

**Biodiversity Planning Support Programme
Integration of Biodiversity into National Forest
Planning Programmes**

The Case of Gabon

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Executive Summary

With a very high forest cover (over 80%) and low population density (below 5 inhbits/km²), Gabon is still a forest biodiversity rich country. Gabon's forests are amongst the richest in Africa in terms of botanical diversity and endemism for example, 22% of plants described in the Flora of Gabon are endemic and the forests of Gabon have more plant species (estimated at 8000 species) than all of the forests of West Africa combined. The fauna is also rich, estimated at more than 190 mammal species, including at least 20 species of monkeys, more than 600 species of birds, 70 species of reptiles and 100 species of amphibians. About 35,000 gorillas and 64,000 chimpanzees dwell in Gabon forests and elephants number between 60,000 and 74,000 individuals.

The network of protected area seems adequate in size (about 10% of the territory) but some important ecosystems are still inadequately protected and most of the protected areas are understaffed and under funded.

Forest biodiversity loss is probably not critical so far but hunting for bushmeat, often but not always linked to opening of forest areas by logging companies is a serious problem.

Gabon is Party to several Conventions (Biological Diversity, CITES, RAMSAR, London, etc.) and a member of the International Tropical Timber Organisation and of the African Timber Organisation.

The civil society is emerging but remains fairly weak and is essentially represented by small NGOs developed in urban areas. It has only a small influence on national level decisions about forest and biodiversity.

Forest and environment sectors have governed by two major laws that are still lacking a proper set of implementation texts though they were passed in 1982 for the Forestry law and in 1993 for the Environment law. These texts have been developed without integrating requirements from the CBD and without real cross-sectoral integration. The forestry law is currently revised but the new text (likely to pass in 2001) although better than the previous one because the implementation decrees are already written does not really integrate CBD concerns.

Gabon has initiated several national planning processes. The NFAP was initiated with the support and under the push of the donor community (especially France) while the NEAP and NASP-BD were essentially a result of the signing of the CBD and were funded by GEF. These various planning exercises have been conducted in parallel without real integration and communication.

It seems however that the situation is now improving as in December 1999, a Planning, Monitoring and Evaluation Unit (CPSE) was created within the Ministry, under the co-ordination of the General Secretary, in order to:

- (i) ensure the follow-up and the implementation of the main conclusions and recommendations of NEAP and NFAP,
- (ii) create a coherent institutional framework within the Ministry,
- (iii) assure appropriate information transfer to institutional and non institutional stakeholders of the sector,
- (iv) prepare the financial mechanisms to support the sector.

A Letter of General Policy is also prepared by the Ministry of Forestry and Environment to summarize the results of the national exercises of environmental planning (NFAP, NEAP, NSAP-BD) and the orientation of the new Forestry Code in terms of policies, operational priorities and axes of implementation for the development of the forestry and environment sectors.

This seems a serious effort to have a better integration of environmental and forestry issues. Nevertheless, this is happening as all planning exercises are completed and validated.

Some progresses have been made thanks to a reorganisation of the agencies involved in environmental and forestry planning exercises but it remains to be seen if implementation and integration of the new legislations become a reality.

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GABON, QUICK FACTS

Figure 1. Map of Gabon (source Atlas Jeune Afrique du Continent Africain)



Area: 267,667 km² with 257,667 km² of land area

Population: 1.15 million of which more than 70% are urban

Density: national average is 4.3 inhabitants/km² but forest areas are below 2

Forest cover: around 205,000 km² and represents 80% of the land area

OVERVIEW OF STATE OF FOREST BIODIVERSITY

Gabon contains three of the 200 eco-regions defined by WWF as the world's most outstanding examples of each major habitat types (Olson and Dinerstein, 1998): the Congolian Coastal Forest, the Northwestern Congolian Lowland Forests and the Western Congolian Forest-Savanna Mosaic. In addition, there are significant stands of central African mangroves along the coast and patches of swamp forests in the northeast. Furthermore several priority freshwater systems occur within the country.

Status of forest biodiversity

In part due to the low human population, much of Gabon remains relatively undisturbed. Its forests cover around 22 million hectares¹ representing 85% of the country of which eight million have barely been affected by human activities. This, combined with its stable climate through geological time (and the consequent extent of refuges) has resulted in a great variety of biodiversity and natural phenomena making Gabon a country of great significance for biodiversity conservation.

Ecosystem diversity

Mangroves and swamps

Covering the various estuaries (Ogooué, Mondah, Gabon, etc.) the Gabonese mangroves are largely dominated by nearly pure stands of *Rhizophora racemosa* accompanied with *Avicennia nitida* and *Conocarpus erectus*. So far, they have been not subject to any form of exploitation in Gabon. The area covered by these mangroves, also including some swamp forest areas, is around 600,000 ha (UICN, 1996).

Closed forest ecosystems

They may be roughly divided into three categories: the broad group of coastal basin forest, the more homogeneous forests of Central Gabon, and the north-eastern forests that share characteristics with semi-deciduous forests (Nicolas, 1977; Drouineau and Nasi, 1999).

- **Coastal basin forests** (Congolian coastal forests *sensu* Olson and Dinerstein, 1998)
This is an evergreen high-forest with clear undergrowth characterised by the abundance of the following tree species: *Aucoumea klaineana*, *Sacoglottis gabonensis*, *Erismadelphus exul* and *Erythrophleum suaveolens*. A great part of these forests are degraded and transformed into secondary forests, as this was the first to be exploited for timber and other resources because of the proximity of the sea and the ease of access.
- **Forests of Central Gabon** (North-western lowland Congolian forests *sensu* Olson and Dinerstein, 1998)
This is a homogenous large block of evergreen high forests characterized by species absent from the two other blocks (*Calpocalyx heitzii* and *Paraberlinia bifoliolata*). It is possible to distinguish some subtle variations, characterised by differences in canopy species abundance, linked to geology and pedology. Most of the timber harvesting is now occurring in these forests as the coastal ones have been largely depleted.

¹ According to the latest FAO FRA 2000 (FAO, 2001), the total forest area is 21.8 million ha; according to TREES (Mayaux *et al.*, 1998), it is 20.7 million ha; Wilks (2000) gives a slightly different interpretation to the TREES data and including fragmented forests (10-70% forest cover), which is closer to the FAO definitions, founds 23.9 million ha (of which 21.1 million ha dense forest).

