

# DEVELOPMENT

January 1993

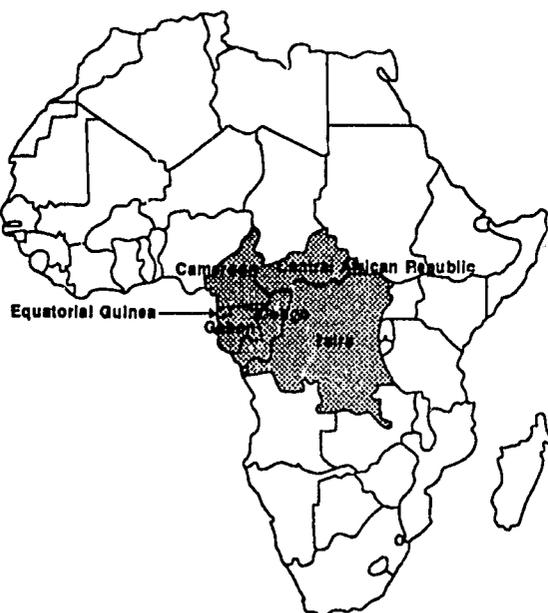
## CENTRAL AFRICA'S FORESTS THE SECOND GREATEST FOREST SYSTEM ON EARTH

by Kirk Talbott\*

Center for International Development and Environment

Straddling the Equator in Africa in an irregular, elongated circle lies the world's second largest contiguous expanse of moist tropical forest. This immense biome, an estimated 2.8 million square kilometers in size, stretches from the Gulf of Guinea through the low-lying interior of the continent all the way to the mountains of the Rift Valley. Contained within its boundaries are Gabon, Equatorial Guinea, and the Congo, and most of Cameroon, the Central African Republic, and Zaire. It is also the home of tens of millions of people who depend heavily upon forest resources for food, energy, shelter, and employment.

Map of Central Africa and its forests



Central Africa's year-round high inputs of solar energy, abundant rainfall, and generally favorable geology, topography, and soils, have given rise to one of the largest areas of contiguous moist tropical forest in the world. The estimated 2.8 million square kilometers is by far the largest such expanse in Africa, accounting for roughly one-fifth of the world's remaining moist tropical forest.

Table 1: Forest Areas - 1980 (10<sup>3</sup>km<sup>2</sup>)

Country	Forest Type		Total
	Closed	Open	
Cameroon	179.2	77.0	256.2
CAR	35.9	323.0	358.0
Congo	213.4	--	213.4
Eq. Guinea	13.0	--	13.0
Gabon	205.0	0.8	205.8
Zaire	1056.5	718.4	1774.9
Total	1703.0	1119.2	2822.2

Note: Closed forests, as defined by FAO, have a high proportion of crown cover, and do not have a continuous dense grass layer. Open forests have a continuous grass cover and more than 10 percent crown cover.

Source: FAO (Food and Agriculture Organization of the United Nations), 1988, *An Interim Report on the State of Forest Resources in the Developing Countries*, FAO, Rome.

Despite its size, central Africa's moist tropical forest is perhaps the least understood of Earth's tropical forest ecosystems. Estimates of its extent, the dominant vegetation types, their distribution patterns, and their biomass densities, for example, vary considerably.

Like many developing areas, central Africa suffers from a variety of socioeconomic ills. Economic stagnation, political crises, rapid population growth, infrastructure decay, and staggering foreign debts have all contributed to the developmental arrest that has come to plague the area in recent years. One result of this stagnation is increasing rates of deforestation: the loss of foreign trade and the consequent economic deterioration compel more people to do whatever they can to subsist. As extensive as the forest resource base may be, it cannot continue to absorb the impacts of increasing human activities indefinitely without showing signs of ecological breakdown.

At present, the forest is being visibly reduced both from within and without, primarily by population increases that strain the carrying capacity of available land and by correlated pressures stemming from declining agricultural productivity. Estimated deforestation rates range between 5,000 and 12,000 square kilometers per year.<sup>1</sup> If these rates continue, central Africa might find itself facing the same unfortunate consequences of extensive deforestation that have plagued West Africa, parts of the Amazon Basin, and much of South and Southeast Asia.

**Table 2: Annual rates of deforestation - 1981 - 1985**  
(areas in 10<sup>3</sup> km<sup>2</sup>)

Closed + Open Forest		
Country	Area	Percent
Cameroon	1.10	0.4
CAH	0.55	0.2
Congo	0.22	0.1
Eq. Guinea	0.03	0.2
Gabon	0.15	0.1
Zaire	3.68	0.2
Total	5.73	0.2

Source: FAO (Food and Agriculture Organization of the United Nations), 1988, *An Interim Report on the State of Forest Resources in Developing Countries*, FAO, Rome.

Because of the extensive, regional nature of its moist tropical forest biome, the six countries of central Africa all face essentially the same set of problems and solutions in trying to make the management of their forest resources sustainable. This shared ecosystem and perspective puts them in a unique position to respond to environmental priorities. For this reason, regional cooperation, not only among the six nations themselves, but also among bilateral and multilateral donors,

scientific organizations, and policy-makers, could well determine the fate of the forest and those who depend on it.

## HISTORICAL, ECONOMIC, AND POLITICAL BACKGROUND

Land-use change in central Africa takes a variety of forms. Agricultural clearing, mining, and road-building can permanently remove tree cover; over-logging and intensive fuelwood collection can degrade forested areas, damaging remaining trees and seedlings, and leaving areas vulnerable to soil erosion; seasonal burning to prepare fields for cultivation or to flush wild game can prevent natural regeneration along the edges of the forest and in recently opened areas.

The clearing, burning, and conversion of forest areas are associated with a variety of direct and indirect factors. Prominent among them are rapid population growth and shifting settlement patterns, inappropriate macro-economic policies, inefficient and wasteful production methods, and weak management and administration.

