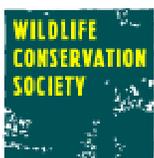


Democratic Republic of Congo Environmental Analysis

Final Report

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ACRONYMS AND ABBREVIATIONS

ADIE	Agence pour le Développement de l'Information Environnementale
AWF	African Wildlife Foundation
CATE	Centre d'Adaptation des Techniques de l'Energie
CARPE	Central African Regional Programme for the Environment
CBFP	Congo Basin Forest Partnership
CEFRECOF	Centre de Formation et de Recherche en Conservation Forestière
CEFDHAC	Conférence sur les Ecosystèmes de Forêts Denses et Humides d'Afrique Centrale
CITES	Convention on International Trade in Endangered Species
CNIE	Centre National pour l'Information Environnementale
COMIFAC	Conférence des Ministres Chargés des Forêts d'Afrique Centrale
CPB	Centre de Promotion du Bois
DFGF	Dian Fossey Gorilla Fund
ECOFAC	Conservation et Utilisation Rationnelle des Ecosystèmes Forestiers en Afrique Centrale
ERAIFT	Ecole Régionale d'Aménagement Intégré des Forêts Tropicales
ERGS	Environmental Resources Management and Global Security
FFEM	Fonds Français pour l'Environnement Mondial
FORAC / OSFAC	Observatoire par Satellite des Forêts d'Afrique Centrale
FFI	Fauna and Flora International
FZF	Frankfurt Zoological Society
GDRC	Government of the Democratic Republic of Congo
GIAP	Global and Inclusive Accord of Pretoria
GIC	Gillman International Conservation
GRASP	Great Apes Survival Project Partnership (UNEP)
GTZ	Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation)
GNP	Garamba National Park
ICCN	Institut Congolais pour la Conservation de la Nature
IJZBC	Institut des Jardins Zoologiques et Botaniques du Congo
IRF	International Rhino Fund
IUCN	International Union for the Conservation of Nature
KBNP	Kahuzi-Biega National Park
KNP	Kundelungu National Park
MZS	Milwaukee Zoological Society
MIKE	Monitoring of Illegal Killing of Elephants
OFR	Okapi Faunal Reserve
PAN	Programme National d'Assainissement
PARCID	Projet d'Appui au Renforcement des Capacités Institutionnelles de la Direction Générale de l'ICCN
PEVi-Kacheche	Projet d'Education Virunga – Kacheche
PNAE	Plan National d'Action Environnementale
PRSP	Poverty Reduction Strategy Paper
RAPAC	Réseau des Aires Protégées en Afrique Centrale
REGIDESO	Régie de Distribution des Eaux
RIL	Reduced Impact Logging

SNHR	Service National d'Hydraulique Rural
SNEL	Service National d'Electricité
SNR	Service National de Reboisement
SNP	Salonga National Park
SPIAF	Service Permanent d'Inventaire et d'Aménagement Forestier
TREES	Tropical Environment Evaluation by Satellite
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNF	United Nations Foundation
UNP	Upemba National Park
USFWS	United States Fish and Wildlife Service
VNP	Virunga National Park
WCS	Wildlife Conservation Society
WWF	World Wide Fund for Nature
ZMS	Zoological Society of Milwaukee County
ZSL	Zoological Society of London

Part I State of the Environment in the Democratic Republic of Congo

The purpose of this environmental analysis was to provide an assessment of the state of the environment and natural resource management in the Democratic Republic of Congo (DRC) at one of the most important crossroads in the nation's short history. The recent peace agreements that brought nearly a decade of war to an end offer the opportunity for an economic renaissance that should bring relief to the long suffering people of DRC. The potential economic explosion provides a unique opportunity for environmentally responsible economic growth. However, if extractive and explosive forces are not managed properly, they could lead to the whole scale destruction of tropical forests and a devastating loss of biodiversity.

The document provides a countrywide environmental threats and opportunities analysis (ETOA) in order to inform USAID/DRC during its strategic planning exercise and to comply with the Sections 118/119 of the Foreign Assistance Act by assessing the mission's strategic objectives in relation to Tropical Forests and Biodiversity.

In particular the document presents:

- the legal, political and social context for environmental management in DRC;
- the status, issues, problems and opportunities related to the principal elements of the environment in the DRC (forests, land, wildlife, coastal and marine resources, air, water), and the primary causes of environmental degradation;
- current interventions in the environmental sector, bi- and multilateral donors, non -governmental organizations (NGOs) and other institutions;
- recommendations as to how the USAID mission in the DRC might best integrate environmental opportunities into its Strategic Objectives;
- an evaluation of the DRC's biodiversity and tropical forest resources;
- an evaluation of the extent to which required actions for conservation are satisfied by current or proposed USAID / DRC programs.

The DRC is struggling to emerge from a decade of armed conflict and over three decades of mismanagement. The effects on the social, cultural, economic and physical fabric of the country have been catastrophic. Although the DRC is one of the largest countries in Africa and harbors by far the largest surface area of intact tropical rainforest, the country's natural environment is severely threatened locally. Furthermore some of the most serious threats to the natural environment are occurring in the areas of highest biodiversity value. Grinding poverty combined with population growth, migration, armed conflict and political and institutional collapse are the underlying causes for environmental degradation in the country.

The DRC is one of the richest nations in Africa in terms of natural resources. It is biologically the most diverse country on the continent, is endowed with staggeringly rich mineral resources and has

the potential to be entirely self sufficient in agriculture. It also has the potential for producing sufficient “clean” hydroelectric power to satisfy its own needs as well as those of all of its neighbors. Instead the DRC is now one of the poorest nations in the world. School enrolment has dropped from 72% in 1990 to 58% today. The DRC’s health indicators are now among the worst in the world (213/1000 live births for under five) and average life expectancy has dropped to below 48. Malnutrition has increased dramatically in urban areas and overall agricultural production has dropped significantly since 1998. To survive more and more urban families have reduced the number of meals to one per day. Average daily calorific intake is currently estimated at 79% of the recommended level of 2,300 kcal per day and malnutrition is having a significant impact on labor productivity, health and education. In rural areas, agricultural production has been reoriented towards subsistence farming since access to markets have been cut as a result of the breakdown in communications caused by the armed conflict. In the east, the country’s richest agricultural soils are coming under increasing pressure as a result of immigration and internal displacement of populations.

In 1984, the last time a national census was conducted, the population was 30,729,443.

With an estimated annual growth rate of 3.1 %, the population is currently thought to be around 54,000,000 people. Urbanization has increased dramatically over the past two decades and this, combined with the complete breakdown of urban infrastructures and services, is placing increasing pressures on the environment in several ways:

- Severe pollution of surface and ground water due to the absence of treatment for sewage, and household and industrial waste. This is responsible for high levels of water borne diseases, as well as heavy metal pollution (particularly Pb) of fish and vegetables;
- Severe urban air pollution as a result of high numbers of poorly maintained engines using leaded fuel, and smoke from household fires
- Increasing pressure on natural resources in the peri-urban areas for food production and fuel wood.

The heritage of half a century of inefficient and poorly regulated mining activities in the south of the country has resulted in enormous environmental liabilities. Air, water and soil are heavily polluted by heavy metals. Radiation, as a result of unregulated management of radioactive waste (Uranium), appears also to be a serious environmental health concern. Widespread unregulated and illegal mining activities in the forested areas of eastern DRC are also having a serious impact on the environment through forest clearance, modification of water courses and commercial hunting for bushmeat.

The Mining Code, promulgated in 2002, sets a sound legal framework for a more environmentally responsible and rational exploitation of the DRC’s enormous mineral resources. However the costs of mitigating the environmental liabilities accumulated over the past decades will be massive. It remains to be seen if the DRC will be able to develop the necessary capacities (human, political and financial) to ensure proper implementation of the new Mining Code.

With over 50% of central Africa’s forest, the DRC has an enormous potential for timber production. Over the next decade the government intends to increase production from its current level of 44,000 m³ / yr to around 10,000,000 m³ /yr, which it considers to be a sustainable harvest level. The new

Forest Code lays the legal framework for sustained forest management. However threats to the DRC's forests come from:

- Forest clearance, particularly in the east of the country where there has been large scale migration into the forested area;
- Poor management resulting from poor governance and/or lack of capacities to implement the forestry regulations.