- **North-eastern forests** (North-western lowland Congolian forests and Congolian-Zairean swamp forests *sensu* Olson and Dinerstein, 1998)

These forests are characterised by the disappearance of important species present in the two previous blocks (especially *Aucoumea klaineana*) and by the appearance of species characteristic of the semi-deciduous rainforests (*Terminalia superba*, *Triplochiton scleroxylon*, *Gambeya subnuda*, *Sterculia subviolacea*, etc.). These forests represent a transition *facies* between the evergreen and semi-deciduous rainforests (well-developed in Cameroon and Congo). The timber harvesting has just started in these forests but because of the absence of *Aucoumea klaineana* and the transportation distance, they are less economically interesting than the two other types. The large tracts of swamp forests are dominated by *Entandrophragma palustre*, *Uapaca heudelotii*, *Hallea ciliata*, etc.

Forest-savanna mosaics

Gabon contains ancient natural savannas called “plaines” that date back to the last glacial maximum 12,000 years ago, and perhaps much further (Oslisly *et al.*, 1996). Small to medium-size graminoids (*Pobeguinea arrecta*, *Ctenium newtonii*, *Bulbostylis laniceps*, etc.) dominate these savannas under xeric conditions (sandy soils). Tall grasses (*Andropogon gabonensis*, *Hyparrhenia diplandra*, *Loudetia flammida*, etc.) dominate more humid sites (generally on soils richer in clay or loam). Woody vegetation is absent in dry savannas and represented by small shrubs (*Annona senegalensis*, *Bridelia ferruginea*, *Crossopteryx febrifuga*, *Hymenocardia acida*) in more mesic sites.

The main areas of forest savanna mosaics are found in coastal plains, stretching in fact from Equatorial Guinea to Congo-Brazzaville, on the Plateau Batéké (southeast), in the Niari and Nyanga plains (southwest) with smaller remnants in the sweep of the river Ogooué (central Gabon). They are characterised by a mix of grass savannas and forest patches or galleries very similar to some coastal forests.

Species diversity

Gabon's forests are amongst the richest in Africa in terms of botanical diversity and endemism (e.g. Reitsma, 1988; Sosef, 1994): for example, 22% of plants described in the flora of Gabon are endemic (Brenan, 1978), the forests of Gabon have more plant species (estimated at 8000 species) than all of the forests of West Africa combined. The fauna is also rich, estimated at more than 190 mammal species, including at least 20 species of monkeys (Groombridge and Jenkins, 1994), more than 600 species of birds, 70 species of reptiles and 100 species of amphibians (IUCN, 1996).

This high species diversity is attributed to the fact that several areas have played the role of forest refuges during the dry climatic phases which have repeatedly affected tropical Africa through the Pleistocene (e.g. Maley, 1996): the high rainfall and wide altitude gradient resulted in their maintaining forest cover at times when the vast majority of forests were replaced by savannas. The presence of several endemic or almost endemic large mammals, such as mandrills, sun-tailed monkeys and Ogilby's duiker confirms the importance of the refuge areas. Gabon has only two true endemic mammals: Gabon dwarf shrew (a very minute animal, less than 10g, described only once in 1965) and the Sun-tailed Guenon (discovered in 1988).

Moreover, Gabon is home to significant populations of large mammals. A survey conducted between 1980-1982 estimated that there were 35,000 gorillas and 64,000 chimpanzees in Gabon (Tutin and Fernandez, 1984) and the elephant number in the country is estimated between 60,000 and 74,000 individuals (Michelmore *et al.*, 1989; Barnes *et al.*, 1995). These spectacular large mammal populations seem to indicate that the fauna has been little affected by humans in the past. Although Barnes *et al.* (1991) showed clearly that elephant abundance is higher in abandoned

human settlements. Gabon is still the only place where lowland gorillas can be regularly seen less than 70 km from a capital city!

The coastal zone includes extensive areas of mangrove, lagoons, brackish and freshwater swamps with a unique flora and fauna, which play key ecological roles. Mudflats at Akanda and Sud-Estuaire are of international importance for migratory waterbirds (Scheepers and Marteijs, 1993), representing vital feeding grounds to many migrating species. Furthermore, the Ogooué delta is one of the largest, most intact and least well-known mangrove and freshwater swamp system in sub-Saharan Africa, containing a unique assemblage of plants and animals, including populations of aquatic mammals such as hippopotamus and manatee and many species of waterbirds, including a new species of stern which nests in exposed sandbanks in the dry season.

The forest-savanna mosaics represent a relatively limited habitat in central Africa but have recently been shown to play a key role in species evolution (Smith *et al.*, 1997). They tend also to be areas with particularly high mammal biomass. Exploration in the last few years has revealed the presence of a new bird species (*Cisticola* sp. nov.) in the savannas of the Plateau Batéké in Southeastern Gabon.

Genetic diversity

There is very little information of genetic diversity per-se but the existing high ecosystem and species diversity coupled with the general good state of forests allows to consider that a very high rate of genetic diversity is still present in Gabon. Even the most degraded ecosystems (coastal forests) still exist enough both in quantity (forest cover) and quality (flora and fauna diversity) to consider that no individual species is really threatened with extinction in Gabon.

Forest biodiversity inventory and mapping

Although a number of projects incorporating woody vegetation inventories have been carried out by a number of institutions, there have been no biodiversity specific monitoring programmes in the forestry sector. This section highlights briefly some of the past and on-going research or development projects being carried out by a number of institutions.

Flora and vegetation

Most of our knowledge of the Gabonese vegetation is drawn from the various forest inventories carried in the designing of management plans, started in the 70s by the Centre Technique Forestier Tropical for the FAO (CTFT, 1971, 1979a, b and c) and resumed in the 90s by private companies or the forestry department (DIARF, 1996) as a requirement of the new forestry code. This knowledge is invaluable however it concerns only trees above a certain diameter (20 cm in the best and 60 cm in the worst cases).

The detailed knowledge of the understorey vegetation and of non-timber forest resources is available in very localised sites (Sud-Estuaire, Ipassa, Lopé, Gamba, etc.) and was mainly carried out by researchers (Reitsma, 1988; White, 1995; Fuhr, 1999; etc.) or research organisations (IRET, Museum National d'Histoire Naturelle Paris, Missouri Botanical Gardens, Wageningen University, Université de Gembloux, etc.).

The Museum National d'Histoire Naturelle is publishing the Flora of Gabon (so far 34 volumes available) but this is subject to available funding and unlikely to be completed in the near future.

The Wageningen University is currently coordinating a project with IRET (should end in 2001) to make the National Herbarium of Gabon a National Centre of expertise and information on the

domain of plant biodiversity, with the aim of contributing to the protection and sustainable management of the tropical forests in the countries of the region.

Fauna

The only published large-scale censuses concern gorillas and chimpanzees (Tutin and Fernandez, 1984) and elephants (Michelmore *et al.*, 1989; Barnes *et al.*, 1995). Some more site-specific studies are available or conducted in protected areas (Lopé by ECOFAC and WCS, Minkébé by WWF). Most of this information is unfortunately still grey literature.