Yet, the region could readily become a model for sustainable development with its immense wealth of resources harbored within its still largely intact, humid forest ecosystem, the world's second largest. If central Africa's forest system is to avoid the fate of West Africa's largely degraded forests, 75 percent of which have been lost this century,<sup>2</sup> current conditions and trends in the region need to be understood and development priorities reformulated.

### A. Early Inhabitants

According to recently unearthed archeological evidence, humanity has been making use of central Africa's forests, woodlands, and savannas for at least 40,000 years.<sup>3</sup> The hunter-gatherers who now dwell in the forests of the region, roughly 200,000 in number, are assumed to be the direct descendants of these early inhabitants.<sup>4</sup> Although economic and cultural assimilation has taken a toll on many communities of these original forest dwellers, most still regard the forest as the ultimate provider of both material and spiritual sustenance.<sup>5</sup>

Hunter-gatherers are not the only long-term residents of central Africa's forests. Farming cultures began moving into the forests from the bordering savanna lands 2,000 to 4,000 years ago. These two groups evolved a symbiotic relationship, in which agriculturalists provided crops, pottery, and tools in exchange for the bushmeat, medicines, and forest products gathered by the hunter-gatherers.<sup>6</sup> Sharing the region's abundant and naturally replenishing resources, a mutually beneficial relationship between agriculturalists and hunter-gatherers lasted for centuries.

One key to the survival of the early farmers was the development of shifting cultivation, often the most practical form of agriculture given the soil qualities of the forests. Traditional swidden (shifting) agricultural practices based on long fallow periods were developed over the centuries allowing farming communities to sustainably harvest foods and fibers from the forest lands.<sup>7</sup>

The agriculturalists began to thrive, establishing villages and trading routes along the forest's edge and navigable waterways. Their descendants are the approximately 50 million Bantu people who comprise the vast majority of modern-day central Africans.

Permanent disruption of the customary relationship between forest-dwelling groups came with the slave trade and the subsequent colonial era. By 1900, fortune hunters from France, Belgium, Britain, Spain, and Germany had laid claim to vast portions of the region. Large tracts of forests were assigned by the colonial authorities to trading firms that exported such forest products as hardwoods, vines, fruits and nuts, and such animal products as ivory, skins, and feathers. Extracting these natural resources, and establishing control over the lands from which they came, quickly brought the Europeans into conflict with the resident hunter-gatherers and the Bantu farmers.

#### **B. Land-Use Rights and Responsibilities: Conflicts and Contradictions**

In general, the colonial rulers based forest tenure policies upon the Roman legal principles then prevailing in Europe. These held that any "unoccupied" land for which written ownership documents did not exist (as they clearly did not in the African culture) belonged to the colonial state. Thus, the Africans living within or dependent upon central Africa's forests were deprived of legally recognized ties to the land.

As a part of the process of the state alienating Africans from their land, by the end of the nineteenth century, hundreds of thousands of Bantu villagers were forced to provide labor for public works projects, especially road and railroad construction. By the early twentieth century, many communities were required to cultivate such export crops as cotton, cocoa, and coffee often in order to pay taxes to the state. Many of the region's hunter-gatherers were also absorbed into colonial enterprises to provide logistical support and field labor for the Bantus no longer able to tend the local agricultural fields.<sup>8</sup>

The tenurial policies of the colonial era remain in force in various forms today. The only legally secure titles to land in modern Zaire, for example, are those officially registered as private concessions and granted by the national government. These account for only a small percentage of the national territory. Secure private titles or leases can be obtained only through written

application. Individual titles are granted by the state for an initial five-year period; definitive title can be acquired once the land has been shown to be "developed," a term that usually means converted from primary forest to agriculture.<sup>9</sup> It is also the strong presumption in the land-use laws of other central African countries that the state owns the forest lands.<sup>10</sup>

*A priori* written ownership requirements, a common feature of land tenure in many developing countries, frequently lead to ecological damage.<sup>11</sup> In many regions of the world, the less secure an individual's title to the land, the less likely the land is to be put to sustainable, long-term use. The connection between security of tenure and sustainable forest management patterns is less clear in most of central Africa, however, in large part because of the prevailing low population densities and relatively minimal human pressure on the resource base.

*De facto* authority over the use and management of the region's forests is rooted in a complex mix of customary forest use practices and rules, modern statutes and laws, and legal and business agreements with foreign entities in the form of timber and mineral concessions. Given the region's extraordinary ethnic and cultural diversity, socially influenced local tenurial arrangements between different ethnic groups frequently also come into play.<sup>12</sup>

Contradictions between oral customary law and the various written codes, regulations, and statutes covering tenurial rights to forests and other natural resources are exacerbated by conflicts between local people and government authorities. Functionaries are charged with increasing government revenues, especially in the wake of recent economic downturns. Local forest dwellers, on the other hand, depend on the forest resources for their livelihoods and survival. Thus, local resource users and government authorities aren't always willing to work out equitable arrangements to manage the forests for sustainable use and conservation.

#### **C. Local Resource Users Overlooked**

Compounding the problem is the dearth of information about the number, practices, and perspectives of the people who live in or depend on the forests. Even well-intentioned development initiatives, such as credit programs for small-scale investments, extension activities, and agroforestry training, are often designed and implemented without local input or regard for customary laws and land-use patterns.<sup>13</sup> Central governments unilaterally enact laws asserting public ownership rights or impose zoning regulations over vast forest areas. Commercial rights are then allocated to extractive enterprises, many times without input from local residents regarding long-term ecological consequences.