The DRC is the most biologically diverse country in Africa and has the highest number of species for almost all groups of higher organisms. It harbors spectacular endemic species and subspecies like the okapi, northern white rhinoceros, Grauer's gorilla, bonobo, and the Congo peacock. Its size and wide range of habitats make it a critically important global centre of biodiversity.

Protected areas remain the cornerstone for biodiversity conservation in the DRC. About 7% of the country is covered by protected areas, and as the first African nation to create a network of national parks, it has a long tradition of protected area management. Given the threats posed by the decade long cycle of political instability that culminated in war, the plundering of natural resources with complete disregard for impacts on biodiversity and the environment, and the necessity of local people to do whatever they could to survive, it is remarkable how much of DRC's extraordinary biodiversity remains. Much of the credit is due to the ability of the DRC's autonomous protected area authority (ICCN) and its numerous governmental and nongovernmental partners to work across lines of conflict to maintain the integrity of the country's protected areas network.

The threats and opportunities relating the USAID's five Strategic Objectives for the DRC were reviewed in relation to biodiversity and tropical forests.

Good governance:

Good governance, the rule of law, and the ability to participate in the selection of individuals called upon to make policy and decisions that both affect the quality of daily life and set the course for the future are extremely important for environmental management. Assuming the thoughtful implementation of governance activities these should enhance the long term protection of biodiversity and maintenance of forest cover. Governance activities should enhance community participation in efforts such as zoning while at the same time help communities to understand the process by which decisions are made that are in the interest of the nation, and not necessarily in the short term interests of a particular group of individuals.

Increased use of health centers:

Increased use of key health services will provide opportunities for reducing pressure on the environment since improving the health and well being of populations will contribute to reducing poverty, one of the most significant causes of environmental degradation. Recommendations are made with respect to the geographical location of targeted health zones in relation to protected areas. While functioning health centers are likely to attract human populations (with the risk of increasing pressure on protected areas), the presence of functioning health centers in the vicinity of protected areas can also be seen as a positive element by the local populations if a direct link between functioning health centers and functioning protected areas can be demonstrated.

Increased rural incomes:

Work in the agriculture sector is critically important to improving the well being and economic status of those who need it the most. USAID livelihood projects have the opportunity to enhance the long term protection of biodiversity and tropical forests by promoting sustainable use. Activities can also help orient people away from critical protected areas as well as other areas highlighted as important for conservation. At the same time, livelihood projects that do not plan for possible negative environmental consequences run the risk of contributing to the degradation and/or loss of forest cover and biodiversity.

Improving basic education, especially for girls:

There are few if any negative impacts that can be envisioned by this USAID program with respect to the environment in general and biodiversity and tropical forests in particular. On the contrary, improving the education level of the Congolese people in general, and girls in particular, is key to improving their economic status as well as understanding their relationship to the global economy. This should have positive impacts on the environment. Further, the program's intention to incorporate environmental education into curricula and its activities and to strengthen links to the CARPE program will have positive long term impacts on the environment

A functional and operational DDRRR program

Given the geographic position of the various warring factions in relation to key protected areas at the end of hostilities and the fact that the majority of the combatants will be demobilized, the locations of demobilization activities and how they are undertaken will be critical to the future viability of critical areas for biodiversity conservation and the protection of tropical forests in Africa.

The USAID mission is cognizant of these facts and appears to be doing everything within its power to design and orient activities away from areas deemed important for biodiversity protection. Further, if properly implemented, these activities could help take pressure off these areas and actually improve the prognosis of successful long term conservation of these areas. This is due to the fact that many of the current pressures are directly related to military, armed irregulars, and rural militias. It will be critically important that NGOs financed to assist in demobilization activities be aware of the proximity of national parks, reserves and other areas of critical ecological value and contact protected area managers.

PartII FAA 118/119 Analysis

This section of the report presents an analysis of forests and biodiversity as required by Sections 118 and 119 of the Foreign Assistance Act (FAA) Guidelines for US government agencies working abroad. The report presents an overview of DRC's tropical forests and biodiversity. The threats that forests and biodiversity are facing are reviewed and an analysis of actions necessary to achieve conservation and sustainable use of the forests and biodiversity is presented.

The Democratic Republic of Congo possesses over 50% of Africa's tropical forests and is second only to Brazil in terms of countries ranked by surface area covered by tropical forest. Dense forests and woodlands cover 1.280.042km² of the DRC's total surface area of 2.344.800km².

DRC's forests play a critically important role in maintaining global climatic and chemical cycles. Millions of people also make their home in DRC's forests, using it for the construction of shelter, harvesting food stuffs, and as a source of spirituality.

The DRC is one of the most important countries in Africa for biodiversity conservation. In terms of species diversity the DRC has the highest number of mammal and bird species in Africa (415 and 1,094 respectively), and plant diversity is also very high (>11,000 species). The DRC also harbors a number of spectacular endemic species and subspecies like the okapi, northern white rhinoceros, mountain gorilla, Grauer's gorilla, bonobo, and the Congo peacock.

Threats to forests

Threats to forests in DRC include slash and burn agriculture and the bushmeat trade. Causal factors include increased forest access (commercial logging, roads), weak institutional capacities (inadequate resources for forest management, lack of good governance) and inappropriate management strategies.

Deforestation

While deforestation rates in central Africa are relatively low (0.5% per year) compared south America and south east Asia the rapidly increasing human population in DRC is having a significant impact on deforestation. This is particularly noticeable in the heavily populated and fertile highlands eastern DRC in Albertine Rift and Rift Frontier eco-development zones.

The DRC's forest biodiversity is not distributed equally, and these two eco-development zones happen to be two of the most important regions for biodiversity conservation in Africa, if not the world. Thus the loss in terms forest cover in these zones and its contribution to global warming and climate change is by no means equivalent to the serious loss of biodiversity that is presently underway.

The human population of DRC, currently estimated at around 50 million, is expected to roughly double in the next 20 years. Given the agrarian lifestyle of eastern DRC's population as well as its reliance on fuel wood and charcoal for cooking, rates of forest loss are likely to increase proportionally. The ability to manage population growth and agricultural expansion will therefore be essential to minimizing loss of biodiversity and forest cover.

Commercial logging

With over 50% of central Africa's forest, the DRC has an enormous potential for timber production. However the DRC lags far behind its neighbors in terms of volumes of timber harvested. This is in large part due to the difficulties of access to the interior, which have been compounded by the recent period of civil strife.

Over the next decade the GDRC intends to increase production from its current level of 44,000 m³ / yr to around 10,000,000 m³ /yr which it considers can be sustainably harvested from its forests. In order to move towards sustainable development in this sector, the GDRC has recently reformed its

forestry code. It is also developing plans for pilot zoning projects that would work with stakeholders to determine production forest zones in areas of high timber production and/or high human population growth. The development of the forestry sector must be accompanied by measures to strengthen the protected areas network.

Roads and rivers

Roads facilitate immigration, forest fragmentation, and commercialization of the bushmeat trade. While the deterioration of the national road network in the DRC may have contributed to holding back the rate of forest degradation, river transportation, by contrast, has continued to play an important role in facilitating the transport of bushmeat to urban centers. The overexploitation of wildlife for the bushmeat trade is contributing directly to forest degradation.

Management issues and risks

An analysis of actions necessary to achieve conservation and sustainable management of tropical forests in the DRC highlights a number of key areas requiring improvement. These include:

- policy and institutions
- good governance (reducing corruption, respect and implementation of commitments and regulations, combating illegal logging, reform of forest concession attribution and management,)
- community participation (consultation of stakeholders, restitution of revenues, etc.)
- land use planning
- monitoring and data analysis
- transboundary collaboration for forest planning and management

Threats to Biodiversity:

Agriculture in previously remote areas

The greatest threats to the DRC's forests are in the areas of highest population density. These threats are likely to be compounded by intense development and international investment, bringing improvement to communications and opening up previously inaccessible areas.

Some of the fastest population growth is occurring in forest frontier areas where the population survives on extensive, land demanding agricultural techniques. This is resulting in extensive conversion of the forest to non-forest land cover.

