic causes. In order to use forest fragmentation as an indicator of deforestation, we need to discriminate between natural and anthropogenic phenomena.

Transport Network

The road network is a fundamental indicator if we want to predict where deforestation will occur in the future. Two parameters are important: location and status of roads and trails. Location of roads is more easily accomplished than assessing their status. Also the forest trail and track locations, which are often the first axis of forest fragmentation, need to be collected from development projects and logging companies.

Navigable rivers also play an important role in the transport of people and goods, particularly in the central part of the Basin. Unfortunately, there are major gaps in existing river network databases.

Vegetation Fires

Vegetation fires detected by satellite are not useful indicators of deforestation in Central Africa, contrary to the situation prevailing in Brazil. First, clouds very often cover forest zones and impede regular image acquisitions (only a few high resolution images per year). Secondly, forest fires occur frequently in secondary forest zones because they are part of the slash-and-burn agricultural system. These fires, limited by the clearing capacity of one person, are often too small to be detected by satellites. Fires lit by new migrants for forest colonization are very different. They are found mainly in southern Cameroon, colonized by the Bamileke.

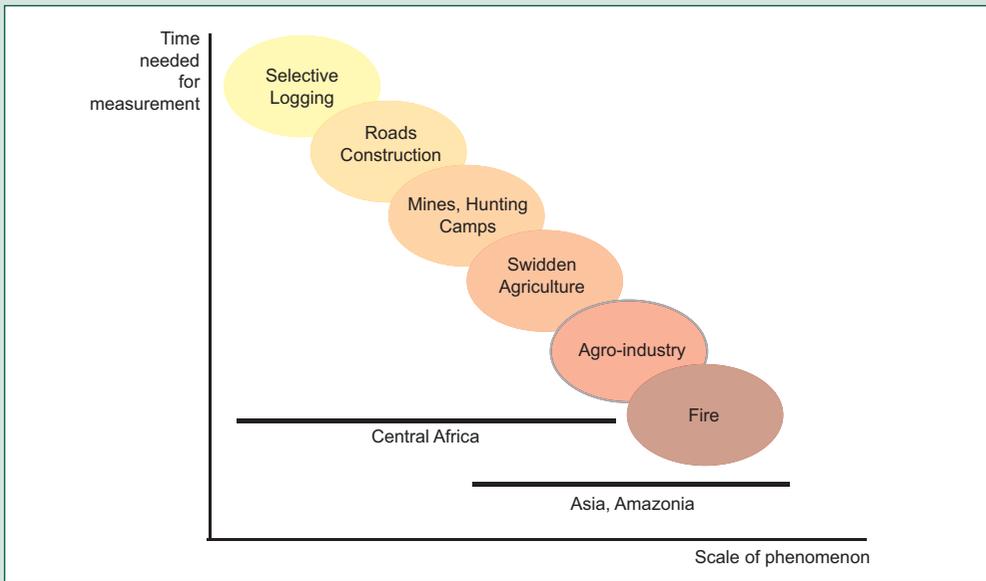
Demographic Growth

In Central Africa, population growth is a significant driver of deforestation. Cities like Yaoundé, Kinshasa or Libreville have developed considerably during the 1970s and the 1980s. The population structure (urban and rural) can have a considerable impact on the different deforestation processes. An increase of rural population leads to a reduction of fallow period, and can lead to soil degradation. Often this happens in secondary forest zones, but when pressure is too high, primary forests blocks can be threatened as well. Fallow periods can thus be a good indicator of demographic pressure. An increase in urban population increases the demand for food products and creates a market in neighboring zones. In that case, the urban population impact on deforestation depends on the accessibility, and by consequence quality, of the transportation network. The poor reliability of demographic data in Central Africa is a major handicap for the implementation of reliable models. Some national censuses date back to the 1970s, while Gabon has population data for 1996. When modeling population dynamics, attention must be paid to the suspect quality of population data. For example, a simplistic model that establishes a linear relationship between population and deforestation should be treated with skepticism. At the initial stage, a population increase can provoke intense forest degradation, but with time the intensification of production techniques reduces the negative impact of population. It is important to be able to estimate the carrying capacity of the different ecosystems concerned.

Logging Concessions

While it is generally acknowledged that excessive logging exploitation has dramatically reduced forest cover in West Africa, the situation is more complex in Central Africa. With sustainable management conditions, logging companies do not represent a major deforestation risk. They generally exploit only a few commercial species without substantially reducing canopy cover. For example, the extraction of 1 to 2 trees per ha reduces the forest cover by 10% (see chapter on commercial forestry). On the other hand, logging exploitation opens new logging trails and roads, increasing access to the forest. It would be interesting to study the impact of new trail construction in correspondence with deforestation measures in ensuing years in the same zone. In that regard, logging concessions maps are of a prime importance for deforestation modeling.

Box 9.4: Time scale to measure change



The method to measure forest cover changes depends largely on the scale and range. If changes occur over very large areas in short time periods (due to fires for example), changes can be detected using sensors with a high frequency acquisition, but with a lower spatial resolution. On the other hand, if changes are small and incremental (selective logging, swidden agriculture), changes can only be detected with precise imagery, even if the acquisition frequency is lower.

Box 9.5: Forest cover change mapping in the Landscapes

The production of a large number of Landsat mosaics allows for the precise mapping of forest cover change in the CBFP landscapes (University of Maryland and South Dakota State University). An example for the Maringa-Lopori-Wamba Landscape is shown below. The primary objective of the project is to create spatially explicit basin-wide maps of forest cover change. By doing so, forest change attributes such as fragmentation can be analyzed over time and correlated with existing *in situ* data sets. This is not possible with a sampling scheme.

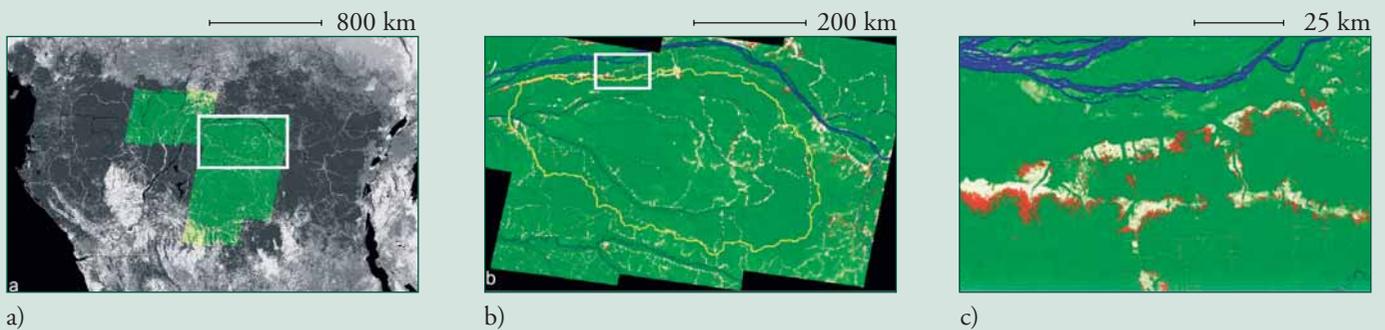


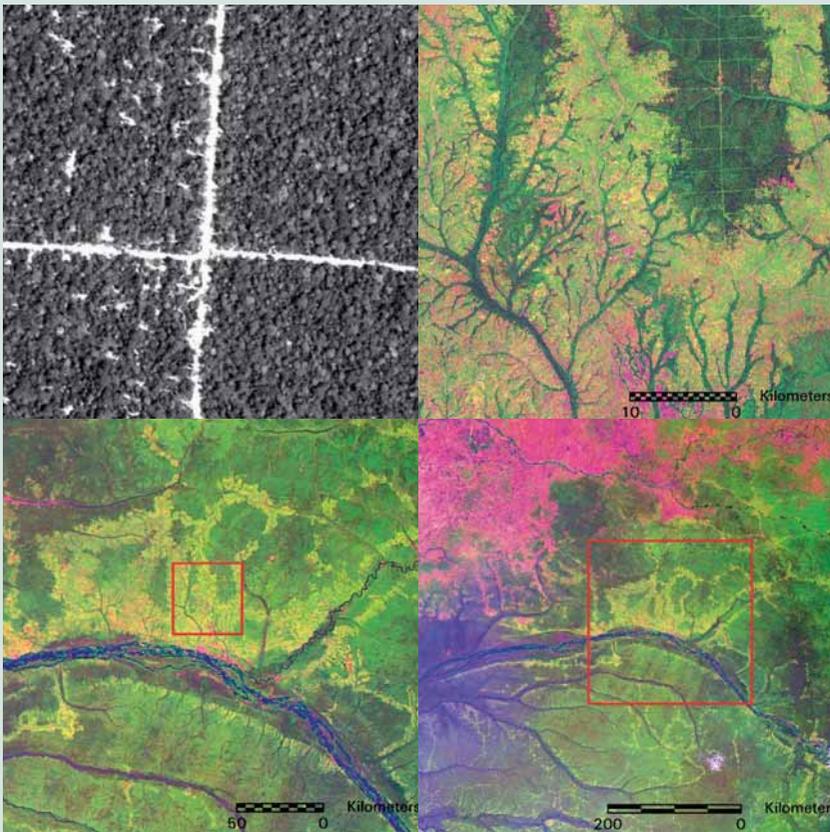
Figure a: Processed high-resolution forest probability and change estimates for the Congo Basin, 1990-2000.

Figure b: High-resolution change map for the Maringa-Lopori-Wamba Landscape (in yellow outline).

Figure c: Full-resolution zoom of change map for the northern edge of the Landscape.

Box 9.6. Spatial resolution and repeatability

One of the fundamental parameters of satellite imagery is the spatial resolution, which is defined by the size of the elements (pixels) constituting the image. We class optical satellite data into 4 major categories based on resolution: very high resolution (Ikonos, SPOT 5: 1-5 m), high resolution (SPOT HRV, Landsat, ASTER: 15-30 m), moderate resolution (MODIS, MERIS: 250-300 m), and coarse resolution (SPOT VEGETATION, AVHRR, Meteosat: 1-4 km). The spatial resolution is usually inversely correlated to the width of the field of view and the data acquisition frequency. Data from different sensors, which have complementary characteristics, can be combined to monitor deforestation: continuous monitoring at coarse resolution, change detection every 2-3 years at moderate resolution, fine measurements every ten years at high resolution. Data at very high resolution make it possible to distinguish individual trees, but cannot be used to measure deforestation given the high costs of acquiring such data.



Satellite Data: SPOT 5 (2.5 m, upper left), Landsat (30 m, upper right), MODIS (250 m, lower left) and SPOT VEGETATION (1 km, lower right).

10. Importance, Constraints and Prevailing Trends of the Timber Sector in the Six Forest Countries of Central Africa¹

Synopsis²

The contribution of the timber sector to the economic activity of the six forest countries of Central Africa (Cameroon, Republic of Congo, Gabon, Equatorial Guinea, CAR and DRC) tends to vary, but on the whole it is of major importance because of the tax revenue it brings in, its share of exports and the jobs it generates, particularly through the creation of centers of activity in regions far removed from established infrastructure and populated areas. The contribution of the timber sector to GDP is difficult to assess and differs substantially from country to country: Cameroon 6%, Republic of Congo 2%, Gabon 3-4%, Equatorial Guinea 6%, CAR 10% to 13%, and DRC 0.7%.