At the same time, most national governments in the region have been largely unable to effectively supervise activities within immense forest areas. A particularly

severe constraint is the inability of governments to staff, train, or pay officials responsible for forest surveying, conservation, and management.<sup>14</sup>

Multilateral, bilateral, and other development organizations have also failed to encourage the development of systematic, suitable, and environmentally sound strategies for addressing tenurial issues in the context of forest management.<sup>15</sup> Large-scale, donor-initiated development projects now being planned in the region could have major impacts on the forests. Timber and mining projects, railroads, roads, and large-scale cash-crop activities continue to be put forward with little attention to the importance of the local communities' vital role in making long-term forest management work.

#### D. Demographic Patterns and Trends

Although data from the region are unreliable, the best estimates available place the present population of the six central African countries at roughly 54 million. Estimated annual growth rates range from 2.3 percent in Equatorial Guinea to 3.5 percent in Gabon. Central Africa's population is projected to reach 140 million by the year 2025, a nearly threefold increase over the next thirty-five years.<sup>16</sup>

The abundant forest resources in the region met the needs of the indigenous population for hundreds of centuries. The colonial period, marked by the exploitation of natural resources for distant consumers, began the slow process of reducing the surplus between indigenous needs and natural supply. For many of the region's people living in sparsely settled rural areas, the forest still meets most human needs year after year. But rapidly expanding urban populations are exerting heavy pressures on the same forest resources.

Today, central Africa is not considered overpopulated, and much of the forest remains virtually uninhabited. But, without question, some areas are already overpopulated, and the resource base is under heavy pressure. One example is the Kivu region of eastern Zaire, where rich volcanic farmland has attracted displaced farmers, many of them from neighboring Rwanda, Uganda, and Burundi, to an area already straining to support its own swelling population. Such pressures inevitably lead to substantial deforestation.

Even though most of central Africa is not overpopulated, it is quite urban -- the legacy of export-oriented trade and of centralized colonial administration. Forty-two percent of all central Africans live in cities and larger towns. With annual growth rates averaging just over 5 percent, the urban population is expected to more than triple within the next 35 years, reaching 90 million.

Rapid urban growth has compromised the surrounding land's ability to provide food, fuelwood, and building materials. Current strains on the resource base lead to

localized deforestation and agricultural degradation. Particularly hard hit are the forests near the largest cities: "urban halos" of deforestation now extend as far as 150 kilometers from Kinshasa, Brazzaville, and Yaoundé.

#### E. Economic Profile

The extraction of natural resources from the vast forest storehouse has long been the *modus vivendi* of central African economies. This pattern began with the original hunter-gatherers, who secured what they needed from the forest and traded the surplus to nearby Bantu agriculturalists. During the colonial era, the region became a major world supplier of timber, copper, palm oil, coffee, and cocoa.

With the worldwide economic growth of the 1960s and 1970s, the newly independent African nations were well positioned to profit from high-level demand for the raw materials they produced. Favorable trade balances were the norm, especially with the development of coastal petroleum deposits in the 1970s and 1980s. During this period, petroleum became the most valuable regional export, often dwarfing the value of other export earners. In Cameroon, Gabon, and the Congo, crude oil exports fueled sharp rises in government expenditures; in Zaire, they helped compensate for a drop in revenues from other minerals, particularly copper.

The emphasis on petroleum generally came at the expense of other economic sectors, particularly agriculture, in the region's six countries. While Cameroon's agricultural sector has until recently avoided serious decline, even there, soil erosion and declining productivity are becoming major problems, especially in western Cameroon with its high population density. In the Congo and Gabon, where urban migration has been particularly pronounced, rural stagnation has aroused concern about the long-term supply of food for city dwellers.

In the 1990s, depressed prices in world commodity markets make it increasingly difficult for central African nations to finance their imports by selling raw materials. Oil-rich Gabon, which enjoyed a per capita income of nearly \$4,000 in 1980, saw this figure decline to \$2,830 in 1988.<sup>17</sup> During the same period, foreign debt has grown dramatically, further aggravating the macro-economic situation. Agricultural subsidies, particularly in the European Community countries that have historically been the region's most important trading partners, have at the same time placed central African producers at a significant price disadvantage.

Faced with substantial revenue shortfalls and unrelenting debt payments on the one hand, and increasing populations on the other, central African countries are rediscovering the importance of forest resources. Economic planners are counting on boosting timber exports to cope with the debt crisis, even though world prices for commercial hardwoods have also been

in decline. Of course, central Africa's continued emphasis on export-oriented, extractive industries over whose markets it has little control indicates the structural weaknesses of the region's economies and the limits on its capacity to cope with worsening terms of international trade.

### F. Political Instability

Compounding the region's economic problems is political instability, in part another unfortunate manifestation of the colonial era. After independence, leaders representing the interests of Paris, Brussels, London, and Madrid were replaced by factional leaders concerned primarily with self-enrichment and with promoting the interests of their own ethnic groups. In many cases, the country's resources have been exploited primarily for the benefit of ruling elites while large segments of the population remain, three decades after independence, effectively disenfranchised.

Until recently, political power in central Africa seemed resistant to pressures for change; entrenched national leaders clung tenaciously to power, often acquired via coups or civil wars. But the combined effects of economic deterioration, capital flight, and political repression have now begun to destabilize the region. Frustrated by their continued disenfranchisement, rival groups have sought to overthrow the incumbent leaders. The worldwide trend toward political pluralism in the wake of communism's collapse has also made an appearance in central Africa. During the past two years, demands for political and economic liberalization have begun to erode once-solid power bases.

Faced with mounting opposition, the Congo abandoned its Marxist orientation in June 1991. Gabon, Cameroon, the Central African Republic, and Zaire have also held national conferences to address the groundswell of political and economic dissatisfaction. Only in Equatorial Guinea has the political system avoided such pressures to date, largely due to the tight control maintained by the current regime.