Gabon is one of the countries where CITES is implementing its Monitoring Illegal Killing of Elephants (MIKE) project. This new monitoring system at the 10th meeting of the Conference of the Parties was intended to contribute to an assessment of the impact of CITES decisions on illegal hunting of elephants in range States. A sample of specific sites is monitored under MIKE, since it is not possible nor practical to cover all elephant populations in all range States. Data are gathered according to a standard methodology. The information gathered includes elephant population data, reports of illegal hunting and assessments of the enforcement effort deployed in detecting and preventing illegal hunting and trade. So far only the pilot phase is completed.

Some references books on mammals and birds of Central Africa or the whole Africa are also available (e.g. Kingdon, 1997; Gauthier-Hion *et al.*, 1999). They contain generally data on the distribution of species at the country level and little in-country information.

Changes in forest cover and biodiversity

Forest cover

Given the lack of national biodiversity inventory, the best surrogate for biodiversity loss is the loss or degradation of forest cover. Data from FAO sources show that deforestation is not important in Gabon. The latest figures from FRA 2000 (FAO, 2001) give an annual rate of deforestation of less than 0.05% per year. Previous FRA estimates were higher but were likely based on inadequate assumptions.

Table 1. Forest cover and deforestation estimates

Source	Forest cover (ha)	Year	Annual deforest (ha)	Relative decline	Period	Source type	Coverage notes
FRA 2000 FAO (2001)	21,927,000 21,826,000	1990 2000	10,000	<0.05%	90-00	Model estimate	Total forests, > 10% tree cover
FRA FAO (1997)	18,314,000 17,859,000	1990 1995	91,000	0.5%	90-95	Model estimate	Total forests, > 10% tree cover
FRA FAO (1993)	18,235,000	1990	116,000	0.6%	80-90	Model estimate	Total forests, > 10% tree cover
Production Yearbook FAO (1996)	20,030,000 19,960,000 19,966,000 19,900,000	1979 1984 1989 1994	14,000 -1,200 13,200	0.01% -0.0% 0.01%	79-84 84-89 89-94	Forestry agency reporting	Production forests + other categories ⁽¹⁾

(1) Production forests + other wooded land + intended reforestation + recreation forests

On the other hand forest degradation is likely to be higher. According to Global Forest Watch (Collomb *et al.*, 2000) in 1999, 11.9 million ha of forests were under logging concession (active or not). Though these data are still questionable because of the absence of an updated logging concession map, the order of magnitude is probably right. Knowing that in a normal logging operation in central Africa (Estève, 1983), the area occupied by permanent infrastructures – roads, base camps, etc.- is about 5% we can consider very roughly that these concessions have cleared or could potentially clear 595,000 ha of forests for their normal operations. At this we should add the canopy opening created by the actual timber felling operations, estimated on average at 10% (White, 1994; Wilks, 2000). If we sum up all these numbers, forest degradation from logging could total about 1,7 million ha or 7% of the total forest area. Once again, this is only an order of magnitude but it is important to keep this number in mind when comparing with the latest data on forest cover (that do not take into account this cryptic deforestation). On the other hand, most of the forest opening created by logging will be quickly colonised and if left long enough will reconstitute a forest.

Forest biodiversity

Flora

According to the IUCN Red List 2000 (Hilton-Taylor, 2000), there is only one critically endangered commercial tree species (*Austranella congolensis*) and three critically endangered rare plant species (*Magnistipula cuneatifolia*, *Ormocarpum klainei*, *Polystachya victoriae*).

Seven other commercial tree species are considered as endangered (*Diospyros crassifolia*, *Grossweileroendron balsamiferum*, *Millettia laurentii*, *Swartzia fistuloides*, *Testulea gabonensis*, *Tieghemella africana* and *T. heckelii*).

Fauna

Wildlife² is another story. Although information is largely qualitative, experts conclude that hunting poses a severe threat to wildlife in Central Africa. Bushmeat market studies have shown that a wide range of species is affected from forest duikers to gorillas. From a socio-economical perspective, hunting is vital to many Central African families without access to agricultural markets, or those too poor to purchase other sources of meat. Moreover, livelihood insecurity and absence of land tenure encourage the unsustainable commercial trade of bushmeat.

Because there is a lack of species population and distribution data, it is not clear whether the volume of bushmeat consumed (between 12,000 and 17,000 metric tons/year) in Gabon is sustainable at current levels (Steel, 1994; Wilkie and Carpenter, 1999). However hunters report that wildlife is becoming increasingly scarce within proximity to roads, urban centres, and towns.

According to IUCN Red List 2000 (Hilton-Taylor, 2000), there is currently only one critically endangered species, the Gabon dwarf shrew (*Suncus remyi*) but it is so rare and so minute that its status is questionable, and seven endangered terrestrial species, *Crocidura wimmeri*, *Gorilla gorilla gorilla* (lowland gorilla), *Loxodonta africana*, *Lycaon pictus* (African wild dog), *Mandrillus leucophaeus* (drill), *Pan troglodytes* (chimpanzee) and *Potamogale velox*. It should however be noted that some of these species (chimpanzees, gorillas and elephants) are not directly endangered in Gabon where they still exist in large populations. African wild dogs might have been extirpated from Gabon in 1996 (Stuart and Stuart, 1996) but the species is normally restricted to savanna and open woodlands. Regarding the drills, their actual presence in Gabon is still questionable. According to Gauthier-Hion *et al.* (1999) only mandrills are found in Gabon.

² We will use this term here as representing animals with a body weight over 2kg. This represents the very large majority of hunted species.

Causes of forest biodiversity changes

It is generally recognised that loss of habitat through destruction or degradation is the main cause of biodiversity loss. As we have seen, Gabon is not experiencing a high rate of deforestation. The main cause of forest biodiversity loss is likely to be logging (both through direct and indirect effects), as agriculture development is very limited and most of the population is living in towns.

Logging

The highly selective logging carried out in Gabon (generally less than one or two trees cut per ha) is not endangering the forest flora. No commercial tree species is threatened of extirpation or extinction in Gabon. In fact, the only critically endangered commercial timber species *Austranella congolensis* is exceedingly rare in Gabon, belonging to a drier type of forests and, according to available statistics, is not harvested.