The intensity of timber extraction varies considerably and depends on the country's forest structure as well as other available resources, the country's raw materials (especially oil) and agricultural production. Equatorial Guinea is the country where the pressure from logging is greatest, with a forestry industry largely dependent on Asian interests and a total absence of sustainable management. At the other end of the spectrum, DRC is characterized by a very low level of timber extraction relative to the available forest area and maintains a firm commitment to the process of sustainable forest management.

The timber industry in the six countries is essentially organized around processing and the export of products. For historical reasons, Europe has long been the main destination for timber exports from Central Africa. This trend began to change in 1994 as a result of two factors: (i) the devaluation of the CFA franc, which improved the competitiveness of the timber sector and boosted investments, and (ii) the surge in Asian demand, associated with Malaysia's 1993 ban on all exports of logs and the sharp fall in forest resources throughout the region. This measure also led Asian companies to invest in certain countries of Central Africa as they moved in to compete with European operators.

The rate of processing is directly linked to the level of industrialization, which remains low in the region, except in Cameroon where there is a partial ban on the export of logs. In Equatorial Guinea, it has declined considerably over the last 10 years. Gabon remains the leading exporter of

logs in Africa, although the processing industry there has only recently begun to develop. In DRC, and to a lesser degree CAR and the Republic of Congo, the level of logging activity operates well below its potential due to repeated conflicts, which have effectively served as a brake on the development of this sector.

Domestic markets are largely supplied by the informal sector, which is often the only source of supply for rough lumber that is accessible at affordable prices and at the local level. The volumes of timber passing through this sector could be higher than those processed by the formal sector, with very little possibility of controls on the volumes intended for export. In DRC, a country undergoing reconstruction and with a very large population, industrial companies in the formal sector are concerned more with the domestic market, due to its strong development potential and the very high associated demand (production of plywood intended solely for the domestic market).

The future development of the timber sectors in the countries of Central Africa is closely linked to their ability to find solutions to the following problems:

- 1) Promoting further timber processing, which is currently limited by numerous constraints:*** major difficulties in supplying the log-processing units; the poor condition of equipment; inadequate transport infrastructure and poor services; political instability and social conflicts; the absence of or failure to implement any concerted and coherent national strategies for the development of the forestry industry; lack of appropriate mechanisms for the financing of a more intensive processing industry; strategies of multinational corporations based on intra-firm transfers (except in DRC, where timber companies tend to be family affairs with a target clientele in Europe); lack of skilled personnel with experience in planning, management of further processing and marketing of products; tight domestic markets for processed products and imports from foreign countries (*OAB, 2004: Promotion de la transformation plus poussée des bois tropicaux en Afrique*).

¹ This chapter was written by J. Gérard.

² This synopsis is organized at a national scale to highlight the particular characteristics of each country. The information provided is the result of an analysis of recent publications and reports, and takes into account the indicators defined at the validation meeting held on November 3-4, 2005 in Kinshasa.

- 2) ***Establishing satisfactory economic and fiscal conditions to secure the sustainable operation of companies*** and ensure that they have growth prospects within a context favorable for their expansion.
- 3) ***Making better use of the timber produced and processed at each stage in the production system***, from rough lumber (logs) on logging sites to the proportion of processed products which do not meet the current criteria of international demand.
- 4) ***Increasing the output of first-stage processing companies***: this output remains low, primarily due to the specifications imposed by the export market (long lengths, fixed dimensions, FAS quality for sawn timber); an increase in output is conditional on the feasibility of further developing timber processing.
- 5) ***Developing the processing and marketing of little-used species, within the context of sustainable management***: at present, logging companies undertaking sustainable forest management are required to use these species to economically optimize the exploitation of their concessions; the inventories carried out make it possible to determine precisely the availability and exploitability of this timber; downstream of the sector, second-stage processing companies in the north, particularly sectors consuming large volumes (exterior woodwork), are seeking to secure their supplies and guarantee their source.

At the end of 2005, 9.2 million hectares of forestry concessions in the Congo Basin had sustainable management plans that were either finalized or in the process of finalization (drafted, submitted or in course of approval). A sustainable management plan, the starting point for genuine sustainable forest management, must reconcile the objectives of the interdependent aspects of sustainable forest management: production of timber and non-timber forest products, environmental considerations and social concerns. It is the first tool for securing and planning sources for the processing units.

The objective of 'timber production', on which the financial viability and implementation of these sustainable management plans are directly dependent, is conditional on the possibility of broadening the range of timber extracted by moving away from the conventional framework in which logging was structured around a limited

number of flagship species. For logging companies involved in sustainable forest management, logging little-used species for marketing addresses two requirements:

- the need to optimize the use of areas already being logged by making the best possible use of unexploited species
- the need to limit the pressure on flagship species in accordance with the objectives defined in their management plans

At present, harvesting, processing and marketing these so-called secondary species is an essential condition to ensure continuity and to contribute to the extension of the sustainable management plans of logging companies in Central Africa.

Cameroon

Since 1986, exports of timber and derived products (particularly plywood panels) have played a growing role in Cameroon's economy. This growth was concurrent with the fall in prices of exported raw materials (coffee, cocoa, etc.). The forestry sector, which contributes some 6% to GDP, currently generates around 45,000 jobs, half of which are in the informal economy. The adoption of the forest code in 1994 and the partial halt to exports of logs in 1999 paved the way for the rapid industrialization of the sector. Cameroon has the most highly developed processing industry in the subregion. In 2003, exports of timber and derived products, second only to petroleum products, represented 16% of all exports (around 380 million dollars).

Construction timber production was estimated at 2.45 million m³ per year in 2004, of which 1.5 million m³ was from the permanent forest domain, 50,000 m³ was from community forests and 100,000 m³ was from reforested areas. Currently, 300 species are marketable, but only sixty or so are logged regularly. Six species are heavily logged in relatively large quantities: obeche, sapele, ekki, iroko, tali and frake.

Industrial fabric and timber processing

Since the partial halt to log exports in 1999 (23 species in 2004³), Cameroon's forest economy has essentially been based on processing, because of the added value and number of jobs generated in both urban and rural areas.

Timber processing units, primarily geared towards first-stage processing, are typically situated in industrial 'free zones' or in urban environments (with easy access to the port of Douala) and are

³ African mahogany, assamela, aniegre, bete, dibetou, bosse, bubinga, makore, white azfelia, red azfelia, fromager, ilomba, iroko, longhi, moabi, movingui, ovengkol, padauk, pao rosa, sapele, sipo, wenge, zingana

usually outfitted with second-hand equipment bought and reconditioned in Europe.

A study by CERNA, carried out between 1994 and 1998, on the industrialization of the timber sector in Cameroon reported 66 factories in operation; a more recent inventory by MINEF (2001) listed 75 units in operation:

- 68 sawmills (with or without dryer and with or without integrated joinery workshop)
- 5 cutting/plywood factories
- 2 slicing factories

The maximum processing capacity is estimated at 2.8 million m³ for an annual production of 2.45 million m³.

The four leading companies in terms of processing capacity are: SFID (*Société forestière de la Doumé*, Rougier Group, 240,000 m³), SFH (*Société forestière Hazim*, with Lebanese interests, 165,000 m³), ALPICAM (Italian company, 110,000 m³) and SIBAF (*Société industrielle des bois africains*, 100,000 m³). Recently, the Cameroonian subsidiary of Interwood was sold to Jean Khoury, HFC (*Hassan Forestière Campo*, subsidiary of the Bolloré Group) was liquidated and SEBC (*Société d'exploitation des bois du Cameroun*) and SAB (*Société africaine des bois*), both subsidiaries of the Thanry Group, were sold to Vicwood (Chinese Group). The other active companies are Lebanese (Cocam, SABM), Italian (Ecam Placage, Vasco Legne Group), Belgian (Decolvenaere), Greek (Etablissements Karayannis), Dutch (Wijma, GWZ Group), Malaysian or Cameroonian.

Second-stage processing, which is growing appreciably in Cameroon, is being carried out by three types of companies:

- 1) *industrial companies*: several have integrated with sawmills and as a result their production of precut timber, profiled timber (flooring, internal trim) and moldings is largely exported. The existence of these integrated companies is a relatively recent development and is evidence of the industrialization efforts that were started in 1998. Integration is concerned with securing supplies and the development of waste recovery in order to increase the companies' yields. The concept of integration, does not favor the development of the domestic sawn timber market.
- 2) *Second-stage processing SMEs and furniture factories*: there are relatively few of them. These companies produce medium to top of the line furniture for a local well-off clientele. They were established in the 1980s to meet the demand for furniture designed for administration or public buildings. Some of these

companies are currently experiencing difficulties due to a shortage of timber of guaranteed origin and competition from numerous small scale local companies.

- 3) *Small scale local companies*: these are more numerous and they tend to be located in city centers, where they use rudimentary equipment to produce furniture and other internal fittings for the domestic and regional markets (Gabon, Equatorial Guinea, etc.). Most of these craftsmen operate within the informal economy.

In addition to these three types of companies, there has been a recent increase in companies that plane down timber to specific dimensions for export, using wood that has come from legal or illegal small-scale sawing operations (chain saws or other mobile saws).

Production

Production of logs (Table 10.1) has been relatively stable over the last three years, while domestic consumption has increased in keeping with the regular increase in sawn timber production, one of the objectives of introducing the new forest code. These data reveal a drop in domestic consumption of sawn timber. This substantial and unexpected reduction can be explained by multiple factors:

- a reduction in supply from processing companies, which prefer to export their products at more advantageous prices than those on the domestic market
- a possible reduction in activity in the building and furniture sectors, the two main consumers of construction timber, linked to a fall in purchasing power
- the difference being covered by informal supplies, for which there are no formal records

Exports

Over the last five years, the ban on exports of logs of certain species has had a strong influence on the timber sector in Cameroon (Table 10.2). These exports have decreased substantially while the domestic industry has grown. Today, less than 7% of logs harvested in Cameroon are exported unprocessed. The activity at the port of Douala is centered on exports of logs from the Republic of Congo and CAR.

Obeche and frake represent 81% of exported logs (Table 10.3). Obeche exports have remained stable while those of frake have fallen sharply because the price of this species has become uncompetitive. Like ekki, it is increasingly being processed locally. Eyong, tali and lati are well behind these two flagship species, while all the other species account for only 5% of the total volume exported.

Italy is the main importer of logs from Cameroon, importing more than 40% of the country's exports (Table 10.4), followed by China (25%) and France (9%).

With 685,000 m³ of cut timber exported in 2004, Cameroon remains one of the leading processors in Africa. The two main species concerned are still obeche and sapele, which represent about a half of all timber exports. Exports of white azfelia (*Azfelia pachyloba*) and iroko increased considerably in 2004; along with tali and ekki, they represent 30% of total exports. The remaining 20% are exports of around 50 other species in the form of cut timber.

European countries, mainly Spain and Italy, are still the largest consumers of cut timber, importing 80% of Cameroon's production; China's share is increasing constantly, but the targeted markets remain transactional at the moment. The 50,000 m³ of plywood exported is mainly consumed by Italy, the Republic of Congo and Senegal (30%, 19% and 17% respectively). Exported veneer (23,000 m³), mainly obeche (80%), goes almost exclusively to Italy.

x1,000m ³		Logs	Sawn timber	Veneer	Plywood
Production	2002	2,150	652	53	42
	2003	2,530	658	47	39
	2004	2,375	710	53	50*
Domestic consumption	2002	1,725	221	30	27
	2003	2,146	178	20	27
	2004	2,234	25	38	3

Source: ITTO

* ITTO estimates or adjustments

Table 10.1. Main production statistics for Cameroon.