These national conferences are an encouraging development. Still, they can't be expected to produce immediate results. Nor is it clear that political reforms will solve deep-seated economic problems. With substantial foreign debts, a scarcity of investment capital, and a worldwide slowdown in the demand for export commodities, prospects for sustained growth are not encouraging. In the short term at least, economic troubles and increasing political pressures will continue to foster the sort of dissatisfaction evidenced by Cameroon's general strike in June 1991 and by the civil unrest that flared up in Zaire beginning in September 1991.

What effects political and economic developments will have on the future of the natural resource base, and particularly the forests, is difficult to discern. If the

basic economic picture doesn't improve both internationally and regionally, leadership changes would not necessarily lead to better management of the natural resource base. Continued political instability could further weaken institutions, potentially threatening the large-scale forest-development plans that governments such as Cameroon, Gabon, and the Central African Republic have prepared. At the same time, government's inability to oversee and coordinate natural resource exploitation could make it easier than ever for individuals to realize short-term gains at the expense of the forest's long-term viability.

## DEVELOPMENT POTENTIAL AND FOREST MANAGEMENT

Whatever macro-economic and political conditions prevail, the people of central Africa, just like their Bantu and hunter-gatherer ancestors, remain dependent upon the region's vast forest resources. The primacy of the forest as a supplier of food, shelter, and energy for millions of people in the region remains unchallenged. At the same time, national economies depend increasingly on forests for the raw materials, especially timber and minerals, upon which most of their foreign trade is based. One linchpin of any practical agenda for the future must therefore be to manage this natural resource system in the most productive and sustainable way possible.

### A. Agricultural Practices and Land-Use Change

The leading source of deforestation and forest degradation in central Africa today is the encroachment of agriculture, particularly of the slash-and-burn variety. By one recent estimate, as much as 70 percent of all deforestation in the region is a direct result of local agricultural practices.<sup>18</sup>

Shifting agriculture is not necessarily a destructive practice. Indeed, this mode of agriculture has represented a sustainable way of utilizing forest resources over countless generations in central Africa, as well as in other parts of the world. The practice becomes unsustainable only when demographic pressures, poorly planned infrastructure projects, and inequitable land-tenure regimes undermine traditional agricultural systems. Rotational cycles are reduced, tension between farmers increases, and migrants or settlers from other regions often introduce slash-and-burn practices unsuited to local conditions.

Despite the more dramatic and publicized role of commercial logging, land clearing for agriculture is the single largest cause of forest loss in much of central Africa. As much as 70 percent of the present deforestation in central Africa is estimated to be a direct result of agricultural land clearing.<sup>19</sup> In turn, agricultural expansion represents the major source of greenhouse gas

emissions: foliage and undergrowth are burned, primarily to permit planting, but also to obtain much-needed fertilizer.

**Table 3: Agricultural Overview**

Country	Ag. % of GDP	Ag. % of Pop.	% of Land Cult.	Arable and Perm. Crop '000 ha	Perm. Pasture '000 ha	Food Imports as % of Total
Zaire	30	67	3	7,850	15,000	26
Cameroon	28	63	15	7,008	8,300	16
Gabon	10	69	2	452	4,700	17
The Congo	14	60	1	168	10,000	15
CAR	40	65	3	2,006	3,000	8
Eq Guinea	46	58	8	230	104	15

Sources: FAO 1991, pp. 201-204; World Bank 1991d, p. 82, 95, 133, 194, 214, 596. FAO 1990 Agricultural Workbook, pp. 3-5.

Population growth, demographic changes, and urban-biased agricultural policies have led to the decline of per capita production of food crops in each of the six countries in 1989: from -1% in Cameroon to -6.8% in the Congo.<sup>20</sup> In general, rural populations are meeting their own food demands, but producing less for urban markets. This shortfall is causing deeper agricultural encroachment into forested areas.

Exacerbating this supply shortfall is a growing preference among urban dwellers for agricultural items that aren't produced domestically (i.e., wheat for bread) or that can be produced only at a higher cost than the international market price (i.e., rice). Together, these two trends have caused food imports in general to rise significantly in recent years. With the exception of the Central African Republic, central African countries import a substantial share of their food needs: from 15 percent in Equatorial Guinea and the Congo to 26 percent in Zaire. During the 1970s and early 1930s, when export revenues were high, growing reliance on food imports was not considered a problem. But with the recent slump in export revenues, those imports now represent a substantial debit on national balance sheets.

Also contributing to the overall decline in agricultural productivity are seasonal labor shortages in rural areas: as financial returns from labor-intensive farming have decreased, many young men leave farming to seek their fortunes in the cities. This is especially true in Gabon and the Congo where the petroleum industry pays far higher wages than the traditional agricultural sector. As

a result of this mostly male rural exodus, an even heavier burden falls on women farmers during the plowing and harvesting seasons.

With greater pressure on the land and less labor to clear new plots, fallows are shrinking from traditional periods of 20 to 25 years to periods of 6 to 10 years and less.<sup>21</sup> Under such circumstances, soils no longer have time to recover through revegetation, pest cycles transcend the short fallow periods, productivity falls, and agriculture becomes no longer viable. When this happens, many farmers relocate to new areas already opened up by logging roads or other infrastructure development. Thus, the agricultural frontier advances at the expense of a steadily receding forest.

Poaching and inadequate extension services also threaten central Africa's forests. In the more accessible areas, commercial poaching reduces the supply of bushmeat, an important component of the subsistence diet, thus giving farmers another reason to move farther into the forest. Agricultural extension services are poor, where they exist at all, so few farmers have access to the technologies and inputs needed to increase unit productivity.

Government and donor bureaucrats' lack of knowledge about the potential of shifting cultivation as a viable agricultural system hinders effective assistance in improving agricultural productivity. The region's agricultural research centers have also tended to neglect the practical realities of central African farming. Not only is local and traditional knowledge about land use not utilized, it is also being rapidly lost as people migrate from their customary lands into new areas, where different techniques may be appropriate.