Human movements and anarchistic distribution of farmland is partly a result of unclear land tenure. This problem must be tackled through zoning which should be grass roots in its approach. Protected areas, forest concessions and community farming zones will be essential elements of land management planning. Livelihood alternatives for rural populations, that incorporate sustainable natural resource management, need to be developed. Care must be taken that the location of livelihood activities does not serve to attract immigration populations towards protected areas.

Mining

There is currently extensive overlap of mining permits (exploratory and/or exploitation) with protected areas, especially in eastern DRC. Furthermore during the war several important protected areas in the east were overrun by numerous illegal small scale extractive operations. With the return

to peace and, hopefully, sustained stability it is essential to tackle this confused situation of overlapping and contradictory land use designations.

Hunting and bushmeat trade

Bushmeat hunting increased during the conflict period as state infrastructures and services deteriorated. Many villages in the conflict zone abandoned gardens and resorted to bushmeat to feed themselves and earn cash. Widespread circulation of weapons favored the development of this trade, and the poor state of roads was not a major barrier to transport of bushmeat which continued to be transported on foot or by bicycle. Despite the return of peace, weapons remain abundant and in the absence of alternative livelihoods the bushmeat trade is likely to remain important.

Habitat loss

Habitat fragmentation and loss, caused principally by agriculture, is the greatest threat to biodiversity. Many of DRC's large emblematic species depend on large areas of unbroken forest. Any activity that facilitates the movement of people and establishment of agriculture will lead to habitat loss. Road building will certainly dictate the geographic direction of major habitat loss.

Actions necessary to conserve biodiversity in the DRC.

- Inventory and improve protection of key areas of biodiversity (current and new protected areas).
- Integrate protected areas with other surrounding land uses, and create multiple use buffer zones where local populations participate in the management.
- produce and implement management plans for protected areas
- develop community conservation programs
- curb illegal bushmeat hunting – through both protection and incentives.
- ensure that development activities, including road building, are accompanied by environmental assessments.
- ensure the inclusion of environmental concerns in the Poverty Reduction Strategy Paper.
- Strengthen institutions and public-private-community linkages.
- Improve laws, policies and governance pertaining to the environment.

2 PURPOSE AND APPROACH

The purpose of this analysis was to provide an assessment of the state of the environment and natural resource management in the Democratic Republic of Congo at one of the most important crossroads in the nation's short history. The following document provides a countrywide environmental threats and opportunities analysis (ETOA) in order to inform USAID/DRC during its strategic planning exercise and to comply with the Sections 118/119 of the Foreign Assistance Act by assessing the mission's strategic objectives in relation to Tropical Forests and Biodiversity. The Wildlife Conservation Society (WCS) team was motivated by the fact that the DRC is one of the most important countries in the world for biodiversity and tropical forest conservation. The recent peace agreements that brought the war to an end offer the opportunity for an economic renaissance that should bring relief to the long suffering people of DRC. The potential economic explosion provides a unique opportunity for environmentally responsible economic growth. However, if extractive and explosive forces are not managed properly, they could lead to the whole scale destruction of tropical forests and a devastating loss of biodiversity.

WCS has been working in conservation in DRC for 25 years and was one of the few conservation NGOs to remain engaged and working in DRC throughout the war years. The presence of WCS personnel in critical conservation areas throughout the country affords a unique perspective on the reality of the war as well as the potential opportunities and pitfalls ahead on the road to environmentally sustainable development. WCS in-country personnel formed the backbone of the assessment team and were joined by individuals with extensive experience working in DRC. The team members included:

Conrad Aveling, independent consultant
Bofya Botaka, Legal Council for ICCN and WCS advisor
Jefferson S. Hall, WCS New York
John A. Hart, WCS DRC
Terese B. Hart, WCS DRC
Bila-Isia Inogwabini, WCS Central African Program
Andy Plumtre, WCS Albertine Rift Program
David Wilkie, WCS New York

Prior to departure from the US, team members consulted members of the USAID Africa Bureau and CARPE staff in Washington to discuss the scope of work and collect relevant information. A broad sample of staff from other US Government agencies, environmental NGOs and development workers with knowledge of DRC was contacted. In addition, a literature search of electronic databases was also conducted.

The team's approach in DRC was to make use of the WCS network throughout DRC to collect information relevant to this report. Staff based in or recently traveling to the provinces of Bandundu, Bas Congo, Equateur, Kinshasa, Maniema, North and South Kivu, and Orientale interviewed individuals and/or provided important input with respect to the state of the environment and the status of biodiversity and tropical forests there. A field visit was made to North Kivu to gain a better understanding of the threats posed to biodiversity and tropical forests in relation to the recent war and both small scale and industrial timber extraction. Finally, extensive interviews were

conducted with government officials in a variety of Ministries, staff from numerous donors and NGOs as well as representatives from civil society.

3 THE CONTEXT OF D.R. C.

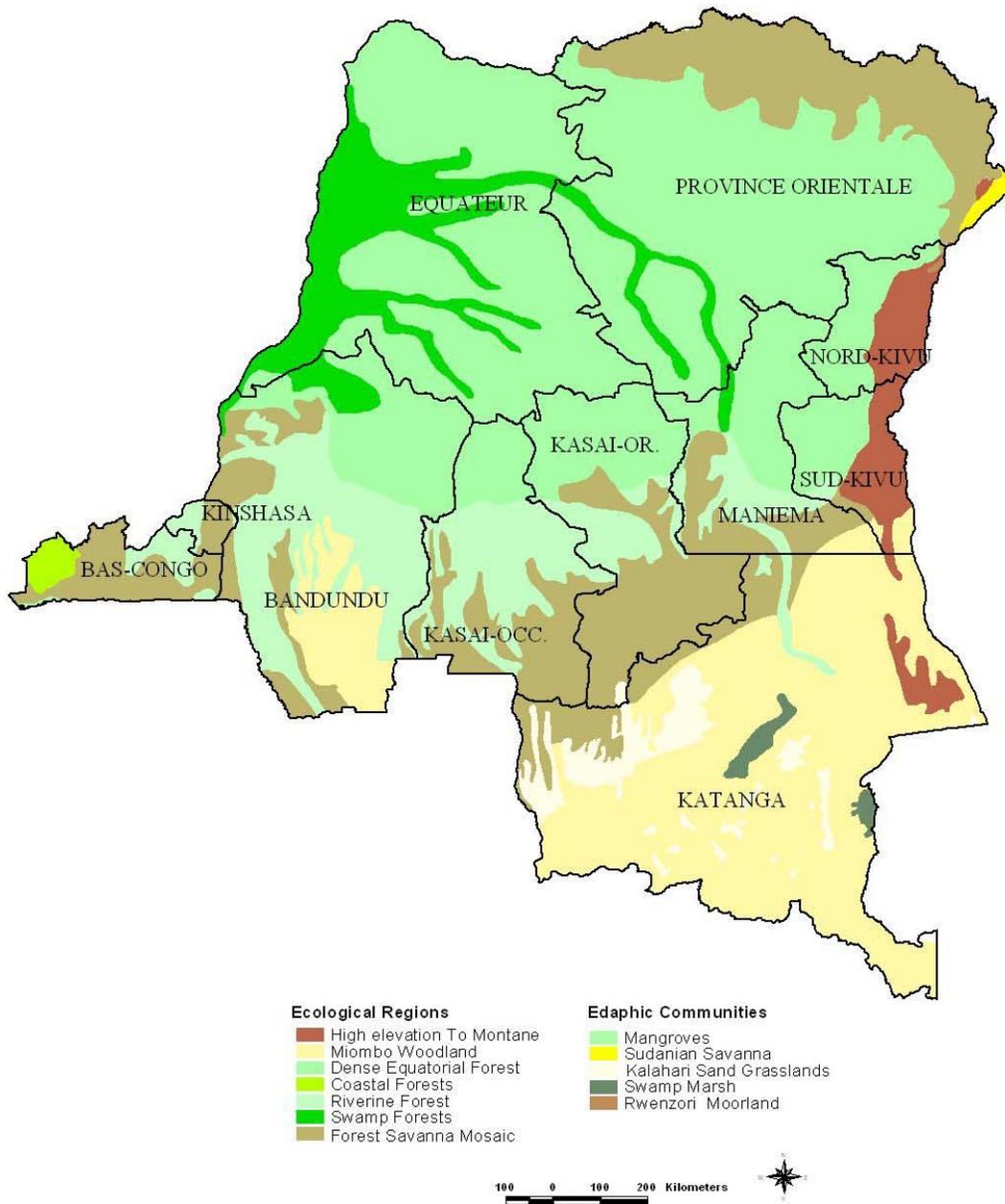
3.1 Physical

The DRC is the third largest country in Africa after Algeria and Sudan. Spanning both sides of the Congo River, the Democratic Republic of Congo covers some 2,344,000 km² in the centre of the African continent.