Development priorities

At present, the main destination for timber from Cameroon is Europe; Cameroon has thus started implementing the European Union's FLEGT process, which is concerned with Forest Law Enforcement, Governance and Trade, to combat illegal logging. Cameroon can play a key role in the enforcement of forest laws and governance in the sector and could become a leader among the producing countries of the Congo Basin. At the same time, individual companies are committing to certification and, at the end of 2005, one forestry company obtained FSC certification⁴.

Promotion and technical support should be supported in order to promote industrial and local small scale SMEs involved in second-stage processing and encourage integration of the informal economy.

Main bibliographical sources

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⁴ WIJMA DOUALA obtained the FSC certificate (EUROCERTIFOR – BVQI) for the management of the *unité forestière d'aménagement* UFA 09 021 and thus became the first FSC-certified logging company in Central Africa.

Table 10.2. Main export statistics for Cameroon.

x1,000m ³		Logs	Sawn timber	Veneer	Plywood
Exports	2002	425*	432	27	15
	2003	385* (191**)	480 (890**)	27	12
	2004	141*	685*	23*	50*

Source: ITTO

*: ITTO estimates or adjustments **: source ATIBT

Table 10.3. Volumes of logs exported from Cameroon in 2004, for the five main species (> 1,000m³).

Species	Volume (m ³)	Main destinations
Obeche	80,894	Italy, China
Frake	33,510	Italy, France
Eyong	9,747	China, Turkey
Tali	6,994	Spain
Lati	2,479	China, Italy

Source: ATIBT

Table 10.4. Volumes of cut timber exported from Cameroon in 2004, for the 10 main species (> 14,000m³).

Species	Volume (m ³)	Main destinations
Obeche	184,975	Italy, Spain
Sapele	143,050	China, Spain
Iroko	96,429	Ireland, Spain
Tali	39,445	Spain
Ekki	38,846	Netherlands, Belgium
White azfelia	31,932	Italy, Portugal
Frake	20,483	Italy, Senegal
Kosipo	16,750	Morocco, Saudi Arabia
Movingui	16,087	France, Belgium
Sipo	14,202	Belgium, United Kingdom

Source: ATIBT

Republic of Congo

Until 1972, timber was the country's primary resource and represented over half of all exports. It was then overtaken by oil. Recent economic revival programs in the Republic of Congo have placed the emphasis on developing the timber processing sector, confirming that the forest sector in general is an important factor for the creation of added value and jobs.

About 90% of the 22.5 million hectares of Congolese forest (over 60% of national territory) are allocated to production, with 11.4 million hectares in concessions. The ligneous potential is estimated at over 150 million m³: 130 million in the forests in the north of the Republic of Congo, rich in Meliaceae, obeche, limba and various other species that are to be promoted, 20 million in the forests of the south, especially rich in okoume and limba. The annual potential, without compromising the forest's regeneration capacity, is estimated at 2 million m³.

To this natural potential must be added

73,000 hectares of plantations of eucalyptus, pine and limba, representing a standing volume of 4 million m³.

Industrial fabric and timber processing

The timber industry is still very much focused on primary processing (sawing then peeling and slicing). Two-thirds of the 33 first-stage processing companies listed are sawing companies, nine of them with a capacity of over 50,000 m³ (Table 10.5).

The leading four companies in terms of concession and sawing capacity are: CIB (*Congolaise industrielle des bois*, a subsidiary of the tt Timber group⁵, 100,000 + 220,000 m³ logs), IFO (*Industrie forestière de Ouesso*, a subsidiary of the German group Danzer, 110,000 m³ logs), Mokabi SA (Rougier group, 80,000 m³ logs) and Likouala Timber (company with capital of French origin, 85,000 m³). The other companies are Congolese (11 companies, 59% of concessions), European (two French, one Portuguese and one Italian-French, 15% of concessions), Malaysian and Chinese (7 companies, 21% of concessions). The level of foreign involvement in the Congolese timber-processing sector is around 85%.

The level of primary processing among industrialists (proportion of timber harvested and then processed into finished or semi-finished products) is between 50% and 90%. For sawing, the average material yield is around 30-35%, but could reach 40% if there was access to the local market, and even more if there was effective promotion of off-cuts (non-standard dimensions of cut wood). In peeling, yields are around 50%.

Forestry companies with first-stage processing tools are essentially export oriented. The domestic sawn-timber market is supplied by (i) industrial units and (ii) small-scale sawyers who obtain their supplies legally or illegally from forest patches and gallery forests in urban peripheries or from areas richer in commercial species. Extraction by small-scale sawyers has increased with the reduction in log traffic on the Congo River and the associated difficulties that small-scale sawyers have in obtaining logs recovered from rafts. For instance, it is thought that 94% of supplies on the Pointe-Noire market come from small pit sawyers. These sawmills play an important social role and supply the local market with sawn timber at accessible prices.

Second-stage processing is still limited to a few semi-industrial joinery units and a host of small informal companies close to the big centers. In the Pointe-Noire region, the rate of second-stage

⁵ At the beginning of 2006, tt Timber was taken over by the Danish group DLH (Dalhoff Larsen & Horneman), which has thus consolidated its position in the tropical timber international market, widened its source of supply in sustainably managed forests and strengthened its possibilities of supplies of ecocertified tropical timber.

processing (volumes reprocessed compared to volumes having undergone first-stage processing) is estimated at less than 2%. Three forestry companies export reprocessed products (Trabec, CIB and IFO). However, the trend is towards vertical integration with consolidation of the first-stage processing infrastructures.

Production

Production of logs in 2004 was 1.3 million m³, of which 50% was exported (Table 10.6). The country's first-stage processing capacity is between 1.1 and 1.2 million m³, with the possibility of processing about 90% of domestic production (the purpose of the legislative and fiscal measures taken by the Congolese government is to encourage local companies to step up their local processing rate to 85% over a given period).

Production of sapele and sipo in northern Republic of Congo is influenced by the implementation of management plans, which are encouraging companies to diversify their species and therefore reduce the volumes of the main species used.

Production of pine and eucalyptus logs (Table 10.7) from plantations stopped for a while due to changes in the shareholder structure of ECO SA in July 2001. Activities resumed in the second half of 2005 following the takeover of ECO by a South African group (see paragraph on *Recent developments*).

Exports

In 2004 exports of logs and square-edged timber (Table 10.8) benefited from the opening up of new concessions in the north of the Republic of Congo and continued activity in the Mayumbe region, particularly for okoume. China buys over a half of exported logs and a significant proportion of sawn timber, mainly sapele. Europe is the second leading destination for this timber.

Okoume accounts for some 50% of log exports, followed by sapele (26%), which is the leading species exported in the form of sawn timber (64%), followed for this product by sipo and iroko, which each represent about 6.5% of exports (Table 10.9).

Table 10.5. Capacity of companies in the Republic of Congo.

Activity	Number of companies	Capacity (C) (x 1,000 m ³ logs)	Total capacity
Sawing	23 of which	3 with C ≥ 100; 6 with 50 ≤ C ≤ 100 4 with 10 ≤ C ≤ 50; 7 with 5 ≤ C ≤ 10 3 with 5 ≤ C	≈ 940,000 m ³
Peeling	5	15; 27; 36; 65 (x 2)	≈ 210,000 m ³
Slicing	2	15; 7	≈ 22,000 m ³
Plywood	3	12 (x 2); 15	≈ 30,000 m ³

Table 10.6. Main production statistics for the Republic of Congo.

x1,000m ³	Logs	Sawn timber	Veneer	Plywood
Production				
2002	1,179	230*	22	4
2003	1,350 (1283*)	167	26	4
2004	1,300	350	32	6*
Domestic consumption				
2002	724	33**	4	0
2003	672	5**	14	0
2004	650	100	4	1

Source: ITTO

*ITTO estimates or adjustments
** consumption figures to be treated with caution in view of ITTO estimates on associated production levels

Table 10.7. Production of eucalyptus logs in the Republic of Congo.

Production	2000	2001	2002	2003	2004	2005
Eucalyptus logs (x 1,000 t)	531	319	83	61	-	18*

Source: BEAC

*: SGS

Table 10.8. Main export statistics for the Republic of Congo.

x1,000m ³	Logs	Sawn timber	Veneer	Plywood
Exports				
2002	445* (641**)	197* (127**)	18	4
2003	610* (712**)	335* (133**)	13* (15**)	3
2004	650* (844**)	250* (143**)	28* (9**)	6

Sources: ITTO/ATIBT

*ITTO estimate ** source: ATIBT

Table 10.9. Volumes of the 10 main species exported from the Republic of Congo in 2004.

Species	Logs (m ³)	Veneer (m ³)	Sawn timber (m ³)	Finished products (m ³)
Okoume	416,116	8600	446	0
Sapele	221,216	0	91,070	879
Sipo	42,840	0	9,520	195
Iroko	39,560	0	9,099	0
Bilinga	22,004	0	746	391
Bosse	15,422	0	4,348	10
Agba	13,237	0	2,493	0
Tiama	11,051	0	1,773	187
Obeche	?	0	6,951	3,305
African star apple	8,158	0	225	0

Source: ATIBT

Recent trends in the forest sector and forestry industries

The activity of forestry companies during the first half of 2005, compared to the same period in the previous year, was characterized by a reduction in both felling and exports. This reduction in activity can be ascribed to two factors:

- recurrent problems in transporting logs to the port of Douala for companies based in the north of the country and maritime transport from Pointe-Noire in the south
- stricter application, by the Ministry of Forest Economy, of the new forest code fixing at 15% the proportion of log production for export

By the end of the first half of the year, compared to the previous year, the amount of okoume and secondary timber species that had been felled was down by 10% and 19% respectively. Exports of okoume and secondary timber species were lower by 15% and 27% respectively.

During the first half of 2005, compared to the previous year, activity in the timber industry saw contrasting developments. Production and foreign sales of sawn timber fell by 57% and 35% respectively. On the other hand, production and foreign sales of veneer increased by 39% and 34% respectively with the resumption of activities at the peeling factories in Pointe-Noire by Man Fai Tai and Taman Industries.

Activities in the eucalyptus sector have resumed in the Republic of Congo, with the creation of EFC (*Eucalyptus Fibres Congo*), a company under Congolese law and a subsidiary of the South African firm Chartwell Carbon Technologies, which has taken over the activities

of the now defunct state-run company ECO-S.A. In return for payment of a forest tax, EFC will work the 42,000 hectares of eucalyptus forest in the Kouilou department.

Development priorities

Development of the Congolese timber sector will require finding the means to:

- create satisfactory economic and fiscal conditions to secure the sustainable operation of companies and assure them of growth prospects within a favorable environment
- improve road, rail and waterway infrastructures
- make better use of the timber produced and processed at each stage in the production process, from rough-sawn lumber (logs) in the logging areas to processed products, which do not meet the current criteria of international demand
- improve yields in first-stage processing companies (at present around 35% on average in sawing operations and 50% in peeling) in line with the specifications required by the export market (large lengths, fixed dimensions, FAS quality for sawn timber); this increase in yields is directly linked to further timber processing
- integrate and redeploy the activities of small-scale sawyers (pit sawyers) who supply most of the local market and improve their yields

Main bibliographical sources

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Gabon

The timber sector is the leading private employer in the country (over 20% of the working population), but its contribution to GDP is low, between 3% and 4%, due to the size of the extractive industries. From an economic standpoint, up until it was overtaken by oil in the 1970s, the forest sector represented the country's main source of wealth. The forest sector is still a key sector because of its potential and because of the possibilities it offers for diversification at a time when the oil industry is expected to start declining.