A key to slowing down deforestation is intensifying agricultural production although this would require substantial costs in terms of improved seeds, fertilizers, capital intensive machinery and agricultural research. If the average cereal production for the region could be increased to that of Gabon's, regional cereal output would be increased by 35 percent. Similarly, if the region achieved the world average, unit productivity would more than double. In this case, no extra land would be required to meet the population's cereal requirement through the year 2015.<sup>22</sup>

U.S.A.I.D. and other donor organizations working on farming systems in central and East Africa have demonstrated that production on areas once subject to shifting cultivation cycles can be stabilized if agroforestry is adopted, along with modest inputs of artificial and natural fertilizer to boost soil fertility and improve soil structure. The keys to increasing agricultural productivity probably lie in setting adequate producer prices, assuring that the necessary inputs are available and affordable, and building infrastructure that enables farmers to bring crops to market in a timely manner.

## B. Energy Resources and Needs

Central Africa is well-endowed with energy resources. The immense Zaire River system constitutes one of the world's major hydropower resources. The Gulf of Guinea contains significant petroleum reserves; Gabon, the Congo, Cameroon, and Zaire are net oil exporters, while Equatorial Guinea has recently begun producing natural gas. Additional petroleum deposits are believed to exist in the interior of Zaire and the Congo and beneath Lake Tanganyika. Largely untapped deposits of methane have been found in the depths of volcanic lakes in Cameroon and eastern Zaire, though the environmental consequences of tapping into this resource are unknown. Uranium ore is mined in Gabon, coal in Zaire. Finally, the region's abundant solar and geothermal energy may also hold long-term potential.

Central Africa's most important energy resource, however, continues to be biomass. The tropical forest system that covers up to 40 percent of the region represents a massive source of renewable energy. Even when seasonally inundated or inaccessible areas are taken into account, central Africa's fuelwood resources exceed its hydropower potential in terms of total available energy content. The prevalence of forest resources, combined with the generally low level of economic development, makes biomass the largest source of consumed energy in central Africa. Most of this consumption takes place in households.

A major cause of regional deforestation is the attempted ways to meet household energy needs, especially fuelwood for cooking. Urban areas are growing rapidly, and where the supply of wood is low and harvesting practices are unsustainable, the demand for energy puts increasing pressure on the nearby forest areas that supply the urban fuelwood and charcoal markets.

Fuelwood is used not only by households, but also by such small businesses as bakeries, restaurants, and brick kilns. Charcoal, a compact and lightweight fuel, is produced in wooded rural areas primarily for urban markets. Although a pound of charcoal has twice the energy value of a pound of wood, the growing urban demand for this fuel poses significant problems because so much energy is lost making charcoal. On average, it takes five to seven units of wood to produce each unit of charcoal, a wasteful use of forest resources. Finding substitutes for charcoal and cutting back on its use, especially in urban areas, could thus alleviate pressures on nearby forests.

In general, economic growth prompts people to abandon charcoal and fuelwood for more modern fuels such as kerosene, electricity, and liquified petroleum gas (LPG). Indeed, movement up this fuel-substitution "ladder" is commonly associated with rising incomes: the cleaner, more convenient, and efficient forms are adopted by people with greater discretionary incomes.

But given the present economic stagnation in much of central Africa, it is unlikely that biomass consumption will fall in the foreseeable future.

Increased utilization of central Africa's immense hydropower potential represents another possible means of helping control deforestation pressure. In the long run, this energy source could substitute for some portion of both fossil and biomass fuels although there are to date few examples, if any, in which hydropower has been used to effectively replace rural people's demand for fuelwood. On the demand side, constraints often include the high cost of electric appliances, and the difficulty of fostering new tastes and habits among a populace long used to traditional fuelwoods. On the supply side, the high cost of building new generation, transmission, and distribution infrastructure has meant that hydropower's potential as an energy source is largely untapped. Possible displacement of people, who are then more likely to become agents of deforestation, is another inherent problem with hydropower projects.

## C. Exploiting Forests

Despite the vast extent of central African forests and their immense capacity for natural renewal, current commercial logging practices pose a serious threat to the forest resource base. Unsustainable logging techniques, technical inefficiencies, inappropriate forest policies, and underfunding and staff shortages in the forestry sector all contribute to ongoing deforestation.

Not surprisingly, the most deforestation is occurring in the largest country, Zaire: some 4,000 square kilometers per year since the mid-1980's according to one estimate.<sup>23</sup> Cameroon, however, is apparently losing the highest *proportion* of present forest cover, mostly as a result of commercial logging: its annual deforestation rate of 1.2 percent is half again as high as the Congo's and three times that of Zaire. In comparison, Brazil's annual deforestation rate is estimated to be about 0.3 percent.<sup>24</sup>

If present trends in central Africa hold, deforestation on a scale previously seen in West Africa, and to a far lesser extent, in the Amazon Basin could be in store. National economic recovery plans calling for intensified logging to offset declining export revenues could certainly help turn a potential problem into a real one.

An important factor determining logging patterns ever since the colonial period has been proximity to rivers and ocean transportation routes. The areas closest to the coast or adjacent to the extensive network of navigable rivers were the first to be logged. As demand and technological options increased, roads and railroads were built. After a century of commercial logging, the most accessible forests have been intensively logged for commercial species several times, while the more remote ones have been logged proportionally less.

Commercial logging in central Africa is dominated by large, foreign operators that extract the region's timber resources to make comparatively quick profits. Although the forests of central Africa are remarkably diverse, with over 500 species growing to timber size,<sup>25</sup> commercial logging has traditionally involved far fewer species and concentrated on fewer than ten. In each country, one to five species generate the bulk of all timber export revenues.