Were it not for a relatively small coast line on the Atlantic Ocean that includes the mouth of the Congo River, the DRC would be landlocked as it is surrounded by nine countries: Angola, Republic of Congo, Central African Republic, Sudan, Uganda, Rwanda, Burundi, Tanzania, and Zambia. DRC spans a broad elevation gradient that begins at sea level on the coast and rises to snow capped peaks of over 5,000 meters on the Ruwenzori Mountain. While much of the country is dominated by an ancient lake formation of the Congo Basin, the region bordering Rwanda is characterized by active volcanoes. Indeed the variety of geologic formations gives rise to a diversity of soils that, along with climate, help define the overlaying ecosystems.

Rainfall varies between 1,500 and 4,000 mm per year reflecting the variation in biomes represented in the DRC. The Congo basin spans 22° of latitude astride the equator. To the north of the equator rain falls between April and August while to the south rain falls from December to March. On the equator two wet and two dry seasons, varying in length from year to year and place to place, influence habitats and life cycles.

DEMOCRATIC REPUBLIC OF THE CONGO
ECOLOGICAL REGIONS



Sources: ESRI DATA, CARPE
Prepared by WCS for USAID Environmental Analysis. September 2003

FIGURE 1 ECOLOGICAL REGIONS OF THE DEMOCRATIC REPUBLIC OF CONGO

3.2 Biological

Covering more than half of DRC (Figure 1), dense forest formations transition from mangroves and coastal forest in the west to closed evergreen tropical forests, closed semi-deciduous tropical forests, riverine and swamp forests to the east, as well as various drier forests, including Zambesian miombo woodland in the south, and Sudanese savannahs to the north. Moving east the forests rise from the Congo basin, to upland plateau, to mountain forests and eventually to alpine vegetation on the Rwenzori Mountain. Around the closed canopy forest block, to the west and south and to the north-east are savannahs, including some edaphic savannahs as well as areas of savanna-forest mosaic. Roughly 85% of the country is covered by forest, forest-savanna mosaic or woodland.

Only exceeded by the Amazon in size, the Congo River dominates the DRC and is the green wet heart of the African continent. It has not always been green in the past. In response to expansions and contractions of the polar ice caps, cool dry periods have alternated with warmer humid periods causing the forest of the Congo basin to shrink and expand periodically. Rain from the distant highlands on the margins of this watershed have always fed this river system but at times the mighty river has passed through arid Kalahari sands stretching up to meet the southern Sahara (Kingdon, 1989). Kingdon (1989) has aptly described the Congo basin as an “evolutionary whirlpool”. During dryer periods swamp and gallery forests along the length of the Congo River and its major tributaries acted as refuges for forest species and served as spring boards for speciation as forests fragmented and expanded alternately enmeshing organisms of both forest and non forest origin. The okapi, the DRC’s endemic forest giraffe, is a spectacular example of a forest species displaying evident savannah origins.

The DRC is the most biologically diverse country on the African continent. It has the highest number of species for almost all groups of organisms with the exception of plants in which it is second to South Africa (Mittermeier and Mittermeier, 1997). It has the highest diversity of mammals (415 species, of which 28 are endemic) and birds (1,094 species of which at least 23 are endemic). Reptiles (268 species, 33 endemic) and amphibians (80 species, 53 endemics) are poorly known and no doubt much remains to be discovered about the true extent of their diversity. Freshwater fish diversity is also high with at least 963 known species. Here again much probably remains to be discovered. Over 1,300 species of butterflies, the highest for Africa, were recorded for ex-Zaïre in 1981 (Berger, 1981) and many more new species have since been added to the list (Ducarme, pers. comm.).

More than 11,000 species of higher plant are known for the DRC, of which 3,200 are endemic. Twelve of Africa’s 30 Centers of Plant Endemism, as described by IUCN/WWF, occur partly or wholly within the borders of the DRC (Mittermeier and Mittermeier, 1997). These are Mayombe, Itombwe, Ituri, Maiko National Park, Kahuzi-Biega N.P., Salonga N.P., Haut Shaba, Kundelingu N.P., Upemba N.P., Marungu Highlands, Garamba N.P. and Virunga N.P. It also has two of the Endemic Bird Areas identified by BirdLife International. These are the Albertine Rift Mountains and the East Congo lowlands.

Although the last detailed vegetation map of the DRC dates from the 1950’s (Ipalaka et al. 1997) several broad categories of vegetation type can be described. Closed evergreen rainforests can be broadly divided into swamp and riverine forests (+/-100,000 km²), Guineo-Congolian lowland

rainforest of the central basin and Bas Congo (+/-900,000 km²) and the afro-montane forest communities in the eastern highlands (+/-55,000 km²). Because of the distinct dry seasons referred to above, and the fact that average rainfall in the vast central basin where most of the forest is located is little more than 2,000 mm, most of the rainforests of the DRC can be more correctly described as semi-evergreen, and they become more deciduous towards the southern and northern forest fringes (Mittermeier and Mittermeier, 1997). The rainforests of the DRC are often dominated by species from the Caesalpiniaceae family (the monotypic stands of *Gilbertiodendron dewevrei* in the Ituri forest are a particularly striking example). To the north and south of the dense humid forest block the floristic compositions of the dry Sudanese and Zambezian forests have been greatly influenced by centuries of fire. The Sudanese forests are characterized by open *Isobertia* woodlands and to the south the Zambezian secondary, fire-influenced “miombo” woodlands are largely dominated by *Brachystegia*, *Isobertia*, and *Julbernardia globiflora*. Probably only a very few relicts of intact Zambezian dry forest (“muhulu”) still persist. This forest type has relatively high diversity and endemism and is characterized by *Parinari excelsa*, and species of *Stychnos*, *Combretum* and *Marquesia* (Ipalaka, 1997).

The montane forest of the Albertine rift show marked patterns of altitudinal zonation. Species of *Podocarpus* and *Prunus* characterize the mid-altitude forests. In places, for example in the Virunga volcanoes, *Hagenia abassynica* is the dominant tree species and its presence is thought to be related to past human activities. Higher up the slope the trees give way to bamboo forests (*Arundinaria alpina*), giant heathers (*Erica arborea*) and giant groundsel (*Dendrosenecio sp*) and lobelias (*Lobelia sp*). At the highest altitudes afro-alpine moorlands are dominated by ericaceous shrubs and grasses.

The primate diversity of DRC is second only to that of Brazil with 37 species from 18 genera (Mittermeier and Mittermeier, 1997). The Ituri forest alone contains 13 diurnal species, unrivalled by any other forest in Africa. Two globally important primate species, with very restricted distributions, occur in the mountains of the Albertine Rift. These are the famous mountain gorilla, *Gorilla gorilla beringei*, occurring in the Virunga volcanoes (across DRC, Rwanda and Uganda), and the Bwindi Impenetrable Forest in Uganda, and the golden monkey *Cercopithecus mitis kandti* restricted to the Virungas and the Nyungwe Forest (Rwanda). The mountain gorilla population numbers little more than 600 individuals. However numbers are stable despite the recent war thanks largely to the sustained support that the Congolese authorities have received from the international conservation community. On the eastern side of the Albertine Rift fragmented populations of Grauer’s gorilla (*G.g.graueri*) live in the high and mid altitude forests. The population was estimated to be approximately 17,000 in 1996 (Hall et al., 1998) but it is known that many populations of this sub species, particularly in and around the Kahuzi-Biega National Park, have suffered severe poaching during the recent armed conflict. It is worth noting that the Mountain and Grauer’s gorillas represent a very significant economic resource for the country. At the end of the 1980’s the gorillas of Kahuzi-Biega NP and Virunga NP were receiving around 8,000 visitors per year, and generating nearly 1 million \$US annually from the sale of gorilla viewing permits.