Of the 22 million hectares of forests, 12 million are allocated in the form of concessions to logging companies. By 2004, approximately

5 million hectares were involved in some form of the management process: management plans were either approved or in the process of approval for around three million hectares and provisional management-logging-processing agreements (= CPAET) were drawn up for two million hectares. The area involved in the management process today surpasses six million hectares, with all individual concessions exceeding 100,000 ha. Action is also being taken to enable small concessions to gain access to sustainable management procedures.

In 2004, the breakdown of industrial permits according to type of holder was as follows: Gabonese (42.5%), French (31.5%), Malaysian (9.1%), Libyan (5.1%), Italian (2.8%), Lebanese (1.3%), and others (7%).

The functioning of the Gabonese timber sector has been greatly influenced by the introduction of the Forest Code, law No 16/2001 of 31 December 2001, whose objective is the sustainable management of forests by combining forest management, industrialization of the sector and the conservation of ecosystems.

Industrial fabric and processing

According to different estimates, the rate of local processing is between 18% and 25%. A recent survey conducted by the Ministry in charge of forests identified 56 industrial units (Table 10.10), of which 41 are for sawing, 9 for peeling, 2 for slicing and 4 for plywood manufacturing. The most recent sawing unit was set up by the Rougier Group in Franceville for processing okoume (target capacity: 1,400 m³ a month).

Asian interests, particularly Malaysian and Chinese, are increasingly present in the sector, even though French interests still constitute the vast majority.

The forestry companies are:

- large groups involved in processing and marketing in Europe, such as Rougier-Gabon, CEB (*Compagnie équatoriale des bois*) / Thanry, Leroy-Gabon (subsidiary of Isoroy of the Portuguese group SONAE), GIB (*Gabonaise industrielle des bois* - tt Timber International AG), CBG (*Compagnie des bois du Gabon*), the Italian company CoraWood, etc.
- smaller companies, sometimes family businesses, such as Lutexfo/Soforga, SHM (*Société de la Haute-Mondah*), SBL (*Société des bois de Lastoursville*), Comexfo (*Commerce exploitation forestière*), GEB (*Gabon export bois*), SGBF (*Société gabonaise Bescos et fils*), etc.

Table 10.10. Number of first-stage processing units in Gabon.

	Sawing	Peeling	Plywood	Slicing
French	17	6	1	
Malaysian	5	1		1
Gabonese	7		1	
Lebanese	4		1	
Italian	2	1	1	
Canadian	1			1
Chinese	2			
Others	3*	1**		

Source: MEFEPNN

*: 1 Malian, 1 Portuguese, 1 Spanish **: Moroccan

Companies controlled by Gabonese capital are often smaller: IFK (Franco-Gabonese group Sogafric), SEEF (*Société équatoriale d'exploitation forestière*) and Nzé Ekomié. Malaysian companies control over three million hectares, most notably Bordamur, a subsidiary of the Rimbunan Hijau group, and SFM (*Société forestière de Makokou*), a subsidiary of the Winnerpac group. The Indian company Olam is the fourth largest exporter of okoume.

Local processing of okoume timber (peeling, sawing, veneer) has grown recently and French companies (Rougier, Leroy, Thanry, Thébault) have invested heavily in this field.

While the tax on exports of tropical logs has been increased from 15% to 20% in order to reduce exports of logs, the other three categories of processed products - sawn timber, veneer and plywood - are not subject to any export tax, so as to encourage domestic processing and the export of processed products.

The domestic market for first-stage processing products is largely supplied by the informal sector, which is competitive and can offer acceptable price levels locally. Bush sawyers in the countryside around Libreville and sea-front sawyers supply virtually all the capital's market.

Second-stage processing is underdeveloped and comprises: a few joinery and cabinet-making units with small-scale structures.

Production

Table 10.11 details the main production statistics for Gabon. Apart from okoume, the flagship species in Gabon, and a few other key species, such as padauk, moabi and kevazingo, production of some hitherto unused species such as okan, bahia and gombe is beginning to increase.

Table 10.11. Main production statistics for Gabon.

x1,000m ³		Logs	Sawn timber	Veneer	Plywood
Production (imports)	2002	3,615	176	71	98
	2003	3,563	231	140*	101
	2004	3,700*	300*	140*	140*
Domestic consumption	2002	1,687	88	26	33
	2003	1,846	108	6	10
	2004	1,700	51	6	27

Source: ITTO

*: ITTO estimate or adjustment

- the system for marketing okoume and ozigo via the SNBG, which threatens the competitiveness of companies because of the high transaction cost and also hinders commercial adaptability through its administrative setup in which timber is purchased at fixed prices and then resold on fluctuating markets

Together, these three factors have led to a reduction of over 10% in exports of logs and about 25% for okoume. While Asia remains the leading buyer of Gabonese logs with 52% of volume, its relative share has fallen since 2003 due to the

Table 10.12. Main export statistics for Gabon.

x1,000m ³		Logs, of which	Okoume logs	Sawn timber	Veneer	Plywood
Exports	2002	1,928 (1921**)	1,233* (64% of total)	89	55	67
	2003	1,717 (1694**)	1,100** (65% of total)	124	141	103
	2004	2,000* (1517**)	829** (55% of total)	250	140*	125

Source: ITTO

*: ITTO estimate or adjustment **: ATIBT

Promotion of little used species remains a priority for the forest department and more particularly forestry companies under sustainable management, which must optimize extraction in their concessions. Likewise, making use of secondary qualities of okoume, not used for peeling, is a major aim of these companies.

Okoume is still the most common species processed as sawn timber, with almost all production by sawing units in the formal sector being exported. A survey conducted in 2004-2005, among the 15 units known to produce sawn okoume timber, estimated a monthly production of between 13,000 and 16,000 m³ for this species. Okoume production from the informal sector, traditionally used at the local level for light construction work, is estimated at three to five times more than that of the formal sector.

Exports

Gabon is the region's leading exporter of logs, mainly okoume, and the third largest exporter within the ITTO (Table 10.12).

In 2004, the fall in exports of logs from Gabon was linked to:

- the effect of the value of the US dollar, particularly on the behavior of Asian buyers
- an increase in the proportion of timber processed locally, accredited to the introduction of management plans and increased industrialization

forementioned reasons. The log exporting sector has undergone a succession of crises since 1998, as a result of: the way in which the sector is organized; taxation which holds back competitiveness; transport problems; and competition from countries with cheaper labor and lower taxation such as the Republic of Congo, Equatorial Guinea and Indonesia.

Although okoume remains the most important species (Table 10.13), the timber species being exported as logs are diversifying now that management plans have become operational, as well as because certain other countries (notably Cameroon) bans the export of certain species as logs. These species include: moabi, bosse, iroko, douka, mahogany, sapele, sipo and niangon.

Although okoume is used and exported above all for peeling and the manufacture of plywood, it is also the leading species exported in the form of sawn timber (Table 10.14).

Recent trends in the forest sector and forestry industries

The timber sector had a favorable first six months in 2005. In fact, production of logs of all species combined rose by 4.7% compared to the same period in the previous year. This production is dominated by secondary timber species. There was also a change in the trend for okoume; which historically accounted for most Gabonese production, but is now being supplemented by sec-

ondary species. Production of secondary species increased by 22% between June 2004 and June 2005, while production of okoume declined by around 11% over the same period.

Operators in the sector are still concerned about the decision by authorities to end the monopoly of the *Société Nationale des Bois du Gabon*; a decision which is to come into effect as of the first of January 2006.

In the first six months of 2005, sales of logs and cut timber rose by 21% and 10.5% respectively. The trend in exports of logs is in line with the overall situation in the sector, whose export volumes rose by 25%.

Main bibliographical sources

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Equatorial Guinea

In 1995, timber production in Equatorial Guinea represented over 20% of GDP and 42% of exports. By 2004, it accounted for only 4% of trade and 6% of GDP, due to the reduction in forestry production and, more significantly, the growth in oil production. Forest currently covers 78% of the area of Equatorial Guinea (2.2 million hectares out of 2.8 million). Most logging is carried out within the continental part of the country, where 1.4 million hectares of forest (two thirds) are logged by some sixty concessionaries.

Industrial fabric and timber processing

The proportion of forestry production processed locally is still small and is less than 10% of total production on average.

The main companies among the twenty or so currently operating in the logging and processing sector are essentially Southeast Asian or Spanish: Anisok Mongola (of Spanish origin, now part of Shimmer), Chilbo (North Korean company), Efusila and Exfosa (under Spanish management but also part of Shimmer), Matroguisa and Safi S.L. (Spanish company based in Valencia), Shimmer International (subsidiary of the Malaysian international group Rimbunan Hijau and world leader in forestry production both for logs and for sawn timber), Sijifo International (Chinese company), Sinosa, Sitsa and Sofmal (Lebanese company whose activities are focused entirely on logging), Sofoge (Lebanese company, activities uncertain) and Somagui Forestal.

Of these companies, six or seven, all south Asian, have peeling units to manufacture veneer: Anisok Mongola, Chilbo, Exfosa (although this company's peeling activity would appear to have ceased during 2004), Safi, Shimmer, Sijifo and Somagui Forestal.

Peeling

The manufacturing of cut veneer is the primary activity in timber processing. Veneers (mainly okoume followed by ilomba and aiele) are intended solely for export. Domestic consumption of veneer is virtually nonexistent and the country has no plywood manufacturing units. In 2004, Shimmer International opened a new peeling factory in Mongomo, with a predicted processing capacity of 50,000 m³ of okoume logs a year. Following the recent wave of takeovers, current veneer production in Equatorial Guinea depends exclusively on Asian interests.

Table 10.13. Volumes of the 9 main species of logs (>26,000 m³) exported from Gabon in 2004.

Species	Volume (m ³)
Okoume	829,000
Padauk	107,200
Moabi	62,400
Kevazingo	51,300
Bahia	41,200
Ekki	32,700
Beli	30,400
Agba	26,300
Movingui	26,100

Sources: ATIBT

Table 10.14. Volumes of the 9 main species of cut timber (>850 m³) exported from Gabon in 2003.

Species	Volume (m ³)
Okoume	68,570
Ekki	32,490
Dibetou	11,610
Bahia	5,010
Moabi	3,290
Douka	2,110
Mahogany	2,070
Movingui	2,070
Padouk	860

Source: MEFEPNN

Sawing

Except for a few small processing units which survive by meeting domestic market requirements (two units in Bata), the domestic market and the small demand for export are supplied by unregulated sawing activities (using chainsaws). This activity involves several hundred operators, although it is still impossible to quantify the actual quantities of timber sawn. This timber is collected and size-graded in small planing units set up on very rudimentary sites near to the source of supply; there are eight sites of this kind around Bata.

Second-stage processing

The second-stage timber processing sector is made up of small companies, usually with a small-scale structure. These companies only supply the local market. They are small and their activity is too limited to imagine opening them up for export markets.