The region's commercially valuable species, which tend to grow at very low densities, are harvested wastefully and inefficiently. In general, loggers fell trees with the maximum amount of usable timber -- tall, old growth trees with straight, clear stems that branch out into the forest's canopy. The industry practice known as "high-grading" depletes the genetic stock of the remaining forest by "creaming" a small volume of the best specimens, often needlessly damaging or disturbing large areas of forest. In addition, only the best wood, from the top of the buttress to just below the first branches, is removed for export. The rest of the tree is left on the forest floor, representing a substantial waste of timber resources. Logging operations often cause unnecessary damage to non-commercial tree species and to forest soils. In some cases, this damage also threatens the regeneration of valuable commercial species.

In Cameroon, for example, harvested volumes may be as low as five to six cubic meters per hectare, out of a potential commercial volume of 35 cubic meters per hectare.<sup>26</sup> In Gabon, harvested volumes are even lower: on average, four to five cubic meters per hectare.<sup>27</sup> (These figures should be viewed with caution, however, since companies may underreport volumes of wood harvested to reduce their tax liability.)

Central African governments have tended to underestimate the economic value of forest resources -- an attitude reflecting in part the region's historic abundance of trees. Financially stressed governments may also view logging concessions as a useful source of rural investment. Often, concessionaires build roads, housing, schools, and clinics for nearby villages, and field offices for government forestry staff. In some cases, concessionaires also provide transportation to logging sites for forestry inspectors and even pay their salaries. For these reasons, governments may at times have been reluctant to press logging companies to make better use of timber resources.

Corruption has also been a significant factor. With civil service salaries often months in arrears, forestry officials have sometimes been tacitly encouraged to get whatever they can for the government as well as themselves. Civil service retrenchments have recently reduced staffing levels and budgets of forest sector agencies, further aggravating this situation.

Throughout central Africa, the price of logging permits is low. In addition, government's dependency

on commercial firms undermines the objectivity of the harvest monitoring upon which forest taxes are assessed. This underreporting of wood volume results in the loss of government revenues where export taxes, royalty fees, and other charges are based on reported harvest volumes. The end result is that forest taxes rarely provide national governments with significant levels of revenue relative to the total value of timber exported. In Gabon, for example, revenues from timber taxes covered less than 20 percent of the government budget allocated to the forest sector in 1984.<sup>28</sup>

In the countries of the region, the system of taxation is complex, erratically implemented, and frequently abused. Taxes and fees are levied by a variety of state agencies at numerous stages from logging to inland transport to export. In Zaire, for example, 53 separate taxes exist for exported timber products.<sup>29</sup> Besides paying these taxes, some concessionaires in Cameroon also pay villagers for the right to log in their area as a result of jurisdictional contradictions between formal and customary tenure systems.<sup>30</sup>

Reforming the forestry tax system would be an important step toward improved forest management within the region. By assessing taxes according to standing tree volume, or potential commercial volume per hectare, for example, government revenues would rise significantly. At the same time, loggers would be given a strong incentive to harvest more carefully, utilizing more of the tree and reducing waste. Given the widespread perception of trees as an overabundant resource, however, and the lack of capacity to effectively monitor and regulate logging, it may be unrealistic to expect such a transition, at least in the next several years.

Even protected forest areas are experiencing increasing degradation. Most of the national parks of central Africa have been poorly managed or protected since independence. Many protected areas are regularly encroached upon by agriculturalists, loggers, oil explorers, and poachers. With so few field staff and so little equipment available, patrolling and protection tends to be ineffective. The Congo, for example, has 43 guards to patrol 15,000 square kilometers of parks. In addition, field staff live under difficult rural conditions, get paid poorly and irregularly, and may face personal danger in confronting armed poachers.

#### D. Transportation, Infrastructure, and Mining

In general, central Africa's transportation system is among the poorest in the world. With a few exceptions, it serves only limited portions of the population, and large areas remain isolated from the mainstream of commercial life. In many cases, interior zones constitute a frontier whose long-term economic potential is only now beginning to be exploited. The system has deteriorated significantly since the colonial period ended -- a victim of poor maintenance and a chronic lack of

investment. This weakness represents perhaps the most obvious obstacle to economic development in each of the six countries.

In spite of often negative environmental impacts, the expansion and improvement of transportation infrastructure is a high priority for national governments. Several large-scale projects, most notably the Transgabonais railway and the Bukavu-Kisangani road in Zaire, have been carried out during the 1980s to improve access to natural resources for their exploitation.

Infrastructure's most significant effect on the dynamics of land use comes from the direct role it plays in opening up the forest to economic activity. Until recently, infrastructure development planners paid little attention to either the direct or indirect effects of road or railway construction upon forest resources. Yet, these secondary effects can be very significant. By some estimates, for every tree cut for timber in Zaire, 25 noncommercial trees may be cleared in building the roads to get to it.<sup>31</sup>

High unemployment and economic stagnation are driving increasing numbers of people into previously forested areas to seek livelihoods and sustenance. During the construction of the Transgabonais railroad, an estimated eight to ten hectares were cleared by land-hungry settlers for each kilometer of railway built.<sup>32</sup> Their homesteading triggered even more economic activity as artisans and tradesmen set up shop, selling their products to merchants, locals, and railroad passengers. The gradual establishment of human settlements has caused serious environmental damage in some cases. Bushmeat poaching has reportedly decimated the populations of primate and other wildlife species, for example, in the vicinity of the Transgabonais railroad.<sup>33</sup>

Similar patterns have occurred in other transportation corridors: the opening of the Bukavu-Kisangani road in Zaire has reportedly caused a noticeable increase in agricultural encroachment and commercial activities along the edges of the Ituri Forest. While no one has studied these effects systematically, similar experiences in the Amazon Basin and West Africa have shown that the rapid influx of large numbers of people into tropical forest areas can wreak substantial environmental damage. Often, infrastructure projects catalyze this chain of events.