Wildlife is adversely affected by logging because the process of locating, felling and exporting timber: a) directly destroys critical habitat, disturbs movement patterns and alters behaviour, and b) indirectly facilitates hunting by building roads and providing hunters transportation on logging vehicles. Moreover, salaried employees and their extended families that live in logging company camps within or bordering concessions constitute a significant local source of demand for bushmeat. For example, it has been estimated that 1,200 employees consumed up to 80 tons of bushmeat in one year in a logging camp near the Lopé Reserve in Central Gabon (PNAE, 1999). The logging industry itself is not the primary market for the commercial bushmeat trade in Gabon. Nevertheless the growth of the logging industry facilitates access to the resource, but what fuels the trade is urban demand and the relatively quick income that it can generate. Hunting of wildlife can contribute up to 40 percent of a logging company employee's income.

Other causes

Other possible causes of forest biodiversity losses are mining (for oil, manganese, uranium) and urban development (e.g. Libreville growth encroaching the Mondah gazetted forest) but they are rather limited in space and do not endanger critically important forest biodiversity rich sites except maybe for the mangrove area in the Mondah estuary which is an important place for migratory birds.

FOREST BIODIVERSITY, CONSERVATION AND PLANNING

Status of biodiversity conservation

In-situ conservation

Gabon has about 2.6 million ha of protected areas covering about 10% of the national territory. The present situation is the result of a management process begun in 1946 to create "hunting reserves" concentrated in the savanna regions of the country, specifically in the central, south and southwestern parts of the country.

Table 2: Protected areas in Gabon

Area name	IUCN type	Year	Size (ha)	Remark
Ipassa	I	1983	15,000	Biosphere reserve
Lopé	IV	1962	536,000	
Wonga-Wongué	IV	1971	380,000	Ramsar site (1986)
Moukalaba-Dougoua	IV	1962	80,000	
Moukalaba	IV	1962	20,000	
Sette-Cama	IV	1962	200,000	Ramsar site (1986)
Ouanga Plain	IV	1966	20,000	
Iguela	IV	1962	180,000	
Ngove-Ndongo	IV	1962	250,000	
Petit Loango	IV	1966	50,000	Ramsar site (1986)
Minkébé	IV	1998	600,000	Gift to the Earth (1998)
Monts Doudou	IV	1998	332,000	Gift to the Earth (1998)

- Source WCMC database, ECOFAC, WWF.

- Moukalaba-Dougoua, Moukalaba, Sette-Cama, Ouanga Plain, Iguela, Ngove-Ndongo, Petit Loango are often grouped under the name of Gamba complex.

The national agency responsible for the management of Protected Areas is the Ministry of Forestry and Environment and more specifically the Direction of Wildlife and Hunting (DFC), although the Tropical Ecology Research Institute (IRET) directly manages the Ipassa Biosphere Reserve and Wonga-Wongué is a Presidential Reserve. Until the arrival of externally funded research and management projects, Protected Areas were mainly “*Paper Parks*”, and all still remain critically understaffed and under-funded. Management plans, based on zoning, are being prepared for three large reserves. Protected Areas and wildlife management are mainly supported operationally by external aid and assistance: several donors (UE through the ECOFAC project, FFEM, NEDA/Dutch Cooperation, USAID with CARPE, and the World Bank GEF) and international NGOs (WWF, WCS, FWIS, Mac Arthur Foundation).

In 1990 IUCN reviewed the Protected Area network in Gabon and made recommendations about priority areas for the creation of new reserves (Wilks, 1990). At that time Protected Areas covered 17,900 km². The existing sites had all been gazetted in the colonial era well before the science of biodiversity conservation emerged to provide the framework of ecological representativeness. The choice of sites was guided largely by criteria such as scenic beauty and numbers of large mammal. The IUCN study proposed a further 25,040 km² of critical sites which were identified as being of priority for conservation. In 2000 IUCN reviewed progress with conservation in Gabon during the previous decade (Bourobou and Ngoye, unpublished report to CEFDHAC): new Protected Areas had been created covering a total of 9,200 km² (Minkébé and Monts Doudou), but many of the critical sites identified 10 years earlier remained unprotected. Furthermore, there were still no National Parks in Gabon and natural resource extraction (including large scale commercial logging) was underway in most existing reserves.

Ex-situ conservation

There is no *ex-situ* conservation programme in Gabon except a small arboretum (Sibang) near Libreville.

Gabon and the International Conventions

Gabon signed the Convention on Biological Diversity (CBD), ratified on 14 March 1997 and the Framework Convention on Climate Changes, ratified on 23 April 1997. Other important international conventions are: RAMSAR (ratified on 13 April 1987), and CITES (signed on 03 March 1973, ratified on 15 May 1989). Concerning international waters, Gabon signed the

Convention of London (12 May 1992) on the prevention, combat and cooperation in matters of oil pollution products, and the Convention related to the valorisation of the marine environment and the coastal zones of the West and Central Africa region (signed on 23 March 1981, ratified on 09 May 1988).

As part of its fulfilment of the CBD requirements, Gabon has produced a first national report (available at <http://www.biodiv.org>) and has prepared a National Environmental Plan and a National Strategy and Action Plan for Biodiversity (see below biodiversity planning).

The policy and institutional framework for biodiversity

The Law 16/93 (Loi cadre sur la protection de l'environnement) lays out the general legal framework regulating environmental issues in Gabon. In this law, the environment is defined as the natural and artificial elements as well as the social, economic and cultural factors whose interactions impact on living conditions, living organisms and human activities, and regulate the human welfare.

The Law 16/93 seeks:

- (i) the conservation and sustainable use of natural resources,
- (ii) the existence of an adequate living place for rural and urban populations,
- (iii) the fight against all sort of pollutions,
- (iv) the improvement of living conditions,
- (v) to promote a new environmental ethic as well as environmentally friendly economic activities,
- (vi) a development in harmony with the conservation of nature.

The text defines the various natural resources and the actions to undertake for their sustainable management, the list of possible pollutions and the correcting measures, the various preventive (environmental impact assessments) and corrective (urgency plans) activities, etc.

Unfortunately it also states that most of the concrete implementing measures will be defined in forthcoming decrees (concerns 40 of the 96 articles). As the result, and like the 1982 forestry law, implementation has been weak because of the lack of most of the implementing decrees. Moreover, in this law, biodiversity is only one aspect among several others of environmental protection. The actual biodiversity concept is even lacking in the text.

Because at that time Gabon was not part of the CBD or the CITES, the various requirements of these conventions were not integrated into the legislative texts.

The role of civil society

Local NGOs and communities³

Rural communities are generally absent in the national biodiversity dialogue or represented by politicians often more interested in their own interests than in the broader community interests. This is partly due to the fact that Gabon is a highly urbanized country, more than 75% of the population live in towns. As a result, the NGO movement is primarily urban. Most NGOs are based in Libreville from which they operate. Thus links between NGOs and rural people are scarce and weak. Few NGOs are established with the major aim of supporting the area where founders are from.