Production

Equatorial Guinea's forestry production increased until 1999, reaching a record volume of about 800,000 m³, after which it has been in steady decline (Table 10.15). Officially, this decline is attributed to the progressive application of the forest law of 1997, which is aimed at preventing overexploitation and favoring the sustainable management of timber resources. The authorities planned a progressive reduction of 10% a year to return to the fixed level of 450,000 m³ which, according to the FAO, is the annual limit that must not be exceeded if the sustainability of the resource is to be ensured. In actuality, most operators within the timber sector in Equatorial Guinea attribute this decline in production to the depletion of forest resources, whose life expectancy is seen by many as being very short (just a few years). Equatorial Guinea is one of the countries in the Central Africa region where the decline in forest production has been greatest.

Okoume is still the most important species in Equatorial Guinea, representing about 80% of

total production, followed by ilomba, tali, ekki, okan and andoung.

Exports

Almost all forest production is exported, mainly in the form of logs, with a small portion in the form of veneer and a tiny fraction as sawn timber (Table 10.16).

Shimmer is the leading exporter of logs and veneer: 70% and 40% of exports respectively. In the first half of 2004, China was Equatorial Guinea's leading customer for logs, taking 68% of the country's exports, followed by the three Mediterranean countries of France, Portugal and Spain. Spain was the leading importer of veneer, 46% of exports, followed by France, Portugal, and then China. Spain is the only country that buys sawn timber. This sawn timber essentially comes from informal activities, including chain-sawing and finishing in highly opportunistic planing units; it is sought after for its very low price and for the species processed, particularly iroko (Table 10.17).

Development priorities

The forest sector in Equatorial Guinea is in serious difficulties and is causing a great deal of concern among most stakeholders, including local and outside observers. This decline must be viewed in correlation with the expansion of oil production, particularly over the last six years.

The limited opportunity for foreign investment in the timber industry in Equatorial Guinea, due to legal and fiscal insecurities and the difficulties associated with working in this sector, are merely adding to this trend.

However, some local second-stage processing companies (general joinery and associated activities), which are supplying only the domestic market, have started to develop. These growing activities are evidence of the desire on the part of company heads to break out of their small-scale business structures and move up to a semi-industrial or industrial level.

Main bibliographical sources

Ambassade de France au Cameroun, 2005; Ambassade de France au Cameroun, 2003; Banque de France, 2003; BEAC, 2005; BEAC-CEMAC, 2005; FAO, 2002; Gérard, 2005b; Palmer, 2004; Roitman & Roso, 2003.

Table 10.15. Production trend in Equatorial Guinea.

Year	1999	2000	2001	2002	2003	2004 estim.	2005 forecast
Production (x 1,000 m ³)	776.1	714.9	669.9	531.5	528.5	513.5	513.5

Sources: OCIPF (Oficina de Control, Información y Protección de las Especies Forestales) and BEAC; Equatorial Guinea is not a member of ITTO, which therefore does not have any statistics on the country

Central African Republic

CAR has 3.6 million hectares of productive tropical forest in the southwest of the country, comprising about 5% of the national territory. The volumes harvested range from 500,000 to 700,000 m³ a year. The forest sector is the country's highest performing economic sector and it plays an important role as a lever for the national economy. With over 4,000 direct jobs and several thousand indirect jobs, it is the country's leading employer. Its contribution to CAR's tax revenue is significant and direct forest taxes and fees amount to 10 billion FCFA per year. The sector's economic output represents 50% of exports, based on value, and from 10% to 13% of GDP. Timber is the country's second leading export, after diamonds.

The sector was rationalized in 2003, and permits were redistributed after undergoing reviews and the removal of dishonest operators. The forest industry escaped material damage (destruction or pillaging) during the politico-military events of 2002-2003. Presently, the primary difficulties are associated with the road transport of logs for export; transport costs, journey times and insecurity push up timber prices. Logging is carried out by ten companies holding permits for a total surface area of 3.5 million hectares and a total exploitable area of 3 million hectares. By mid-2005, six forestry companies had started preparing management plans for their forest concessions: SEFCA (707,000 ha), SCAD (435,000 ha), SCAF (269,000 ha), VICA (299,000 ha), SESAM (392,000 ha) and Thanry (228,000 ha).

Industrial fabric and processing

Decree No 91/018 of 2 February 1991 establishing the mechanism for the allocation of concessions (granting of licenses) was revised in 2004. The forestry companies are now obliged to justify the creation of production and processing units. In 2003, the forestry industry had eleven industrial units, most of them made up of simple sawing lines (with no dryer or industrial joinery units) with two exceptions: SCAD, which also has a plywood production line and SSB, which has a peeling and slicing line, however, only its sawing equipment is operational. The units are spread out over the forest area as follows: four in Lobaye (two IFB, two SCAD), six in Sangha-Mbaéré (two SESAM, two SEFCA, one Thanry-Centrafrrique and one SBB) and one in Mambéré-Kadéi (SOFOKAD).

Table 10.16. Main export statistics for Equatorial Guinea.

	2001	2002	2003	1 st half of 2004
Export of logs (m ³)	589,355	519,858	438,293	108,077
Export of sawn timber (m ³)	3,030	4,285	1,056	364
Export of veneer (m ³)	28,403	13,103	26,287	15,851
Value of exports (x 1,000 CFA)	38,790	33,270	33,382	-

Source: OCIEPF

SCAD manufactures semi-finished products (parquets, friezes, moldings, and broomsticks) via its associate company Dameca.

Domestic timber consumption, which represents a substantial volume, can be broken down by its numerous uses. The timber is collected directly from the forest in the form of deadwood or by felling standing timber, or it is bought on the local sawn-timber market. For villages near to sawmills, timber which is not of commercial quality is given away by these companies for private or collective use. Construction timber prices on the domestic market in CAR are very high and act as an obstacle to the development of small processing industries and craftsmen.

Production

Given the granting of three major permits to new concessionaries and the prospect that the exchange rate for the dollar would return to a more reasonable level, the department of water and for-

Table 10.17. Exports according to species from the first half of 2004 in Equatorial Guinea.

Species	Logs (m ³)	Veneer (m ³)	Sawn timber (m ³)
Okoume	34,192	10,290	30
Tali	7,333		
Ekki	6,403		
Padouk	2,003		
Eyong	1,322		
Izombe	318		
Iroko	100		310
Ilomba	-	3,856	
Miscellaneous	56,406	1,705	24
Total	108,077	15,851	364

Source: ASEMAR SA (shipping agency in charge of almost all tropical timber exports)

Table 10.18. Main production statistics for the Central African Republic.

x1,000 m ³		Logs	Sawn timber	Veneer	Plywood
Production	2002	664	97	-	2
	2003	516	69	-	2
	2004	570	107	-	1*
Domestic consumption	2002	333	20	-	1
	2003	293	11	-	1
	2004	376	50	-	-

Source: ITTO

*: estimate or adjustment

ests forecasted a growth in the industrial production sector for 2004, returning it to the 2002 level (Table 10.18). However, the data for 2004 show that these forecasts did not materialize and production remains below the country's potential.

The logs and sawn timber being marketed primarily consist of the following species: sapele, obeche, sipo, kosipo, iroko and aniegre.

Exports

The appreciable fall in log exports between 2002 and 2003 continued in 2004, when a decline of around 13% was recorded (Table 10.19). This apparently cyclical decline was due to the country's political situation (troubles linked to the overthrow of the government in March 2003) and to the fact that the Department of Water and Forests was taking over a sector in which a number of irregularities had been observed concerning the allocation of special permits. It is not surprising that the emergency measures introduced in April 2003 by the Minister of Water and Forests to rationalize the sector (return of permits to the public domain, temporary ban on logging and timber exports, etc.) resulted in the sector's decline. Sustainable management of the forests also disrupted the rhythm of operations.

To these political factors must be added an economic factor: the fall in the value of the dollar in the last quarter of 2004 severely affected the

competitiveness of free zone Central African timber. Finally, in 2004, the prices of tropical timbers suffered a number of blows, with the price of sapele logs for export dropping 10% to 15%.

The downward trend in sawn timber exports that began in 2003 continued in 2004. This decline is directly linked to the sharp fall in the value of the dollar, which affected the competitiveness of sawn timber from Central Africa to the benefit of Asian sawn timber, particularly that from Malaysia, within the traditional export markets for Central African timber.

In 2004, approximately 20 species were exported in the form of logs; the first two account for 60% of the total volume exported, while the first five represent 91% of the total volume exported (Table 10.20).

The two leading exporters of logs (SEFCA and SOFOKAD) account for 49% of the total volume exported; the first five exporters (the two above-mentioned companies plus Thanry, IFB and SOTRAC) account for 77% of the total.

China is the leading buyer of logs (31.4%), followed by Italy (16.3%), Spain (15.9%), France (10.9%), Germany (10.7%) and Portugal (6.1%). The other importing countries of note (with less than 5%) are Turkey, Japan and Finland.

Sapele represents over 80% of exports in the form of sawn timber, with iroko a distant second with 13.6% of exports (Table 10.20). The first five species represent 98.5% of the total volume exported in the form of sawn timber.

The two leading exporters of sawn timber (SEFCA and the Thanry-VICWOOD Group) account for 63% of the total exported and the first five exporters (the two aforementioned companies plus IFB, SESAM and SBB) represent 95% of the total exported.

Spain is the leading buyer of sawn timber (28.4%), followed by China (18.9%), Belgium (17.6%), and the United Kingdom (10.3%). The other importing countries of significance (with less than 5%) are Morocco, France, Ireland and Italy.

Table 10.19. Main export statistics for the Central African Republic.

x1,000 m ³		Logs	Sawn timber	Veneer	Plywood
Exports	2002	331 (343**)	77 (56**)	-	1
	2003	223 (232**)	58 (50**)	-	1
	2004	194 (195**)	57 (44**)	-	1

Source: ITTO

** ATIBT data

Development priorities

In 2003 the Minister of Water, Forests, Hunting and Fisheries convened a wide ranging ministerial review in order to meet the national transitional government's expectations for stabilizing all sectors of the CAR economy, including the timber sector. The subsectoral forest commission was given the task of conducting an analysis of the current situation and proposing solutions to revive the industry. Several proposals were made concerning the development of the timber sector and the domestic market, including:

- drawing up and adopting industrialization standards for the processing sector
- facilitating access to bank loans through preferential rates for large investors
- studies on the domestic timber market to strike a better balance between supply and demand
- introducing incentives for the creation of sales depots throughout the country
- easing the taxes on sales of construction timber for the domestic market
- developing local marketing channels for timber
- setting up training courses

All of these proposals are still valid.

Main bibliographical sources

Ambassade de France au Cameroun, 2004; Ambassade de France au Cameroun, 2005; BEAC, 2005; BEAC-CEMAC, 2005; Commission du sous-secteur forêt, 2003; Liabastre, 2005; OAB, 2004; OIBT, 2002; OIBT, 2004.

Democratic Republic of Congo

Although DRC houses the second largest tropical forest in the world, some 130 million hectares that have barely been touched, the timber sector in DRC has suffered and is still suffering from a number of major problems: production structures are in very poor condition, slow means of transporting production, political troubles and wars, poor forests and high harvesting costs. The contribution of the timber sector to the country's GDP was estimated at 0.7 % in 2004 and although it remains low, it is now growing.