Paradoxically, weak infrastructure has perhaps been the most effective safeguard against large-scale deforestation in central Africa. Without the access that good infrastructure provides, many economic investments are either impractical, or can only proceed on a reduced scale. Major road-building projects are well beyond the means of local communities. At present, states are extremely hard-pressed for investment capital; and many donor agencies, increasingly aware of the environmental consequences of major infrastructure

projects, are modifying or even cancelling plans for new roads in the region.

This "roadblock" aside, it is unrealistic to expect that stretches of national territory containing valuable natural resources will remain isolated for long. Since infrastructure development is essential to further economic development in the region, national governments are naturally trying to improve the geographic coverage and efficiency of infrastructure. Donors interested in facilitating this effort have a critical role to play in encouraging the design and construction of infrastructural developments that minimize environmental damage.

Like infrastructure, mining has had both direct and indirect effects on central Africa's forest resources. The open pit method of mining manganese, copper, cobalt, and uranium traditionally employed in Gabon and Zaire requires substantial land clearing, though the vast majority of Zaire's extensive copper mines lie in the shrublands of the southeast. Major mining operations also require the building of railways, roads, and electricity-transmission lines to bring in and operate heavy machinery and to transport minerals to processing centers or ports. Magnets for both skilled and unskilled labor, mines also attract large numbers of job seekers and can thus become the stimulus for rapid population growth and commercial development in satellite communities.

Low world prices for minerals combined with chronic transportation bottlenecks, high investment requirements, and a lack of investor confidence in local political and economic stability all make it hard for central Africa's mining sector to grow. The long-term outlook could be quite different, however. Much of central Africa has not yet been thoroughly surveyed, and major mineral deposits could yet be discovered, especially in the Central Basin area of Zaire and the Congo. The region is believed to contain substantial petroleum deposits, the exploitation of which will require a massive investment in the transportation sector. With a network of roads and railways in place, logging and agriculture could develop rapidly in currently inaccessible areas. The result will be greater penetration into the forest and the concomitant increasing risk of environmentally damaging impacts.

## CONCLUSION

A multiplicity of human activities contributes to the mounting pressures on the central African forest. Human interactions causing deforestation include: agricultural practices and land-use changes; available energy resources and needs; commercial logging practices; and, the expansion of transportation infrastructure and of the mining industry. These human activities are influenced both directly and indirectly by

several key factors: lack of input by local resource users with regard to land-use changes and tenurial policies, rapid population growth and demographic changes, inappropriate macro-economic policies, and weak management and administrative capacities.

While widespread deforestation in central Africa has not reached the alarming rate evident in many areas of Asia, Latin America and other African regions, localized areas are experiencing extensive damage or loss, and the trends suggest that the regional ecosystem is at increasing risk. This threatens the long-term livelihoods of the people as well as the stability of the central African national economies dependent on forest resources. However, the forest of central Africa has met the needs of its inhabitants for centuries and *can* potentially continue to do so if understood and managed sustainably.

*First, efforts need to be directed toward a better understanding of the conditions and trends currently affecting the central African forest ecosystem. Second, these efforts should be linked to the development of*

strategies for the productive and sustainable management of the forest. *Although current data is severely limited and unreliable, enough information already exists to proceed proactively with specific steps toward implementing a series of forest management plans.* This information gathering and strategic planning should catalyze the rethinking of relevant policy and the reformulation of development priorities in the region.

*A critical element of this entire process is the existence of regional cooperation.* The forest ecosystem of central Africa extends past national boundaries, thus, in order to achieve any measure of success, decision-making and planning must be regionally integrated.

A concerted *and integrated* effort on the part of governments, donors, non-governmental organizations and local peoples is urgently needed to address these threats of irreparable damage to central Africa's forest. If current deforestation rates continue or worsen, central Africa might find itself eventually facing the same unfortunate environmental, economic, and social problems that have resulted elsewhere in the world.

*Kirk Talbott, an associate with WRI's Center for International Development and Environment, has graduate degrees in law and international relations from Georgetown University. He has traveled and worked extensively in Africa and Asia over the last thirteen years. Before joining WRI over five years ago, Talbott practiced law in Washington D.C. and conducted research on cultural knowledge of ecosystem management for Professor Edith Brown Weiss of Georgetown University Law Center under a grant with the United Nations University.*

#### \* ACKNOWLEDGEMENTS

The World Resources Institute worked with the AID-supported Biodiversity Support Program (BSP) and the NASA/Goddard Space Flight Center to carry out a series of studies on central Africa and global climate change. These regional, technical studies will be available from BSP in early 1993. This AID Africa Bureau-supported Bulletin results, in large part, from that long-term collaborative effort with BSP and other organizations and individuals.

This Bulletin builds heavily on the efforts of several people. The author would like to thank first and foremost Fred Swartzendruber who contributed greatly to the analysis and writing in this document. Fred, the Senior Analyst for the WRI contribution to the BSP studies, is an independent consultant in Washington, D.C. Kate Newman, BSP Program Manager for Africa, and Barbara Braatz, Project Coordinator, provided leadership to the BSP project and supported WRI fully in its contributions and this much smaller analysis. Several others provided research and analytic support to this effort and the larger WRI studies, particularly Mike Berdan, Christine Haugen, Marc Trexler, Jennifer Green, and Roberto Martin. The author also thanks Tony Pryor of the USAID Africa Bureau for his guidance and vision in the overall initiative and the BSP project's senior reviewers, Leonard Berry, Allison Herrick, William Moomaw, and Berrien Moore. Also thanks to others at WRI, Thomas Fox, Walt Reid, Lauren Morris, and David Gow who provided helpful criticisms and improvements to the early drafts of this collaborative Bulletin. Finally, thanks to Kathy Courier, Hyacinth Billings, Faye Kepner Lewandowski and Jim Mangani for their editorial and production assistance.