³ Largely drawn from Bonis-Charancle, 1996.

The NGO movement is recent in Gabon; most have been established after 1990. National NGOs are very numerous but they have not reached an advanced stage in development (very few have permanent staff and offices).

The ENGO (environmental NGOs) group includes NGOs involved specifically in the environmental sector and multi-sectoral NGOs conducting environmental activities. National NGOs concerned with environmental issues on a regular basis amount to a dozen. Because of Gabon's characteristics (middle income country, huge forest areas), ENGOS represent a much more driving force among NGOs than in countries overwhelmed with more serious or urgent social problems.

The three major sectors for ENGO focus and operation are environmental education, urban rehabilitation activities and lobbying activities. Their most significant results are:

- Publishing of "Cri du pangolin", the most elaborated magazine on environment in the sub-region among publications by ENGOS.
- Emergence of an ENGO collective group monitoring forest uses: policy, felling license granting, and certification. This is a key feature of Gabonese ENGOS.

Gabonese ENGOS are seldom directly involved in natural resource management activities. An exception is the Tourism Office of Lopé (Syndicat d'initiative de la Lopé, SIL). The SIL has links with the other NGO partners of ECOFAC (Amis du Pangolin, Aventures sans frontières).

ENGOS do not collaborate very much either. Rather, they tend to compete for the same activities. Mutual information and communication sharing are inadequate. However, some collaboration is emerging among some NGOs for activities of influence. A Gabonese ENGO collective group has recently adopted a collective position regarding a logging concession granted in the Lopé protected area.

As a conclusion, we must recognize that the part played by civil society in biodiversity management or planning is still very little in Gabon. Although some of the better-established ENGOS (Les Amis du Pangolin) are generally invited to attend meetings and were somewhat associated with the NEAP and NFAP exercises, their contribution is often ignored. Their main impact seems still as an advocacy group but, in this role, they represent only a small part of all interested stakeholders (young literate urban citizens).

International NGOs

Due to its classification among middle-income countries International NGOs are virtually non-existent in Gabon, outside of the environmental sector. Among the existing international NGOs we can cite Worldwide Fund for Nature (WWF), Wildlife Conservation Society (WCS), Veterinarians without Frontiers (VSF), Gabonese Institute for Agricultural Development (IGAD), all operating within the environmental sector.

WWF and WCS have been directly involved in the biodiversity planning process but it is difficult to really measure their impact or their role as often they act officially on behalf of the Gabonese administration while pushing their own agenda.

The National Biodiversity Planning process

In 1997, following its ratification of the CBD, Gabon started the process of designing a **National Environmental Action Plan** (NEAP). The plan, based on a White Book (Livre Blanc), contains the environmental strategy of the Government and determines the operational priorities. It was

approved by the Government in March 2000. The program of actions proposed by the White Book is based on the following components:

- (i) management and protection of urban environment,
- (ii) availability of clean drinking water,
- (iii) conservation and management of biodiversity,
- (iv) integrated coastal management,
- (v) sustainable management of forests,
- (vi) ecological and economic efficiency of energy use and development.

As a fulfilment of its duties to the Convention on Biological Diversity, Gabon has also produced a **National Strategy and Action Plan on Biological Diversity** (NSAP-BD) with the financial support of UNDP/GEF. The global objective fixed by the NSAP-BD is to assure the conservation of biodiversity, by 2025, and to guarantee an equitable sharing of socio-economic and ecological benefits derived from biological resources through public awareness and through human and institutional capacity building. Five operational objectives were identified:

- (i) to study biodiversity,
- (ii) to protect biodiversity (genes, species, habitats and ecosystems),
- (iii) to better understand physical and human environment in order to realize and appreciate the value of its biodiversity,
- (iv) to conceive a viable and dynamic economy, which takes biodiversity into account,
- (v) to ensure the involvement of local communities in the conservation of biodiversity.

A NEAP Coordination Unit started the NEAP exercise under the umbrella of the Ministry of Tourism, Environment and Nature Protection. In 1999, this Coordination Unit became the Biodiversity Coordination Unit of General Direction of Environment (DGE) of the Ministry of Planning, Environment and Tourism. It was basically just a name change as the people in charge as well as the Minister were the same. It is interesting to note that at this moment, the management of protected areas was still under the Wildlife General Direction (DFC) of the Ministry of Forestry.

FOREST MANAGEMENT IN GABON

Importance of forestry to the economy

In 1997, the forestry sector represented around 6% of GDP, 12% of the revenues from exportation and 28% of the employment. This put the forestry sector at the second rank (after oil⁴) in the national economy and as the first private sector employer (the main employer in Gabon being the State – representing more than 50%). Some recent statistics are summarised in Table 3.

One species, Okoumé (*Aucoumea klaineana*), has historically been Gabon's main export commodity. Okoumé is mainly used for high quality plywood and Gabon is the principal producer country. It is found in about 70% of forested area, except for the eastern and northeastern regions. Okoumé still accounts for 60-75% of timber export value, complemented by Ozigo (*Dacryodes buettneri*) and species normally referred to as other species (bois divers). The export trade in Okoumé and Ozigo raw timber is under the monopoly of the Société Nationale des Bois du Gabon (SNBG) who buys the timber to local companies and sell it to the international markets. The trade in other species and all transformed products is outside the control of the SNBG. Although the new forestry law promotes a greater industrialisation of the forestry sector less than 10% of the harvested timber is locally processed.

⁴ In 1960, timber made up almost three fourths of Gabon's exports, but with the expansion of oil exports, this share was reduced to less than 10% by 1980 (Pourtier, 1989).

Table 3. Timber production and exports (modified from Drouineau and Nasi, 1999)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
Production (x 1000 m3)									
Okoumé	821	1015	1332	1462	1531	1779	1836	--	--
Ozigo	74	98	127	205	141	124	157	--	--
Others	431	416	400	460	588	506	782	--	--
Total	1326	1529	1859	2127	2298	2409	2775	--	--
Export (x 1000 m3)									
Okoumé	889	953	1377	1322	1553	1728	1900	1038	1563
Ozigo	64	85	127	160	158	115	134	48	61
Others	372	372	364	370	418	444	683	685	714
Total	1225	1402	1874	1900	2219	2289	2719	1773	2338
Export (million US\$)									
Value	155.7	162.5	277.2	288.6	308.6	330.6	401.5	--	--