Following the promulgation of the forest code in 2002, the area under concession has fallen from 45 million hectares to about 20 million hectares. The present concessions are being converted to

Table 10.20. Volumes of logs and sawn timber exported from the Central African Republic in 2004, according to species.

Species	Logs (m ³)	Sawn timber (m ³)
Obeche	60,919	
Sapele	57,366	34,879
Aniegre	24,114	726
Iroko	23,156	5,921
Sipo	11,109	678
Azfelia	6,610	
Longhi	5,095	
Mahogany		547
Kosipo		431
Others	6,371	201

Source: T. Liabastre in la Lettre de l'ATIBT

a new type of contract; an operation that is being carried out in the presence of independent observers. Until 2004, the concessions were not involved in any management process; most of them remained closed because of insecurities. In 2005, five companies joined the conversion process, accounting for a surface area of over 6 million hectares. Additional companies are preparing to follow suit.

In 2004, in consultation with all the players involved in the forest-timber sector, the World Bank commissioned an economic review to support the revival of the forest sector's activities and to formulate recommendations for the development of the timber sector and sustainable management of DRC forests. The findings of this review were embodied in Interdepartmental Decree No 010 of 17 March 2004.

Industrial fabric and processing

The forest sector in DRC has suffered from years of war; it is now undergoing reconstruction. Among the sixty or so forestry companies registered with the directorate-general for forests, only twenty are listed as having resumed their activities. Only half of these companies would really seem to be in a position to start up again; these ten companies control two thirds of the approximate 400,000 m³ of theoretical production capacity (Table 10.21).

Second-stage processing, to supply the national market, is in the hands of small firms, many of them in the informal economy, and also industrial companies, with activities focused on the manu-

Table 10.21. Capacity of first-stage timber processing companies in DRC.

Activity	Number of companies	Capacity (C) (x 1,000 m ³)	Total Capacity
Sawing	17* of which:	1 with C ≥ 100; 6 with >10 to ≤ 20 C; 7 with C ≤ 10	≈ 281,000 m ³
Sawing, peeling	2	10; 15	≈ 25,000 m ³
Sawing, peeling, slicing	1	60	≈ 60,000 m ³
Peeling	1	10	≈ 10,000 m ³
Slicing	1	20	≈ 20,000 m ³

Source: Roda et al, for DGF

*: 3 for which no capacity data is available

Table 10.22. Main production statistics for DRC.

x1,000m ³		Logs	Sawn timber	Veneer	Plywood
Production*	2002	105*	35*	1*	1*
	2003	90*	15*	1*	1*
	2004	90*	15*	1*	1*
Domestic consumption	2002	75*	6	1	1
	2003	32	1	0	1
	2004	32	1	0	1

Source: ITTO

*: ITTO estimate or adjustment

facturing of finished products (parquet, pre-cut timber), mainly for export.

Production

Production in the formal sector has always been low relative to the immense size of the resource and in comparison with other producing countries in the subregion. Of the six Central African countries, DRC has the lowest rate of forest production (Table 10.22). Production never topped 400,000 m³ (DGF-Simon) to 500,000 m³ (FRFC-Karsenty) during the decade preceding the war. In 2004, it dropped below 100,000 m³, with more than half being exported, mostly in the form of logs. In 2005, production is estimated to have been around 250,000 m³.

With regard to forest companies restarting after the interruptions caused by the war, most worksites have yet to reach their production targets for the first year. Production often remains below 2,000 m³ a month or under 20,000 m³ a year.

A key portion of production in the country is carried out by the informal sector for the domestic market. Pit sawmills, whose workforce increased considerably between 1996 and 2000, offer more competitive prices, even though the quality-price ratio is equal to what the formal sector can offer. The market in Kinshasa and the other big cities is also supplied by industrial companies. The precise quantities produced by the informal sector are unknown, but appear considerable and could be as high as those produced by the formal sector. Plywood production is basically intended for the domestic market.

Exports

The exports mentioned concern only the formal sector and remain limited, despite a substantial increase in 2005 (Table 10.23). Exports from the informal sector are not quantifiable, but could constitute a higher volume than those from the formal sector. There seem to be two main outlets for timber from the informal economy: one to the west, in the direction of Angola, and one to the east, in the direction of Uganda, Kenya, Zambia, and Tanzania. The outlet in the east is supplied by logging that has developed in Ituri and Kivu. These exports go towards financing imports of consumer goods for populations in the east of the country.

The particularly difficult conditions for freight in DRC are an additional constraint that restricts export possibilities and influences the sector's commercial strategies. Destinations are limited, departure times are few and far between and costs are high. For conventional shipments the only destination is Europe. There are only three charter firms, whose operating procedures are restrictive: frequent stops at other ports in the subregion, transshipments, etc.

Destinations for the shipment of containers are more numerous, but the associated costs are high.

Development priorities

The factors limiting the sector's development possibilities are freight costs, costs connected to reinvestment, overall transportation costs and the extremely high human population pressures in certain regions.

Consequently, the main action objectives are:

- making provincial activities and river traffic secure

Table 10.23. Main export statistics for DRC.

x1,000 m ³		Logs	Sawn timber	Veneer	Plywood
Exports	2002	30*	29	-	-
	2003	58 (37**)	14 (16**)	1	-
	2004	58*	14	1	-

Source: ITTO

*: ITTO estimate or adjustment ** ATIBT data

- improving port infrastructures and rehabilitating the Kinshasa-Matadi rail link
- zoning forest areas to determine land use priorities
- establishing a reliable power supply, particularly in Kinshasa
- improving information and education of the population
- abolishing forms of incidental taxation where no services are supplied in return

DRC is a country undergoing reconstruction whose growing demand for materials, especially timber, is being supported by a revival of its industrial production sector and substantial growth of its timber sector.

Main bibliographical sources

Ambassade de France au Cameroun, 2005; FAO, 2002; Lumbwe Gwaadigo, 2000; Makombo Monga Mawawi, 2004; OAB, 2004; OIBT, 2004; Roda *et al.*, 2003.



Figure 10.1. Floating logs on the Congo River in DRC.

11. The Environmental Dimension of Industrial Logging¹

With areas under concessions often being much larger than the neighboring protected areas, logging in Central Africa can be a potential instrument for conservation of the environment or one of the causes of environmental damage and loss of biodiversity. These diametrically opposed trajectories fuel the ongoing controversy between supporters of the management of tropical forests, as a means of conserving them, and champions of protection, pure and simple. These two options, however, can be complementary and it is time to move beyond the traditional sterile debates between conservationists and those in favor of sustainable management. Conservation is obviously essential, but logging that is compatible with maintaining and renewing resources, and makes optimum use of tropical forests, can also contribute to their protection from conversion into alternative uses. This ‘sustainable’ logging necessitates greater consideration for environmental factors in the management of production forests (Table 11.1).

Tropical forest logging

The evolution of forestry concepts

While Southeast Asia leads the tropical timber export industry, logging originated in Africa with the first exports of mahogany from West Africa to England in 1672. In Central Africa logging for a few high value species (ebony, padauk, etc.) continued relatively extensively for about three centuries, however, the tropical forest of Central Africa really became the loggers’ green gold in the 1950s. The 1950s brought the arrival of new machinery (crawler tractors and logging trucks), which substantially increased the profitability of timber logging and made it possible to work further away from the coasts and major watercourses.

During the years 1950 to 1970, the forest was seen as capital allowing an endless production of timber. Most of its users regarded it as a simple source of income and foreign exchange. Growing environmental awareness at a global scale, marked by the Stockholm Conference in 1972, led to growing recognition of nature conservation as a fundamental factor for human development. The increase in the rate of species disappearance gave rise to conservation biology in the 1980s. At the same time, the perception of forests changed from simple capital in the form of land and timber to that of a complex and multifunctional living environment. This concept gave tangible form to the principle of sustainable forest management (although the principle had been around since the beginning of the 20th century), aimed at meeting current needs without compromising future needs. Then in 1992 at the Rio Conference, Agenda 21 defined non-restrictive forestry principles for the sustainable management of forestry resources: triggering a shift from the classic technical concept of ‘sustained timber production’ to the current socially-based concept of sustainable forest management, which takes into account the numerous uses and users of forests. This change in concept was accompanied by a growing sensitivity on the part of society to the environmental impacts of logging in tropical forests. However, the respective expectations of societies in the North and the South vis-à-vis tropical forests are different, sometimes even contradictory (Gullison *et al.*,

¹ This chapter is taken from a collective work co-produced by CIFOR, the Autonomous University of Madrid and ITTO, financed by ITTO, to be published at the end of 2006: ‘La gestion durable des concessions forestières dans le Bassin du Congo’ by R. Nasi, J.-C. Nguingui & D. Ezzine de Blass (Eds.). We would like to thank the International Tropical Timber Organization, which authorized the use of this work for the 2006 report on the State of the Forest.

What is the logging situation in Central Africa? What environmental impacts does it have? How are these environmental aspects taken into account in practice? What progress can be made to achieve forestry management, certification and logging with a reduced impact? These are the questions that this chapter will attempt to address.

Table 11.1. Trends in the management of production forests.

Old concept: sustained yield	Recent concept: Sustainable management
Forest = productive capital	Forest = complex multifunctional living environment
What must be preserved in the long term: the volume harvested is equal to annual production	What must be preserved: the ecological functions (therefore both plant and animal biodiversity), as well as the economic and social functions
Concern for a balance in age classes for timber species	Concern for overall balance of the environment; no irreversible measures
	Application of the precautionary principle

2001; Lugo 1999; Smouts, 2001), and the idea of being able to conserve the biodiversity of tropical forests through sustainable forestry practices is rejected by a sector of the conservation community (Vincent, 1992; Howard *et al.*, 1996; Rice *et al.*, 1997, 1998a and b; Bowles *et al.*, 1998).

Area affected by logging

Why then worry about improving logging activities by implementing techniques with a reduced environmental impact?

Quite simply because the industrial or communal exploitation of the tropical forests of Central Africa will continue, regardless of what the environmental lobbies may have to say, and the forest area under concession is much greater than the forest area contained in protected areas (Table 11.2).

At present, the area under protection (unfortunately often a somewhat theoretical notion) represents about 16% of the area of dense forest, while the area allocated to forestry concessions as of 2004 represented 36% of the area of dense forest.

Sustainable logging of production forests, therefore, provides an additional opportunity to that offered by protected areas to maintain forests and biodiversity (Lugo, 1999; Whitmore, 1999) in Central Africa. To attain this objective it is essential to ensure that the logging causes the least possible damage to the environment.

Characterization of forest logging in Central Africa

In Central Africa, logging is by and large very selective (Table 11.3). It concerns a limited set of commercial species and very few individual trees are harvested (between 0.5 and 3) per unit area (Ruiz Perez *et al.*, 2004). In legal texts, the individual trees that can be harvested are defined by a minimum felling diameter (MFD). There is no such limit to the number of individual trees that can be harvested per hectare, even if the natural distribution of commercial species means that the number of individual trees that can be felled is low.

Irrelevant of a concessionaire's commitment to a particular management approach, logging in a forest requires the construction of infrastructure: camps, road networks, timber storage areas, tracks, etc. The road network includes main roads and secondary roads which are used by trucks to carry wood away from timber storage areas in the forest.