Further east the endemic pygmy chimpanzee, or bonobo (*Pan paniscus*), is restricted to low altitude forests to the south of the Congo River. Its range is thought to be quite large (>800,000 km²) but its distribution within this range is poorly known and is suspected to be patchy. Considered to be genetically the closest relative to man it was not discovered until 1935. Other mammals endemic to the DRC rainforest, and only discovered in the course of the 20th century include a forest giraffe, the

Okapi (*Okapia johnstoni*), the aquatic fishing genet (*Osbornictis piscivora*), the Ruwenzori dwarf otter shrew (*Micropotamogale ruwenzorii*) and the Salonga monkey (*Cercopithecus dryas*) of which the first adult specimen was found in 1985 (Kingdon, 1997).

The DRC has a high diversity of antelopes with 30 species. These include the largest forest antelope, the bongo (*Tragelaphus euryceros*), the swamp dwelling sitatunga (*Tragelaphus spekei*) and 8 species of forest duiker (*Cephalophus* sp).

Finally the emblematic northern white rhino (*Ceratotherium simum cottoni*) is endemic to the savannas of the Garamba National Park in northern DRC. This last remaining population is very seriously threatened and numbers little more than 35 individuals (Hillman-Smith and Smith, 1997). It is however remarkable that this species, which is so highly prized by poachers, and which is currently restricted to an area of the DRC bordering Sudan where armed conflict and lawlessness has existed on and off for the past 50 years, has survived at all. Once again this is largely due to the commitment of the DRC parks staff supported for the past 20 years by a number of dedicated NGO's including the Frankfurt Zoological Society, WWF and the International Rhino Fund.

3.3 Socio-economic context

The Democratic Republic of Congo (DRC, formerly Zaire), has a total surface area of 2,345,000 km². The national territory is divided into 11 provinces. These are: Kinshasa, Bas-Congo, Bandundu, Equateur, Kasai Occidental, Kasai Oriental, Katanga, Maniema, North Kivu, South Kivu and the Province Orientale. Administratively, each province is divided into districts, and districts are divided into territories (Figure 2). Territories in their turn are divided into sectors and sectors are made up 'groupements' and villages. The President of the Republic nominates governors and vice-governors for each province. Under the governors, the districts and territories are respectively governed by the "Commissaires" and the "Administrateurs des Territoires", appointed by the Ministry of Interior in Kinshasa.

Land tenure is based on the Bakajika law of 1973. Modifications to the land tenure system were introduced to the Bakajika law in 1980 as well as to the new Forest Code. According to the Bakajika law, forests and the natural resources therein belong to the state (IUCN, 1991).

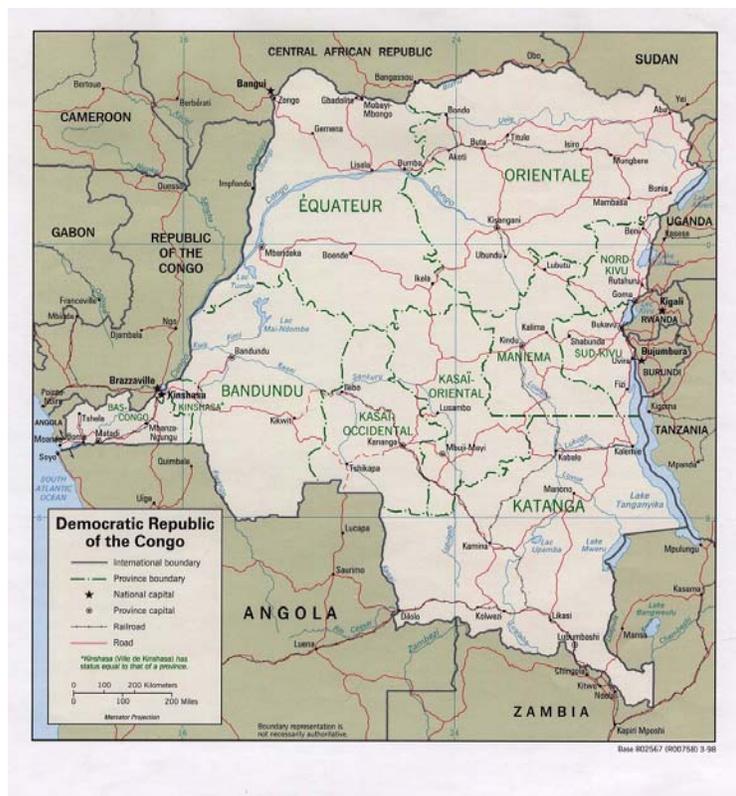
The population DRC was estimated at 30,729,443 people in 1984 (INS, 1984; De Saint Moulin, 1991; Ngondo, 2001). Assuming an average net growth rate of 3.1% per year the overall population was estimated to be 48,000,000 people in 1999 (UNICEF, 1999) and may be about 54,000,000 people today (Figure 3). Approximately 48% (25,900,000 people) are under the age of 18 (UNICEF, 1999). Older people represent only 3% of the entire population (Ngondo, 2001).

Overall the rate of education is 58.3% but with major variations between provinces (De Saint Moulin, 1991; UNICEF, 1999). The provinces with the lowest education rates are the Province Orientale, Equateur and the Kivus (De Saint Moulin, 1991). The best developed educational facilities are concentrated in major towns, i.e. Lubumbashi, Matadi, and, particularly in Kinshasa. On average life expectancy has decreased from 56 years in 1988 (USDS, 1988) to 48 years in 2001 (Ngondo, 2001).

The population of DRC is unevenly distributed (De Saint Moulin, 1991). There are many more people in the provinces of Province Orientale, Katanga, Bandundu and the former Kivu complex (now divided in three different provinces: North Kivu, South Kivu and Maniema). These provinces represent respectively 14%, 13%, 12.3% and 17.5% of the total population of DRC, making up about 57% of the population of Congo. The regions of Kivu, particularly the shore of Lake Kivu, have the highest human population density, estimated at 300 people/km² in 1996 (Bakinahe, 1995; Inogwabini et al., 2000), while Kinshasa has about 267 people/km² (De Saint Moulin, 1991).

The DRC has over 250 tribes, with the majority speaking different Bantu dialects (Obenga, 1987; Wufela, 1992). There are five major ethnic groups, distinguished on the basis of social affiliations (BEPR, 1970; USDS, 1988). These groups are the Pygmies, the Bantu, the Sudanese, the Nilotic, and the Hamitic (BEPR, 1970; USDS, 1988). In the centre of the country, the largest group of Bantu is the Mongo group (Obenga, 1987; Wufela, 1992), which includes the Lokele in the Province Orientale, all the Mongo in the Equateur, the Tetela in Kasai, and the Kusu in the Maniema (Obenga, 1987). In the eastern part of the country the Nande are the dominant economic force.