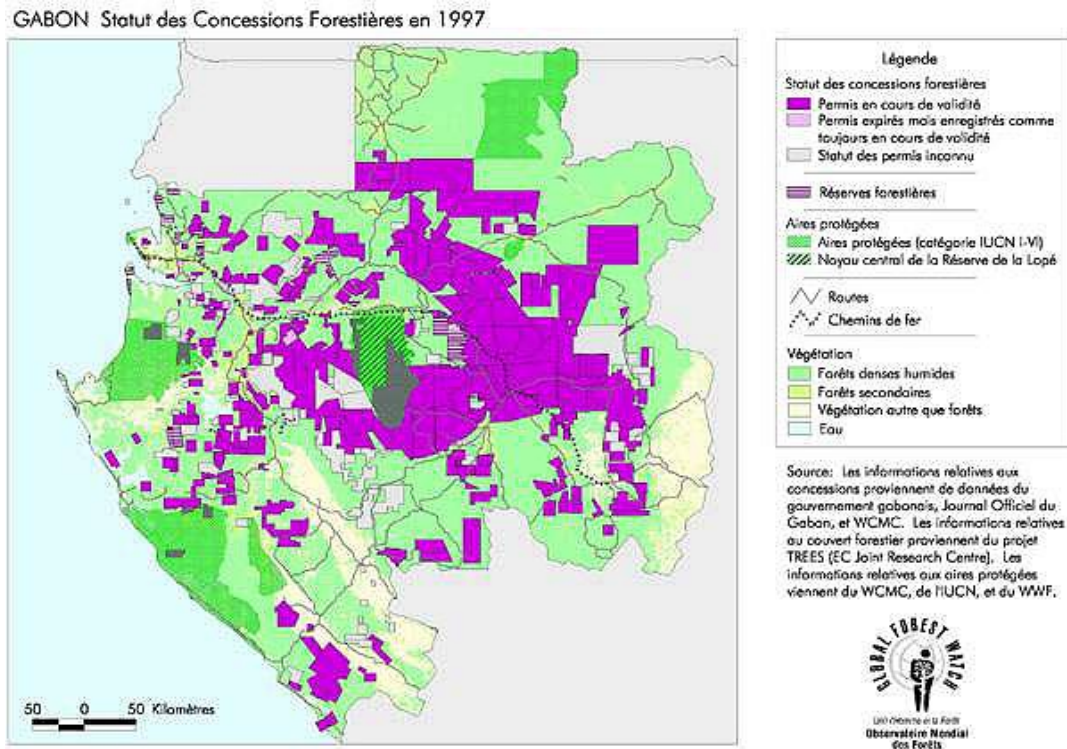
Evolution of the main forest production areas

Industrial forest harvesting started in 1900. Most of the timber was then extracted a few meters from a river, manually pushed into the water and then floated to the port. Harvesting was mainly made by indigenous people who became wood fellers, as they were previously ivory or rubber gatherers. Between 1900 to 1913 the harvested quantities rose from 5,000 to 135,000 metric tons.

After the First World War, the use of small railway systems (Decauville) allowed to mover further into the forest. This technological change induced a change in the forest sector structure, which became controlled by European interests able to buy the necessary equipment. In 1930 more than 400,000 metric tons were exported for 1.5 million ha of concessions. The coastal zone became depleted and, as a result, the colonial administration decided to create two zones following the limits of the coastal basin. The second zone was opened to logging in 1956 and required even bigger capital and investment. In 1960, the total logging concession area was around 3,0 million ha mostly in the first zone (coastal basin); in 1968, concessions in the first zone represented 0.1 million ha and 2.8 million ha in the second zone (Pourtier, 1989).

Today, more than 80% of the 11.9 million ha of logging concessions are located in the second zone (see Figure 2). A detailed account by administrative units is available in Collomb *et al.* (2000).

Figure 2. Logging concessions in 1997 (source <http://www.globalforestwatch.org>)



Policy framework and institutional structure for timber exploitation and forest management

The forestry sector activities are still governed by the 1982 forestry law (Loi d'orientation en matière des eaux et forêts) or Law 1/82. This text lays out the general legal framework regulating logging activity as well as other natural resource use (e.g., hunting). The law recognises the concepts of logging zones, logging permits, size of logging concessions, wood processing development, and other aspects of the forest sector.

This text was conceived as a broad legislative framework to be implemented through various other legal texts, particularly *décrets* (ministerial orders) and *arrêtés* (administrative orders). This did not happen and the first decrees (or implementing texts) were published in 1987, followed by three more in 1994. In 2000 less than one fourth of the planned decrees were written.

As a result the law 1/82 remained too vague to be really fully enforced on the ground. A detailed review of the weaknesses and poor implementation of this law is available in Collomb *et al.* (2000).

Since 1998, the Government has embarked in the preparation of a new forestry law design to replace the Law 1/82. This new text went to the Assembly and was rejected in first instance for several reasons, one being that like for the Law 1/82 there was no implementing decrees. As a result, it was decided to produce a forestry code (including the law proper and the decrees). This new forestry code is not yet accepted but is considered as near final. The full text of this new forestry code is available on-line on the Ministry of Forestry website (<http://www.gabon-forests.org>). The new code seeks to promote sustainable forest management strategies, based on

management plans; adjust the tax base to promote and encourage more sustainable logging practices; and develop a national wood processing industry.

Brief history of forest management in Gabon

In Gabon, forest management traces back to 1945 with a decree stating that prior to any exploitation all forests should be prospected and a simple management plan designed. The forests were then allocated by open auctions. This decree was slightly modified in 1960 at the independence and by 1970 was not implemented anymore.

The 70-80 decade is characterised by a number of forest management projects funded by the FAO without any real interest from the forestry administration. Several million ha of forests were then inventoried and detailed management plans designed. Unfortunately, none of these plans was ever implemented and they remained nice but totally theoretical exercises.

In 1982, the forestry law 1/82 defined a permanent forest estate composed of gazetted state forests (forêts domaniales classées) and protected state forests (forêts domaniales protégées). Article 13 states that the gazetted state forests should represent at least 40% of the national territory and Article 14 adds that gazetted state forests must be regulated by a management plan. These forests could only be harvested by the forest department on behalf of a concessionaire or after a public auction.

Surprisingly, the “protected” state forests can be harvested with prior agreement of the administration but do not require a management plan. They became basically open-access forestlands.

In reality only nine forests, covering less than 1 million ha, were ever gazetted some with a management plan but never implemented. As a result most forests were harvested following the very minimal requirements of protected forests.

The new forestry code, defines a permanent national forest estate composed of gazetted forests (such as protected areas) and productive forests (logging concessions) and a rural forest estate reserved to local communities. All productive forest including the ones in the rural forest estate must be regulated by a management plan. Logging of any productive forest cannot begin without prior approval of a documented management strategy submitted to the Ministry of Water and Forests. Failure to gain approval within three years will result in the permit’s withdrawal and the reopening of the bidding process. Management plans are designed to ensure sustainable annual production, while preserving social, physical, and biological values derived from forests. These plans are simplified for community forests in the rural forest estate.