## ENDNOTES

1. FAO-UNEP (Food and Agriculture Organization of the United Nations- United Nations Environmental Programme). 1989. *Forest Resources of Tropical Africa, Part 1: Regional Synthesis*. Tropical Forest Resources Assessment Project. Rome: FAO.
2. C. Martin. 1991. *The Rainforests of West Africa: Ecology - Threats - Conservation*. Basel: Birkhauser Verlag.
3. D.S. Wilkie. 1988. Hunters and farmers of the African Forest. In: Denslow, J.S., and C.Padoch, eds. *People of the Tropical Rain Forest*. Berkeley: University of California Press. 111-126.
4. J. Beauclerk. 1990. Hunters and Gatherers in Central Africa: On the Margins of Development. Draft consultancy report for OXFAM.
5. T. Hart, and J. Hart. 1986. "The Ecological Basis of Hunter Gatherer Subsistence in African Rain Forests: The Mbuti of Eastern Zaire", *Human Ecology* 14(1):29-55.
6. D.S. Wilkie. 1988. Hunters and farmers of the African Forest. In: Denslow, J.S., and C.Padoch, eds. *People of the Tropical Rain Forest*. Berkeley: University of California Press. 111-126.
7. H. Conklin. 1963. *The Study of Shifting Cultivation*. Washington, DC: Pan American Union; Dove, M. 1985. *Swidden Agriculture in Indonesia: Subsistence Strategies of the Kalimantan Kantu'*. Berlin: Mouton Press.
8. J. Beauclerk. 1990. Hunters and Gatherers in Central Africa: On the Margins of Development. Draft consultancy report for OXFAM.
9. J.W. Salacuse. 1985. The National Land Law System of Zaire. Report to the Land Tenure Center, University of Wisconsin-Madison and U.S.A.I.D./Kinshasa.
10. J.C. Riddell and C. Dicerman. 1986. *Country Profiles of Land Tenure: Africa 1986*. University of Wisconsin-Madison Land Tenure Center Paper, Madison, Wisconsin.
11. See, e.g., Daniel Bromley and Michael M. Cernia. 1989. *The Management of Common Property Natural Resources: Some Conceptual and Operational Fallacies*. World Bank Discussion Papers No. 57. Washington, DC: World Bank; Owen Lynch and Kirk Talbott. 1988. "Legal Response to the Philippine Deforestation Crisis." *New York University Journal of International Law and Politics* 20(3):679-713.
12. R. Peterson. 1990. Whose Forests: Land Tenure Dynamics on Zaire's Ituri Forest Frontier. University of Wisconsin Land Tenure Center. Unpublished.
13. K. Talbott. 1991. Nation States and Forest Peoples: Tenurial Control and the Squandering of the Central African Rainforest. Paper presented at the Second Annual Meeting of the International Association for the Study of Common Property, Winnipeg, Canada, 26-29 September 1991.
14. R. Winterbottom. 1990. *Taking Stock: The Tropical Forestry Action Plan After 5 Years*. Washington, DC: World Resources Institute.
15. See, e.g., Marcus Colchester and Larry Lohman. 1990. *The Tropical Forestry Action Plan: What progress?* Penang, Malaysia/Dorset, England: World Rainforest Movement/The Ecologist; R. Winterbottom. 1990. *Taking Stock: The Tropical Forestry Action Plan After 5 Years*. Washington, DC: World Resources Institute.
16. See World Resources Institute. 1990. *World Resources Report: 1990-91*. New York: Oxford University Press, this reference based on UNDP sources.
17. World Bank. 1990. *Trends in Developing Economies*. Washington, D.C.: The World Bank.
18. Keith Openshaw, personal communication, 1991.
19. See Biodiversity Support Program, World Wildlife Fund, et.al. 1992. *Central Africa: Global Climate Change and Development: Overview*. Draft.
20. FAO (Food and Agriculture Organization of the United Nations). 1991. *The State of Food and Agriculture: 1990*. Rome: FAO.
21. World Bank. 1990. Environmental Issues Papers. Unpublished.
22. Keith Openshaw, personal communication, 1991.
23. N. Meyers. 1989. *Deforestation Rates in Tropical Forests and Their Climatic Implications*. London: Friends of the Earth.
24. World Resources Institute. 1992. *World Resources Report: 1992-1993*. New York: Oxford University Press.
25. IIED. 1988. *Natural Forest Management for Sustainable Timber Production*. Draft. International Tropical Timber Organization.
26. IIED. 1988. *Natural Forest Management for Sustainable Timber Production*. Draft. International Tropical Timber Organization.
27. IIED. 1988. *Natural Forest Management for Sustainable Timber Production*. Draft. International Tropical Timber Organization.
28. IIED. 1988. *Natural Forest Management for Sustainable Timber Production*. Draft. International Tropical Timber Organization.
29. IIED. 1988b. *Zaire Forest Policy Review (Draft): Summary Report*. Washington, DC.
30. S. Gartlan. 1990. Practical Constraints on Sustainable Logging in Cameroon. Presented at the Conference sur la Conservation et l'Utilization de la

---

Foret Dense d'Afrique Centrale et de l'Ouest, Abidjan, Cote d'Ivoire, Nov. 5-9.

31. R.J.A. Goodland, et. al. 1990. *Tropical Moist Forest Management: The Urgent Transition to Sustainability*. Draft.

32. M. Nicoll and O. Langrand. 1986. *Conservation et*

*Utilisation Rationnelle des Ecosystemes Forestiers du Gabon*. Gland, Switzerland: IUCN.

33. M. Nicoll and O. Langrand. 1986. *Conservation et Utilisation Rationnelle des Ecosystemes Forestiers du Gabon*. Gland, Switzerland: IUCN.