DEMOCRATIC REPUBLIC OF CONGO ADMINISTRATIVE UNITS



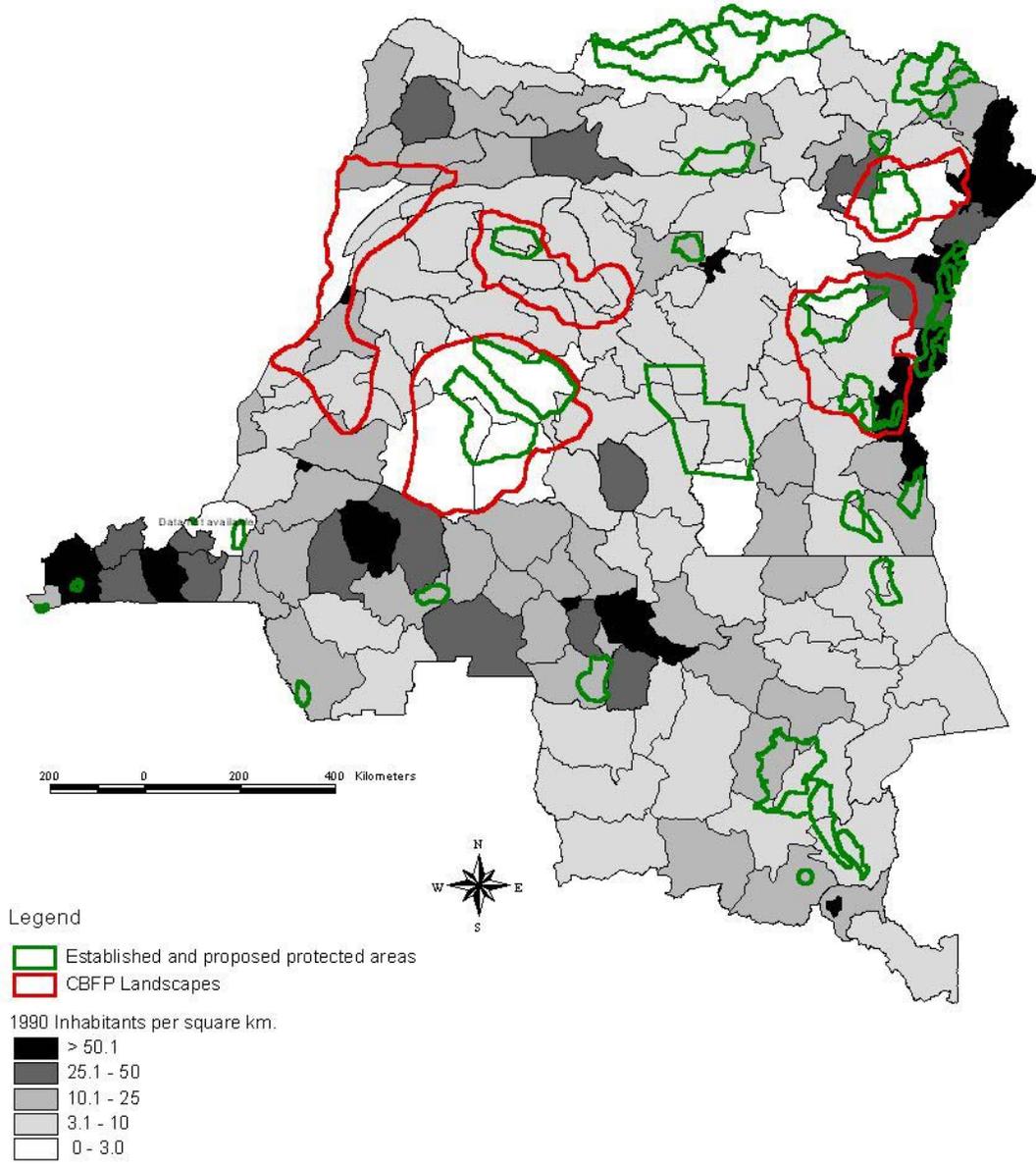
Districts



Secteurs

FIGURE 2 ADMINISTRATIVE ZONES IN THE DEMOCRATIC REPUBLIC OF CONGO

DEMOCRATIC REPUBLIC OF THE CONGO
 1990 ESTIMATED POPULATION DENSITY



Sources: CARPE, SANRU, WCS
 Prepared by WCS for USAID Environmental Analysis. September 2003.

FIGURE 3 HUMAN POPULATION DENSITY IN RELATION TO CONSERVATION AREAS AND CBFP LANDSCAPES

Four national languages are recognized in DRC: Kikongo, Lingala, Swahili and Tshiluba (BEPR, 1970). Kikongo and Lingala are spoken in the western part of the country while Swahili is the most spoken language in east. Tshiluba is confined to the central southern provinces of Kasai. French is the administrative language, and widely spoken (USDS, 1988).

The average gross national product (GNP) of DRC decreased from \$150 in 1995 (Nzanda-Buana, 1995) to \$110 (UNICEF 1999). Between 1990 and 2000 the GNP decreased by 43.7%, an average annual decrease of 5.6% (INS, 2003). During this period the mean annual inflation rate was 884% (INS, 2003). The number of registered state employees has decreased sharply from 1,242,500 people in 1990 to 400,000 people in 2000. The DRC has signed several structural adjustment agreements with the International Monetary Fund with the aim of redressing the corruption-riddled economy. These necessary austerity measures have been keenly felt in social sectors such as education, health, public welfare (Lutala et al., 1993; Wamba, 1994).

The above mentioned state employees represent only 3.1% of the active population (INS, 2003). Declining standards of living have forced people to resort to the informal sector as a survival strategy (Newbury, 1986) although quantitative data on the scale of the informal sector are sparse. Kambay (1993) and Nzanda-Buana (1995) suggest that more than 60% of the people in Kinshasa (and more than 70% in the interior of the country) survive through the informal economy, and that this parallel economy provides more than 50% of basic livelihood goods in DRC.

3.4 The Legal and Political Context

DRC gained its independence from Belgian rule in 1960. The first five years of independence were turbulent due to the lack of experience in exercising political power (Mahoney, 1983; Mbenza-Longo et al., 1991; Makombo, 1998). A relatively stable period of 25 years then followed under authoritarian rule (Ntalaja, 1986), which prevented the emergence of a democratic culture. In 1990, the effects of the end of the cold war, combined with internal factors such as high levels corruption, military extortion, and non-payment of salaries, forced the authoritarian regime to accede to the increasing demand for democracy. At the end of 1991 a national conference was convened which was supposed to lead Congo towards a transition to democratic rule (Afana, 1998).

The transition to democracy has, however, been difficult due to the absence of a democratic culture, a deeply ingrained culture of corruption and a lack of political leadership. Tribalism continues to dominate political life, with personal interests overriding the greater interest of the nation (Mukamba, 1993; Kambay, 1995; Afana, 1998). Congo's waning strategic importance to the west (Afana, 1998) combined with the general fatigue of the Congolese people culminated in the overthrow of the old authoritarian regime in 1997 (De Saint Moulin, 2003). However the end of the Moboutu regime did not bring an end to conflict as the country continued to be torn apart by a civil war in which the different warring factions were backed by at least four of Congo's neighboring countries. With the signing of the "Global and Inclusive Accord", requiring a two-year transitional period toward elections and democracy, there is at last the possibility of stability and growth. The success of this accord will be dependent on the good faith of the leaders of the former warring parties, international support, improved social welfare, and a degree of decentralization of power (De Saint Moulin 2003)

3.5 Constitutional and Legislative Framework for Environmental Management

Elaborated under the “Global and Inclusive Accord of Pretoria” (GIAP), the constitution of the Democratic Republic of Congo stipulates a number of clear articles regarding the environment sector, particularly article 54 that states: “*all Congolese have the right to a healthy environment, appropriate to their welfare. The public institutions and the citizens are obliged to ensure the protection of the environment under the conditions set by the law.*” In this same context article 50 requires the government of the DRC to enact legislation “*to assure the sanitary and nutritional security for all consumers*”.

3.6 Existing laws for the environment

The legal authority of the DRC constitution derives from the GIAP, which was signed on the 4th of April 2003. The subsequent laws regarding the environment are:

- The Nature Conservation law N^o. 69-041 of October 22, 1969;
- The Forestry Code N^o. 011/2002 of the 29th of August 2002;
- The Hunting Law N^o. 82-002 of the 28th of May 1982;
- The Law on the system of ownership of goods, land use and estates N^o. 73-021 (20th of July 1973), that is completed by the law 80-008 of the 18th of July 1980 (Bakajika Law);
- The Law on the administrative, territorial and political decentralization of the Republic of Zaire throughout the transitional period N^o. 95--005 of the 20th of December 1995;
- The Law creating and defining the attributions the Ministry of the Environment and Conservation of Nature N^o. 75--231 of July 12, 1975;
- The Law creating and providing the status of a para-statal enterprise denominated “Institut National pour la Conservation de la Nature” (now known as ICCN) N^o. 78 -- 190 of May 05, 1975;
- Creation of a fund for the forest reconstitution by law N^o. 85 – 211 of August 30, 1985.

It should be noted that the DRC has not yet passed an Environment Law, although a draft text has been under discussion for several years.