To date, though the new code has not been officially voted, several large logging companies have embarked in the design of a management plan following requirement of the new forestry code. This initiative has largely been possible thanks to a system of financial incentives put in place by French aid agencies (Fonds d’Aide et de Coopération, Agence Française de Développement and Fonds Français pour l’Environnement Mondial) combining grants for integrating biodiversity concerns in forest inventories, discounted rate loans to design management plans and specific loans for industrial investments linked to the existence of these management plans.

National forest planning

Started in 1997 as the Tropical Forestry Action Plan for Gabon (PAFT-Gabon) with the support of the French Cooperation, the National Forest Action Plan (PAFN Gabon) was achieved, presented and adopted during a national workshop held in October 1999. The operational strategy proposed by the NFAP is based on five main points:

- (i) a long term protection of forest ecosystems and resources,
- (ii) the creation of a permanent forest domain of 12 million hectares including 4 million hectares in Protected Areas, as well as a rural domain of 10 million hectares,
- (iii) the elaboration and implementation of sustainable forest management plans as a necessary condition to exploit forest resources,
- (iv) the certification of managed forests,
- (v) the increasing involvement of rural populations in forest management and in the local transformation of forestry products.

A Coordination Unit under the umbrella of the Ministry of Forestry managed the PAFT-Gabon exercise. At the beginning, the process was under the umbrella the Ministry of Forestry, Fishing and Telecommunications, which then became the Ministry of Forests and Replanting, and is now the Ministry of Water and Forests, Fishing, Reforestation in charge of Environment and Nature Protection.

The national forest planning exercise started therefore about at the same time that the national biodiversity planning but in two different Ministries with little official or unofficial links and communication.

Gabon and the international agenda on sustainable forest management

Gabon is a member country of ITTO (International Tropical Timber Organisation) and signed to the International Tropical Timber Agreement. As a result it endorsed the Objective 2000 of ITTO, pledging to achieve exports of tropical timber and timber products from sustainably managed sources by year 2000.

Like most (if not all) ITTO producing country members, Gabon has not been able to meet this objective. In 2000 less than one million ha of logging concessions were regulated by management plans and about three million ha were in the process of designing management plans. Nevertheless the situation in Gabon seems more favourable than in other Central African countries. But we have still to wait that the new forestry code enters into force (all logging concessions must have a management plan) and to monitor the implementation to see confirmation of the current hopes for better management of Gabonese forests.

Gabon is also a member and hosts the Secretariat General of the African Timber Organisation (ATO). As member of the ATO, Gabon has been active in the initiative on Criteria and Indicators for sustainable forest management launched by the ATO.

INTEGRATION OF NATIONAL BIODIVERSITY AND FORESTRY PLANNING PROCESSES

When the biodiversity and forestry planning exercises started, two separate coordination units belonging to two different Ministries managed them. At that time the situation was even worsened by the fact that the Ministry in charge of Environment, although responsible for the national biodiversity strategy was not the one managing the protected areas.

The situation seems to be improving. There is now a Ministry of Water and Forests, Fishing, Reforestation in charge of Environment and Nature Protection. As a result the Environment General Direction (DGE) – that developed the NEAP and the NASP-BD- and the Wildlife and Hunting Direction (DFC) – in charge of protected areas are now within the same Ministry.

In December 1999, a **Planning, Monitoring and Evaluation Unit** (CPSE) was created within the Ministry, under the co-ordination of the General Secretary, in order to:

- 1) ensure the follow-up and the implementation of the main conclusions and recommendations of NEAP and NFAP,
- 2) create a coherent institutional framework within the Ministry,
- 3) assure appropriate information transfer to institutional and non institutional stakeholders of the sector,
- 4) prepare the financial mechanisms to support the sector.

It seems therefore that a serious effort is in progress to have a better integration of environmental and forestry issues. Nevertheless, this is happening as all planning exercises are completed and validated. The question of integration in the implementation is therefore still open.

However, a **Letter of General Policy** is being prepared by the Ministry of Forestry and Environment. The document summarizes the results of the national exercises of environmental planning (NEAP, NFAP, NSAP-BD) and the orientation of the new Forestry Code in terms of policies, operational priorities and axes of implementation for the development of the forestry and environment sectors. Its approval and signature by the Minister is foreseen in the near future.

The Government, largely pushed by the World Bank, is also proposing a **Sectoral Forest and Environment Program** (PSFE) to the donor community. The program adopts a broad sectoral approach including forestry, fisheries, environment and biodiversity preservation and promotion, as well as a cross-disciplinary component to support the development of the sector. This strategic choice is justified by the lessons learned from the past (weakness of environmental institutions; lack of collaboration, synergy and consistency in the forestry and environment sector; etc.).

The overall PSFE objective is to sustainably increase the contribution of the forestry and environment sector to the national economy, while (i) ensuring the sustainable management of natural resources and the conservation of biodiversity, and (ii) improving the standard of living.

CONCLUSION

Gabon is a country with a very high forest cover. Forests are globally in good health, except some parts of the coastal areas. Gabon is a Party to the Convention on Biological Diversity and has fulfilled some of the requirements of the CBD. Still, the legislation on environment and on forests does not really integrate the needs or recommendations of the CBD. Most of the actors of the forestry sector (public or private) have no idea of what is inside the CBD and the move towards more friendly practices seems largely influenced by two external driving forces: the donor community position (especially the World Bank) and the recognition by the private sector that it might become costly to continue business as usual with markets more and more sensitive to environmental issues.

Some progresses have been made thanks to a reorganisation of the agencies involved but it remains to be seen if the implementation and the integration of the new legislations become a reality.