Logging also leads to considerable human activity in the forest. To begin, there are prospecting and concession demarcation teams who travel throughout the forest block, followed by the civil engineering teams and their machines, who establish the main road network and camps. Once the minimum infrastructure is in place, an inventory team goes through the forest to determine and locate the harvesting potential. Inventory activities vary in intensity depending on whether the logger proceeds by selection 'on sight', without any prior planning (simple inventory or harvesting inventory, with varying degrees of efficiency), or develops a management plan (management and harvesting inventories carried out according to strict standards and with rigorous controls). Inventory teams are followed by cutting and extraction teams, which cut down the designated trees and transfer the trunks to temporary storage areas. Once there, additional teams cut them and load them onto trucks for transport to timber yards at factories or ports.

Table 11.2. Areas (ha) of production forests and protected areas in Central Africa.

	Cameroon	Gabon	Republic of Congo	DRC	CAR	Equatorial Guinea	Total
Area of country ^(a)	46,540,000	25,767,000	34,150,000	226,705,000	62,298,000	2,805,000	398,265,000
Area of dense forest ^(b)	19,639,000	22,069,000	22,263,000	108,339,000	8,227,000	1,843,000	182,380,000
Production forest							
'Large dense <i>terra firma</i> rainforests' ^(c)	12,000,000	17,000,000	13,000,000	90,000,000	3,500,000	1,500,000	137,000,000
Surface allocated in 2004 ^(d)	5,400,000	13,600,000	10,000,000	16,000,000	3,000,000	1,400,000	49,400,000
Protected areas ^(e)							
Category I (Full nature reserve)	0	15,000	0	270,000	86,000	51,500	422,500
Category II (National Park)	1,748,312	2,910,285	2,247,542	8,544,000	3,102,000	303,000	18,855,139
Category IV (Area managed for habitat or species)	1,053,583	20,000	1,042,500	1,438,425	1,493,000	197,500	5,245,008
Category VI (Protected areas of managed natural resources)	425,466	1,010,000	528,960	5,889,225	336,000	0	8,189,651

(a) FAO, 2005

(b) Mayaux *et al.*, 2004

(c) FRM, 2003

(d) FRM, 2003; MINEF planning document Cameroon 2004; Karsenty direct survey for DRC

(e) Vande weghe, 2004

Table 11.3: Species logged and productivity.

Country (Concession)	Number of species logged	% of 5 main species	Average productivity (m ³ /ha)
Cameroon (5)	12-35	65-100	4-7
CAR (global)	20	91	3-4
Republic of Congo (7)	8-30	75-100	4-11
DRC (5)	11-21	75-100	3-7
Gabon (4)	25-30	± 90	± 6

Source: Ruiz Perez et al. 2004

Environmental impacts of logging

The above mentioned operations cannot be carried out without causing some degree of disturbance. To reduce the negative impacts of logging on the environment, it is necessary to understand the nature of these impacts and, above all, to determine those practices which can be modified in order to minimize overall damage.

A distinction can be made between the direct and indirect impacts of logging. In addition, some impacts are unavoidable and must be mitigated, whereas others are avoidable and should be eliminated (Table 11.4). The destruction of a certain number of trees and other forms of life is indisputably a direct and unavoidable consequence of logging. It is impossible to construct a road or fell a tree without some damage. Hunting and the sale of bushmeat by employees of logging

companies are not essential to the harvesting and marketing of timber. They constitute indirect and potentially avoidable consequences.

Direct impacts of logging

Creation of infrastructure

The creation of infrastructure implies complete and permanent destruction (for the duration of the concession) of the affected vegetation cover. Different data published in the literature show that camps and industrial installations (such as sawmills) commonly take up between 0.03% and 0.1% of the surface area of the forest (Estève, 1983; Lumet *et al.*, 1993; Durrieu de Madron *et al.*, 1998).

The area occupied by road infrastructure varies according to the topography, road widths and the distribution and number of harvestable trees. The values found in the literature typically vary between 1% and 2% of forest cover destroyed (Estève, 1983; Durrieu de Madron *et al.*, 1998, 2000).

Inadequate construction or maintenance of road systems can have a direct effect on the environment (Dykstra & Heinrich, 1996) by:

- obstructing the flow of certain watercourses and building dams (often sources of plant pathogens or causes of plant mortality) upstream of infrastructure
- increasing sedimentation of watercourses, which can have serious consequences for water supply and quality
- causing significant soil erosion
- increasing the risk of landslides on steep gradients, along with the repercussions that this can have on infrastructure, watercourses and modes of land use
- substantially modifying vegetation and fauna along the main routes (Malcolm & Ray, 2000)

The presence of a road network, even well designed, also has the indirect effect of fragmentation of the forest block to varying degrees (see following section).

Table 11.4: Environmental impacts of logging.

Impacts	Direct impacts	Consequences
Unavoidable	Damage in the residual stand	Increase in the local density of the human population
	Noise, various disturbances	Loss of nutrients
		Fragmentation
Avoidable	Soil erosion and pollution of watercourses	Increased access to isolated forests
	Reduction of regeneration capacity, loss of genetic diversity	Increased deforestation
		Increase in hunting
		Increased risk of fire
		Propagation of exotic species

Logging

Once the access roads have been constructed, the operations connected with felling and removing logs to the timber yards will also destroy or damage parts of the vegetation. The extent of this damage is directly linked to the tree-felling intensity (Fig. 11.1) and the precision of various operations, but it is impossible to carry out logging without damage to the residual stand.

In Central Africa, legal logging removes about one tree per hectare. Opening up trails for inventories entails cutting plants at their base. Felling of trees causes varying degrees of damage to other trees. Opening up the skid tracks and the skidding itself lead to the death of a large number of seedlings, young plants and undergrowth. Skidding can also inflict injuries at the base of large trees. Opening up timber storage areas requires clearing strips in the forest. However, at the average removal rate of one tree per hectare, these impacts concern only small areas: 1-2% of the total area for secondary roads and timber storage and 2-4% for skid trails.

All teams working in the forest commonly make a lot of noise and disturb fauna, especially when using motors. This impact is in addition to the fact that personnel often take advantage of their stay in the forest to lay traps, hunt with guns or collect small slow-moving animal species. Although there is a lack of rigorous studies (see Larkin, 1996 and Radle n.d. on the effects of noise on wildlife), it is probable that disturbances related to human presence and noise cause little damage to wildlife, as long as they have the means to move away from the areas of disturbance.

As long as adequate management procedures are applied, logging is not a highly polluting activity (unlike the extraction of petroleum or certain ores). Poor management of industrial waste (fuels, oils, used parts) or human waste (see following section) can, however, be a direct cause of damage to the environment.

Indirect impacts and consequences

At present, logging in Central Africa is generally carried out in remote and often undeveloped areas with few inhabitants. The arrival of a logging company, with its associated resources, in these isolated and undeveloped areas often attracts large numbers of immigrants in search of better living conditions. This immigration from surrounding villages, combined with company employees and their families, leads to a rapid and substantial local increase in the density of sedentary populations.

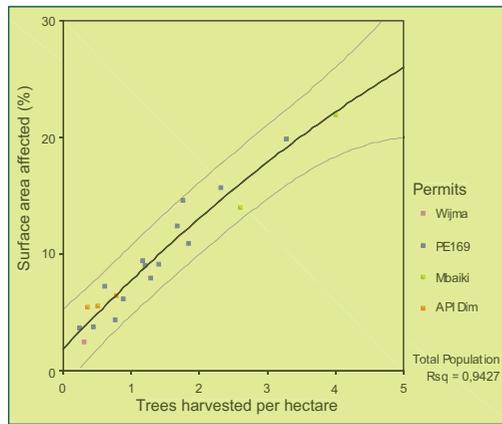


Figure 11.1: Percentage of forest area disturbed according to the number of trees harvested

Source: modified from Durrieu de Madron et al., 2000.

Pokola in North Congo is a striking example of this phenomenon: a small village of fewer than 300 habitants in the 1970s, the installation of the CIB's main camp changed Pokola into a town of 13,000 by 2003; a town equipped with better infrastructure than the regional capital (Ouessou). CIB employs 2,000 people in Pokola, giving a ratio of 6.5 habitants per employee. Such human concentrations in the forest quickly become local sources of pollution (household waste, excrement) and can perpetuate the propagation of exotic species and the overexploitation of forest resources (commercial hunting, fishing, deforestation).

Impact on the conservation of nutrient cycles

In the dense forests of the tropics, most nutrients are stored in trees and soil is of poor quality, serving primarily as a medium for the conversion of dead matter into living plants.

Traditional forestry activities do not lead to the movement of appreciable quantities of organic matter or nutrients. The large scale of logging activities makes it tempting to think that very large quantities of matter are removed, however, in reality the quantities removed are small, particularly if good practices are followed. The volume extracted – less than 10 m³ per ha – is small relative to the total biomass, which is over 500 m³ per ha. Logs rejected after felling, and the tree crowns left *in situ* after separation from the trunk, return to the forest and represent a volume comparable to that extracted. The tree crowns are particularly valuable because they consist of the youngest parts of the tree (leaves and branches), which are also the richest in nutrients. These nutrients are released slowly and can be taken up by the vegetation. This process is in contrast to the case of slash and burn agriculture, which releases nutrients too quickly for efficient absorption.

Impacts on plant diversity

Forests relatively close to inhabited areas are used to gather fruit, other secondary foods, medicinal plants, building materials and/or material for other uses. The removal of these products is normally within limits that do not endanger the survival of species, but when there is strong external demand, over harvesting can occur. While the unfortunate disappearance of a rare species is always a risk, the threat of causing the extinction of a plant species in an area where properly conducted logging operations are being carried out is very low. From an ecological point of view, logging does not lead to any major modification of the system.

However, logging does have two negative effects that tend to run counter to sustainable production. Extracting specific species tends to modify imperceptibly the floristic composition of the forest and in some cases this modification can favor non-commercial species to the detriment of species being extracted. Moreover, the systematic selection of the finest examples of specific species has the perverse effect of reducing the genetic diversity of the harvested species and selecting for the least commercially attractive specimens. The elimination of seed-bearers also severely compromises regeneration. In the case of illegal logging, with the indiscriminate felling of the largest number of trees, there is a greater possibility of substantially reducing both commercial and non-commercial species.

Impact on fauna

Opening up the necessary roads and trails for logging causes fragmentation of the forests and facilitates access by local or outside populations to areas that are often home to abundant and relatively 'naïve' wildlife species. In what become densely populated areas, subsistence or commercial hunting quickly reaches unsustainable levels. In areas that have been recently opened up, hunters can easily find large prey because the fauna is still very abundant and diverse. These areas should be given special consideration as regards conservation (Auzel & Wilkie, 2000; Auzel, 2001). If the areas have been accessed by hunters for a long time, they have generally passed through an 'extinction filter' and only the most 'resistant' species, rodents and small antelopes, will have survived (Cowlshaw *et al.* 2004).

According to Robinson *et al.* (1999), logging appears to be the primary cause of the non-sustainability of hunting in tropical forests. The presence of logging activities drastically changes the prevalent hunting conditions by facilitating

access to the forest and offering commercial outlets for what were originally subsistence activities. Auzel and Wilkie (2000) observe that in northern Congo the employees of concessions hunt more than villagers and that, in general, employees and villagers living along the roadside hunt more than villagers living in areas further away. For a general review of the effects of hunting and their associations with logging, it is worth referring to Fimbel *et al.* (2001) or Robinson and Bennett (2000).