3.7 Enforcement of environmental law in DRC

Article 1 of the law N^o 75-231 of July 12, 1975, states that the Ministry of the Environment and Conservation of Nature (MECN) will promote and coordinate all activities related to the environment and conservation of nature, in both urban and rural areas. The MECN is required to initiate all measures to fulfill its mission based on the best available scientific data.

In urban areas, the MECN is directed to:

- Ensure the cleanliness of the human environment by addressing the threats created by water and air pollution;

- Make certain that human settlements are spaced in ways that allow for green zones and parks, and to ensure that trees are replanted in order to minimize erosion;
- Provide advice on questions related to the human habitat and the urbanization of the national territory;
- Provide a documented overview of any industrialization project likely to affect the quality of life.

In rural areas, the MECN is called upon to:

- Create and manage wildlife capture stations established within or outside of natural reserves, and manage water and forest ecosystems.

From a strictly legal point of view, the MECN has the legal authority to enforce environmental legislation throughout the national territory of the DRC, although other ministries and/or government agencies also intervene in the environmental sector. Ministries and government agencies with some regulatory authority in this domain include Ministries of Health, Agriculture, Mines, Energy and Rural Development, as well as agencies like the urban water authority (REGIDESO), etc. To enforce environmental legislation in the DRC, the MECN is present throughout all administrative divisions of the national territory (provinces, districts, territories, sectors and towns).

It should be underlined however that the MECN’s capacity to enforce environmental legislation is, in reality, extremely weak. This is due to:

- Overlapping prerogatives with other ministries for the enforcement of environmental regulations causing confusion and/or disengagement of responsibilities
- Extremely weak resources (human, financial, and technical), compounded by years of “laissez faire”, corruption, armed conflict and a general breakdown in the rule of law (Box 3-1).

BOX 3-1 ATTRIBUTION OF MINING PERMITS DURING THE ARMED CONFLICT.

Mining was liberalized in the 1980’s and many mining permits were attributed, often without due regard to the legal status of existing protected areas. Since the start of the war in 1998 this confused situation worsened, and pressures on the environment increased, as the leaders of the rebellion also started issuing mining permits. Local populations also practiced clandestine, illegal small-scale exploitation. New mining sites have been opened in Maiko and Kahuzi-Biega National Parks as well as in the Okapi Faunal Reserve (United Nations Security Council, 2002). With the creation of a government of national unity and the return to peace, the need to restore state authority throughout the entire country is obviously an urgent priority.

3.8 Labor division between different administrative and territorial entities

Law N^o. 75--231 of July 12, 1975 creating and stating the attributions the MECN confers on it most legal authority on matters related to the environment. Towns, provinces, districts, and territories have specific environmental activities that they can regulate at the local level. Articles 11, 49, 71,

119, 161, 164, 169, and 170 of law No. 95--005 of the 20th of December 1995 on the administrative, territorial and political decentralization throughout the transitional period in the Republic of Zaire, as modified and completed by the decree-law No. 081 of July 02, 1988, clearly separates the juridical authority between the central and provincial governments with regards to the environment.

3.9 International conventions and treaties signed by DRC

Article 193 of the transitional constitution of DRC stipulates that *all properly concluded treaties and international agreements take precedence over national laws (on condition that the parties to the treaties or convention apply them)*. Furthermore, article 182 allows the government to discuss and to conclude international agreements, which are not subjected to ratification, but requires that *'peace treaties, treaties on commerce, treaties on international organizations and those related to international conflicts, those that imply public financial support, those that modify national legislation, those that are related to the human well being, and those that may imply a change in national territory, be ratified by passing a law in parliament implementing such treaties.'*

The following treaties and conventions related to the environment have been signed by the Government of the Democratic Republic of Congo (GDRC):

- The World Convention for Nature, initiated by DRC;
- The Convention on Illegal Trade of Endangered Species of Flora and Fauna (CITES), also known as Washington Convention of 3 March 1973;
- The Convention on the Protection of Migratory Species, Bonn, 23 June 1979;
- The World Natural and Cultural Heritage Convention, Paris, 23 November 1973;
- The African Convention for Nature Conservation, Algiers, 15 September 1968;
- The Lagos Action Plan for African Economic development: 1980 – 2000;
- The Convention of Biological Diversity, Rio de Janeiro, 4 June 1992;
- The UN Convention on Climate Change 1992;
- The International Agreement on Tropical Timber, Geneva; 1990;
- The Declaration of Gbadolite (RDC) between DRC, CAR and Chad on the protection of environment, Gbadolite 7 June 1981;
- The Vienna Convention on the Protection of the Ozone Layer, 22 Mars 1985;
- The UN Convention on seas, Montego Bay, 10 December 1982;
- The London Convention on the conservation of wild species of fauna and flora, London ,14 January 1936;
- The International Convention of the Protection of Flora, Rome, 06 December 1951;
- The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, Washington, 10 April 1972;
- The London Convention of Ocean Water Pollution, London 29 December 1972;
- The Bale Convention the Transport and Treatment Toxic Wastes, Bale, 22 March 1989;
- The Convention the African Timber Organization (OAB), as revised in Kinshasa, 2002;
- The Declaration of Yaoundé creating the conference of ministers responsible for the forests of Central African (COMIFAC)
- The Declaration of Kinshasa, creating the Conference on the Dense Humid Forests of Central Africa (CEFDHAC).

All these treaties and international conventions are important for DRC, as they contribute to the protection of its environment. They unquestionably reflect the role that DRC has to play in the conservation of nature for the well being of humanity.

4 INSTITUTIONAL AND POLICY FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

4.1 Federal institutions and the management policy

The government of the DRC is highly centralized, with only a very modest decentralization of power to the Provinces. This governing concept also applies to the MECN. In many cases institutions responsible for environmental management are based in Kinshasa, with only a few of their implementing staff based in the interior of country. Institutions (and para-statal enterprises) that fall under the authority of the MECN are:

- *Direction de la Gestion Forestière et de Chasse (GGFC)*: the government body responsible for setting the criteria and procedures for the rational use of natural resources in DRC.
- *Direction de la Programmation, de la Formation et des Relations Internationales*: responsible for sector studies, particularly on forestry, to ensure harmonious and coordinated development of environmental activities.
- *Service Permanent d'Inventaire et d'Aménagement Forestier (SPIAF)*: responsible for floristic inventories throughout the country as well as the development of management plans to guide natural resource use.
- *Service National de Réboisement (SNR)*: responsible, through different services, for forest reforestation and regeneration. Ultimately this service will merge with the National Forestry Fund proposed by the new forestry code.
- *Centre de Promotion du Bois (CPB)*: has the mandate to promote the use of tree species that are poorly known and/or generally not commonly used for timber. Its other mission is to promote more efficient use of timber, particularly more efficient transformation.
- *Centre d'Adaptation des Techniques de l'Energie*: charged with the promotion of new techniques for the transformation of wood, and its consumption as a source of energy.
- *Institut Congolais pour la Conservation de la Nature (ICCN)*: responsible for the protection of national parks and related domains. A second objective of ICCN is to promote scientific research on biological diversity and wildlife management.
- *Institut des Jardins Zoologiques et Botaniques du Congo (IJZB)*: responsible for the management of zoos (or captive animal populations), botanic gardens and other green spaces.

As stated above, other ministries and state services are also implicated in the environmental sector. These are:

- *The Ministry of Energy*: oversees enterprises such as REGIDESO and SNEL (Service Nationale de l'Electricité) that manage water, landscapes and other related subjects.
- *The Ministry of Mining*: which, according to the new Forestry Code, is directed to take into account environmental concerns before delivering any mining permit through its service called “*cadastre foncier*”. The 2001 Mining Code also makes several provisions aimed at ensuring environmentally responsible mining activities including the creation of a “*Service de Protection de l'Environnement Minier*”.
- *Office Congolais de Contrôle (OCC)*: an enterprise overseen by the Ministry of Commerce that is responsible for quality control of both imported and exported goods. It has the obligation to ensure that all international and national norms, including environmental norms, are followed.
- *Office des Douanes et Assises (OFIDA)*: operates under the Ministry of Finance. Its objective is to tax all imported and exported goods. In particular it controls weights and volumes of timber products and logs.