REFERENCES

- Barnes, R.F.W., Barnes, K.L., Alers, M.P.T. and Blom, A. 1991. Man determines the distribution of elephants in the rain forests of northeastern Gabon. *African Journal of Ecology* 29: 54-63
- Barnes, R.F.W., Blom, A., Alers, M.P.T. and Barnes, K.L. 1995. An estimate of the numbers of forest elephants in Gabon. *Journal of Tropical Ecology* 11: 27-37
- Bonis-Charancle, J.M. 1996. Assessment of NGOs in Central Africa case studies in Cameroon, the Congo, Gabon and the Central African Republic. Report to the PVO-NGO/NRMS Project and the Biodiversity Support Program.
- Brenan, J.P.M. 1978. Some aspects of the phytogeography of tropical Africa. *Annals of Missouri Botanical Garden* 65: 437-478
- CTFT. 1971. Etude sur l'aménagement de la forêt des lacs du nord. Plan de Développement Forestier du Gabon. Centre Technique Forestier Tropical, Nogent/Marne.
- CTFT. 1979a. Aménagement du Massif de Fougamou - tome 1. Plan de Développement Forestier du Gabon, 3ème phase. Centre Technique Forestier Tropical, Nogent/Marne.
- CTFT. 1979b. Mise en valeur forestière du Fernan-Vaz. Plan de Développement Forestier du Gabon, 3ème phase. Centre Technique Forestier Tropical, Nogent/Marne.
- CTFT. 1979c. Aménagement du Massif du Sud-Estuaire. Plan de Développement Forestier du Gabon, 3ème phase. Centre Technique Forestier Tropical, Nogent/Marne.
- Collomb, J.G., Mikissa, J.B., Minnemeyer, S., Mundunga, S., Nzao, H.N., Madouma, J., Mapaga, J.D., Mikolo, C., Rabenkogo, N., Akagah, S., Bayani-Ngoye, E. and Mofouma, A. 2000. A first look at logging in Gabon. A Global Forest Watch Report. Washington D.C.: World Resources Institute.
- DIARF. 1996. Aménagement du massif forestier de la Bokoué - vol 1. Direction des Inventaires, Aménagements et Régénération Forestière, Libreville.
- Drouineau, S. et Nasi, R. 1999. L'aménagement forestier au Gabon. Historique, bilan, perspectives. Project FORAFRI.
- Estève, J. 1983. La destruction du couvert forestier consecutive à l'exploitation du bois d'oeuvre en forêt dense tropicale humide africaine ou américaine. *Bois et Forêts des Tropiques* 201: 77-84
- FAO. 2001. The State of the World's Forests 2001. Food and Agriculture Organisation, Rome.
- Fuhr, M. 1999. Structure et dynamique de la forêt côtière du Gabon. Implications pour une succession secondaire dérivant de la forêt monodominante à okoumé (*Aucoumea klaineana* Pierre). Thèse de doctorat, Université Montpellier II, Montpellier.
- Gauthier-Hion, A., Colyn, M. and Gauthier, J. P. 1999. Histoire naturelle des primates d'Afrique Centrale. ECOFAC, Libreville.
- Groombridge, B. and Jenkins, M. (eds.) 1994. Biodiversity Data Sourcebook. Compiled by the World Conservation Monitoring Centre. World Conservation Press, Cambridge, UK.

Hilton-Taylor, C. (compiler) 2000. 2000 IUCN Red List of Threatened Species. IUCN, Gland, Switzerland and Cambridge, UK. <http://www.redlist.org>

Kingdon, J. 1997. The Kingdon field guide to African Mammals. Academic Press, London.

Maley, J. 1996. "The African rain forest - main characteristics of changes in vegetation and climate from the Upper Cretaceous to the Quaternary." The Royal Society of Edinburgh Proceedings Section B (Biological Sciences) 104: 31-74

Mayaux, P., Achard, F. and Malingreau, J.P. 1998. Global tropical forest area measurements derived from coarse resolution satellite imagery: a comparison with other approaches. Environmental Conservation 25(1): 37-52

Michelmore, F., Beardsley, K., Barnes, R. and Douglas-Hamilton, I. 1989. Elephant population estimates for the Central African forests. *In*: Cobb S. (ed.) The ivory trade and the future of African elephant. Ivory trade review group, International Development Centre, Oxford.

Nicolas, P. 1977. Contribution à l'étude phytogéographique du Gabon. Thèse de 3ème cycle, Laboratoire de sociologie et de géographie africaines, Ecole des Hautes Etudes en Sciences Sociales, mimeo, Paris.

Olson, D.M. and Dinerstein, E. 1998. The global 200: a representation approach to conserving the earth's most biologically valuable ecoregions. Conservation Biology 12: 502-515

Oslisly, R., Peyrot, B., Abdessadok, S. and White, L. 1996. Lope 2: Evidence of transition in a tropical ecosystem ca 10,000 BP from a site in the middle Ogooue valley (Gabon). Comptes Rendus De l'Académie des Sciences Série II Fasc. A-Sciences de la Terre et des Plantes 323: 933-939.

PNAE. 1999. Livre Blanc. Plan National d'Action pour l'Environnement (PNAE). Libreville, Gabon.

Pourtier, R. 1989. Le Gabon. Tome 1: Espace-histoire-société. Edition L'Harmattan, Paris.

Reitsma, J.M. 1988. Végétation Forestière du Gabon. Forest Vegetation of Gabon. Tropenbos Technical Series 1. The Tropenbos Foundation, Wageningen.

Schepers, F.J. and Martejijn, C.L. (eds.) 1993. Coastal waterbirds in Gabon. Zeist, WIWO Report.

Smith, T.B., Wayne, R.K., Girman, D. and Bruford, M.W. 1997. A Role for Ecotones in Generating Rainforest Biodiversity. Science 276: 1855-1857

Sosef, M.S.M. 1994. Refuge Begonias: taxonomy, phylogeny and historical biogeography of Begonia sect. Loasibegonia and sect. Scutobegonia in relation to glacial rain forest refuges in Africa. Wageningen Agric. Univ. Papers.

Steel, E. 1994. Etude sur le volume et la valeur du commerce de la viande brousse au Gabon: Rapport final. WWF-Gabon, Libreville, Gabon.

Stuart, C. and T. Stuart. 1996. Africa's Vanishing Wildlife. Smithsonian Institution Press, Washington, D.C. USA.

Tutin, C.E.G. and Fernandez, M. 1984. Nationwide census of gorilla (*Gorilla g. gorilla*) and chimpanzee (*Pan t. troglodytes*) populations in Gabon. American Journal of Primatology 6: 313-336

UICN. 1996. L'atlas pour la conservation des forêts tropicales d'Afrique. Editions Jean-Pierre de Monza, Paris.

White, L.J.T. 1994. The effect of commercial mechanised logging on forest structure and composition on a transect in the Lopé Reserve, Gabon. *Journal of Tropical Ecology* 10: 309-318

White, L.J.T. 1995. Etude de la Végétation – Rapport Final. ECOFAC Composante Gabon, Libreville.

Wilkie, D.S. and Carpenter, J.F. 1999. Bushmeat hunting in the Congo Basin: an assessment of impacts and options for mitigation. *Biodiversity and Conservation* 8(7): 927-955

Wilks, C. 1990. La Conservation des Ecosystèmes Forestiers du Gabon. Gland, UICN.

Wilks, C. 2000. La forêt gabonaise. Libreville (unpublished draft).