Impact on plant cover: fragmentation

Another consequence of logging is the increased fragmentation of the ecosystem. The roads, tracks and tree-fall gaps create discontinuities that can create problems for wildlife. The reaction of wildlife to fragmentation varies. For instance, main roads may represent impassable obstacles for certain arboreal species or those with low mobility, while the secondary vegetation which develops at the edge of the road may attract a number of large herbivores (elephants, buffaloes, large antelopes) which profit from the abundant source of food. However, in edge areas there is also a higher risk of being hunted. In the absence of any hunting pressure, a certain level of fragmentation appears to increase the animal biomass (Tutin *et al.*, 1997). Another study (Tweheyo *et al.*, 2004) showed that logged areas of the forest and the forest edge provide approximately 76% of the diet of chimpanzees; these are also the areas with the greatest human interference. Studies in Neotropical forests have revealed that hunting and fragmentation act in synergy, with the effects of one compounding the effects of the other (Peres, 2001).

Apart from facilitating hunting, the fragmentation of forests increases their vulnerability to fire. Although this phenomenon is less prevalent in Central Africa than in Indonesia, the extensive fires in Côte d'Ivoire in 1982-83 clearly showed that fragmented forests are more vulnerable to fire than intact forests (Bertault, 1992). Van Nieustaat and Sheil (2005) showed that in Indonesia most trees destroyed by fire were already killed by drought. Therefore, it seems that there is a fairly strong relationship between fragmentation, drought and fire. This relationship probably contributed to the major fires of 1982-1983 in Côte d'Ivoire.

Although the evidence is rare in Central Africa, fragmentation and greater access to forests also increases the risks associated with the invasion and dissemination of animal or plant pests. The increased presence of domestic animals (dogs, cats, livestock) around human concentrations can

increase the chances of disease transmission between domestic and wild animals. Furthermore, some exotic and/or ornamental plants introduced in camps or villages could turn into invading species that favor the changes in forest cover and microclimate due to fragmentation. Examples of this phenomenon appear to be fairly rare in Central Africa, but infestations of *Chromolaena odorata* (Figure 11.2) have been noted at the edges of practically all forests in the Congo Basin. This light-craving species forms a dense thicket of 1 to 2 meters high in open spaces. *Chromolaena* rarely reach felling gaps as these gaps are isolated from the roads and paths by a curtain of forest, however, few woody plants can penetrate *Chromolaena* thickets and, according to observations in Côte d'Ivoire, transition into tree cover is very slow. Observations in post-harvest fallows demonstrate that these thickets do not give way to woody plants until many years later.

Impact on soil and water

The most obvious impact associated with harvesting activities is the compaction of soil that can affect water movement. This risk is particularly high with clayey soils. It cannot be avoided when the permanent road infrastructure is created, but must be minimized when opening up temporary paths and skid trails.

A second risk is the disappearance of the humus layer. Generally, soils in tropical rainforests are not very rich in humus: there is only a slight development of color with depth, and even the surface layer is red. The aforementioned compaction is visible on wheel tracks from skid trails, which also expose a mixture of materials from the top few centimeters. These disadvantages can be minimized by stopping logging when the soil is wet.

In conclusion, it is clear that the indirect impacts, often subtler and less spectacular than logging itself, present a greater danger for the survival of the forest than the felling of a few trees.

How to reduce the environmental impacts of logging?

Low-impact logging (LIL)

For approximately the last ten years, low-impact logging (LIL) has been widely presented as one of the most important advances in sustainable forest management. Most recent publications on the subject seem to concur about the existence of a number of practices that can reduce appreciably the negative environmental impacts of tropical logging (Ong & Kleine 1995; Pinard *et al.* 1995; Putz *et al.* 2000; Fimbel *et al.* 2001). There also seems to be a general consensus on the fact that LIL as currently advocated, essentially a series of recommendations relating to advanced planning, forestry management and civil engineering, is not necessarily a panacea and is probably insufficient to guarantee environmental sustainability (Sist *et al.* 2003a). For example, its beneficial effects, such as the reduction of damage to the residual stand, quickly disappear in cases with excessive harvesting intensity or particular spatial distributions of harvested species (Sist *et al.*, 2003b) or become debatable if the harvested species are light-demanding species that require large openings in the canopy in order to regenerate (Fredericksen & Putz 2003; Sist & Brown, 2004).

In Central Africa, the few large-scale studies that have been carried out (Durrieu de Madron *et al.*, 1998; Parren 1998; Jonkers, 2000) show that the adoption of rational harvesting practices (planning of road networks and trails, undertaking careful logging inventories, removing buttresses before felling, etc.) allow productivity per hectare to be increased, while reducing damage to the stand. Other classic recommendations in LIL manuals, on the other hand, seem ineffective (directional felling) in reducing damage or pose a threat to biodiversity (removing lianas).

In conclusion, the adoption (or rediscovery) of good harvesting practices by operators should allow the impact per cubic meter to be reduced considerably. In certain conditions, other measures recommended in LIL could also be of some use. This is conditional on there being a genuine operational plan that really does incorporate these practices and controls offtake.



Figure 11.2. *Chromolaena odorata* is an aster of Asian origin.

Ecocertification

For fifteen years, various ecocertification systems (Forest Stewardship Council, Pan European Forest Certification, CSA International, Sustainable Forest Initiative, etc.) have been developing with the common objective of having good forest management practices labeled by a third party. Whichever the system, these are market instruments intended to improve current practices based on the assumption that 'ecosensitive' consumers will prefer to buy an ecocertified product. In return, producers wishing to retain this sensitive market will improve their practices in order to obtain certification. However, the applicable markets only exist in Europe and North America and represent only a very small portion of the world's consumption of tropical timber (Roda 2000).

Proof of this can be seen in the very low level of growth of ecocertification in tropical and subtropical forests (Table 11.5). The latter, although forming some 50% of the world's forest areas, only represent about 17% of certified forests around the world under the FSC label (the most widespread in the world). In Central Africa, the situation is even simpler: only one FSC certificate has been issued so far, although a few companies have recently embarked on this process. This imbalance is probably due to the opportunity cost of ecocertification, which is higher for tropical forests than for temperate or boreal forests (which already have a long history of rational management).

Additional limitations of certification relate to product quality, compliance with sizing standards and the reliability of supplies, all points on which Western (and therefore sensitive) markets are very strict. As ecocertified products are rarely cheaper than non-certified products, their market is highly competitive. Even if consumers are prepared to pay more for a product in exchange for a 'good forest management' label, this does not mean that they are prepared to pay more for products of lower quality. In terms of most forestry products, the two critical components of Western markets, be they ecosensitive or not, are the demand for a certain level of product standardization and the demand for a high level of reliability in the regularity and volume of supplies. These requirements relate to the organization and performances of industrial sectors and have no direct relationship with 'good or bad' forest management (Roda 2001).

In conclusion, certification certainly offers opportunities for improving current forestry practices in Central Africa in order to make them more environment-friendly, but these opportunities have yet to be seized and certification alone, without forest management, will certainly have only a limited impact.

Forest management

In Central Africa, an approach to forest management has been emerging in recent years based on the concept of integrated management. In this approach, an industrial partner is involved in the management of the forest allocated to him right from the management conception stage. This approach is backed by a French cooperation (Ministry of Foreign Affairs, for institutional aspects; *Agence Française de Développement*, for the financing of facilities and industries; *Fonds Français pour l'Environnement Mondial*, for biodiversity considerations) and thus far approximately 15 million hectares of dense rainforests are already under or being brought under management (Nasi & Forni, 2003).

This concept of integrated management runs counter to the extraction practices still applied by the majority of operators (no real planning of logging operations, removal of a small number of species, repeatedly logging patches, rapid exploitation over very large areas, etc.). Forests to be managed are large in size (several hundred thousand hectares) and current forestry practices are limited to logging. Operators are tempered by a genuine concern to take into account forest dynamics (mortality, growth, regeneration, damage

Table 11.5. Areas of FSC certified forests. Note: in February 2006, 1,445,758 ha were ISO 14001 certified in Gabon, 41,965 ha were FSC certified in Cameroon, and 1,727,788 were Keurhout certified in Gabon.

FSC certified areas	Non-tropical	Tropical subtropical	Total
Asia	639,676	194,699	834,375
Southern Africa	-	1,854,190	
Central Africa	-	0	
West Africa	-	0	
East Africa	-	36,825	
Africa (total)	-	1,891,015	1,891,015
America	12,959,840	6,616,567	19,576,407
Europe	30,383,543	-	30,383,543
Oceania	630,373	591,842	1,222,215
Total	44,613,432	9,294,123	53,907,555

Source: FSC 2005, modified

to the stand) and aim for sustainability of the resource to be exploited. More and more frequently biodiversity is being included in management systems. There are now numerous examples of management plans that are not just plans for felling timber, but instead plans that incorporate mammal populations or even, in the case of the most sophisticated plans, refuges of plant and animal biodiversity. Consequently, there are increasing numbers of industrial companies adopting this approach with the help of international NGOs or specialized consultants (Tutin & Nasi, 2001).

Unfortunately, this approach currently applies only to industrial operators and not small, medium-sized or community operations, although these represent an appreciable part of the region's production.

Conclusion: where are we?

Seeking ecologically sustainable forest management involves constantly searching for a better understanding of nature and the means to use it more efficiently. The most effective way is through the widespread establishment and application of genuine forest management. However, for this approach to respond effectively to concerns for ecological stability, the following areas will have to be developed over the next few years:

The incorporation of biodiversity implies so-called low-impact logging techniques (LIL). While LIL has demonstrated its effectiveness in a tropical environment, it is founded on considerations related to civil engineering and forestry and includes few or no ecological considerations, in contrast to practices in northern countries (NBF, 1992). However, researchers in numerous disciplines believe their work can potentially improve logging practices. Knowledge on the vulnerability of forest taxa is much more widespread than is commonly thought or applied (Martini *et al.*, 1994). A synthesis of this knowledge and its implications for biodiversity in LIL, would likely be more useful than specific studies on the impact of logging, which are classically found in the literature (Sheil & van Heist, 2000).

Changes in current forestry practices that are based on a universally applied rule: the minimum felling diameter (MFD). Originally defined in accordance with the technical capacities of the sawmill industry, current MFDs do not take into account the ecological and forestry considerations of the concerned species. Blind application of MFDs leads to excessive logging intensities or compromises the maintenance of rare or slowly regenerating species. In the long term, this can

have serious consequences for the floristic diversity of the ecosystem. Using MFD as the only constraint would therefore appear to be insufficient, and forestry must include new standards to ensure the sustainability of the ecosystem (Sist *et al.*, 2003a and b).

Optimizing canopy gaps: Logging causes gaps whose size, spatial distribution and frequency may vary substantially. To date, there is no official recommendation on how to optimize the number and size of gaps, as a function of forest ecology. It would be interesting to know which logging approaches would favor the regeneration of the largest number of species and, therefore, greater floristic variety, as suggested by the theory of intermediate levels of disturbance (Sheil & Burslem, 2003; Wright, 2002). In other words, can particular logging conditions serve as a motor of floristic diversity?

It is also necessary to address the sustainability problems posed by legal or illegal hunting associated with logging. To comprehensively consider this question, it is necessary to look beyond pure prohibition or solely repressive measures. Solutions must be sought by fostering a greater awareness on the part of governments and industrialists and by the genuine integration of the faunal resources in management processes.