- *Fédération des Entreprises du Congo (FEC)*: a committee comprised of timber companies, with the objective of harmonizing practices in timber management in the DRC.
- *La Commission Mercuriale du Bois*: responsible for collecting all information relating to prices and destinations of timber produced in the DRC in order to propose the best practices and best prices to the national authority.

As with all government agencies, at the level of the provinces, the Provincial Coordinator of Environment represents the MECN. Hierarchically, s/he has the grade of *Chef de Division*, and responds directly to the Secretary General of the MECN. Practically, s/he works under the authority of the Governor of the province. This sometimes creates confusion as s/he has to respond to two different authorities at the same time.

The MECN has, in theory, a significant influence on legislation in matters related to the environment in the DRC. As a national government institution, and by virtue of article 125 of the transitional constitution that stipulates that the *initiative to make law is concurrently used by members of the government and members of the bi-cameral parliament*, the Minister has authority to propose new laws. It is on the basis of this constitutional provision that the government proposed to the parliament the new Forestry Code, adopted in 2002.

Article 126 of the constitution allows *members of the government, members of the parliament and senators to amend laws under discussion*. Beyond this Ministers have the authority to promulgate regulations related to their domain as well as influence legislation under debate. This authority comes by virtue of article 91, which makes *them solely responsible for their departments and allows them to implement the agreed national program by decisions taken as ministerial decrees*.

To ensure that environmental considerations are taken into account in the GDRC's Action Plan for Poverty Reduction, the MECN has a national direction for rural development that links it to the Ministry of Planning (which leads the National Program for Poverty Reduction). The objective of this joint activity is to take into account environmental considerations while designing the country's development plan. The role of the MECN has thus been enlarged beyond its traditional mission.

4.2 The role of MECN in relation to environmental policy

Article 4 of the Forestry Code specifies that the elaboration of a national forest policy is the role of the ministry responsible for the administration of forests. The national forest policy defines general orientations to be included in the national forestry plan and defines precise objectives and actions to attain these objectives. *The elaboration of the national forest policy must, by virtue of article 5 of the forestry code, involve all interested actors at all hierarchical levels of private and public sectors*. This clause indicates clearly the desire of the GDRC to actively involve local communities in activities related to the environment, even at the level of policy development.

The national environmental policy defines a list of penalties for breaches of the law. Unfortunately law enforcement is currently very weak. This should be the priority for the future.

4.3 Civil society and environmental management

Due in part to its role in the national conference in the early 1990s, civil society has become a political force in DRC. Organizations within civil society are involved in every aspect of life in DRC. In the realm of environment and conservation of the nature, there are national and international NGOs that operate in DRC. National NGOs are organized into large working platforms. Environmental NGOs operate within the Réseau d'Organisations non-gouvernementales du Secteur de l'Environnement (ROSE), and all NGOs are obliged to be registered with the MECN. Some 220 Congolese environmental NGO's exist in the DRC although it is likely that few of them are really active. While insecurity brought on by the war greatly decreased their number and activities, a handful of international NGOs remained engaged in DRC. As with other sectors, the number of NGOs working in the environmental realm is rapidly increasing. All national and international NGOs are required to comply with the regulations of law no. 004/2001 of the 20th of July 2001. Articles 1, 2, 3, 4, 5, 6, 7, 8, 10, and 57 relate to the creation, the registration and the installation of NGOs, non-profit associations, and public enterprises. NGOs that were operational in DRC before this law have to comply with the new legislation.

4.4 Private sector funding for environmental management and conservation

While organizations representing business leaders (e.g. Lions and Rotary Clubs) may have contributed to locally based environmental activities, documentation is difficult to find. In spite of the fact that many endemic and/or charismatic mammals are prominently featured in advertising for Congolese companies, there is apparently only one example of the private sector stepping in to help fund a conservation project in any substantial way. In 1986, Tabacofina, the parent company of Tabazaire, began funding a World Wide Fund for Nature (WWF International) project in the Ituri Forest to help create what is now the Okapi Faunal Reserve (OFR). In the early and mid 1980s one of Tabazaire's most important products was the Okapi brand of cigarettes. A true interest in conservation by the Director General of Tabacofina led to the formation of a 4 year partnership with the ICCN (formerly IZCN) to help create a reserve to protect this endemic rainforest giraffe. In addition to contributing some \$300,000 to the effort in the Ituri Forest, Tabazaire provided housing, office space, and logistical support to the WWF country representative in Kinshasa as well as lobbying support. While no one individual, group or organization can claim credit for the creation the reserve it is clear that the reserve could not have been created without the support of Tabacofina and Tabazaire.

4.5 Universities

Western education started in the Congo in 1880 with the establishment of two schools located at Mulweba (on shores of Lake Tanganyika) and Boma (Makombo, 1998; Ekwa, 1999a). Education was rudimentary and was confined to primary and secondary levels until 1954 when the University of Lovanium, created by the Catholic missionaries, opened its first pre-university class (Makombo, 1998). Subsequently, the Belgian government opened the State University of Congo at Lubumbashi in 1956, followed by the Protestant University in Kisangani.

The three universities remain the most important educational centers in the country in terms of the number of students they enroll annually. After independence the DRC created a number of other specialized higher education institutions (Ekwa 1999a & b). These include the Instituts Supérieurs Pédagogiques (ISP), the Instituts Supérieurs de Développement Rural (ISDR) and the Instituts Supérieurs Techniques (IST). A number of research institutions were also created including the Centre de Recherche en Ecologie et Foresterie (CREF), the Centre de Recherche en Sciences Naturelles (CRSN), the Institut National de Recherche Bio-médicale (INRB), the Institut National de Recherche Agronomique (INERA), etc. Since the late 1980s, the GDRC has authorized the creation of private institutions (Ekwa, 1999a) of which the principal ones are the Faculté de Théologie Catholique, the Université Protestante au Congo, and the Université Kimbanguiste au Congo. These institutions are, however, not limited to teaching theology and have departments entirely devoted to other fields such as economics, agriculture, medical sciences, etc.

Biology and its related branches are taught in most of the universities and ISPs and some aspects of ecological research are covered by CRSN, INERA, and CREF. However the biological curricula taught at most university institutions have been limited to basic biological concepts or laboratory biology, though some courses in practical botany with a brief introduction to the concept of ecology have been taught in certain biology departments (ISP Mbanza-Ngungu, IPN, University of Kinshasa).

The faculty of sciences of the University of Kisangani has a long history in teaching ecology, zoology and botany and has produced a remarkable number of university graduates over the years. More recently the University of Kinshasa started a curriculum in natural resource management at the Faculty of Agriculture, with an option in wildlife management. The University of Kinshasa also hosts the Ecole Régionale d'Aménagement Intégré des Forêts Tropicales (ERAIFT), a central African regional postgraduate school financed by UNESCO. The school trains central African citizens in sustainable natural resource management and places a particular accent on the human dimension of conservation practice (ERAIFT, 1998). There is also a private organization based at the University of Kinshasa known as Environmental Resources Management and Global Security (ERGS), founded since 1998 to promote the rational management of natural resources for global security (Shumway et al., 2002). The Institut Supérieur des Techniques Appliquées (ISTA, Kinshasa Ndolo) has also recently included environmental studies into its curriculum. The program has a particular focus on environmental health questions (water and waste treatment, urban environment, etc.).

Few institutions focus specifically on conservation biology in the DRC, and where this has been initiated the modules are still at a very early stage of development and are handicapped by lack of equipment, good teachers and sufficient funding (Ngub'usim, 2002). Furthermore, provinces of high biodiversity importance like Equateur and Kivu have no university institutions providing training in conservation.

If the DRC is to develop the quality and quantity of human resources necessary to ensure sound management of its exceptional natural heritage, a high priority needs to be given to developing strong programs in conservation biology.

4.6 Financial basis for environmental management and conservation

Data on the GDRC's financial investment in the environment are difficult to obtain as even the budget for 2003 did not include expected expenditures in the officially published version of the Journal Official of 2003. Lack of national funding is perceptible in the total absence of the most basic administrative equipment such as papers, pens, pencils etc. in some offices that are supposed to play crucial roles such as the Centre National pour l'Information Environnementale (CNIE).

The World Bank and other donors, such as the European Commission, the USA, and the UN are presently putting together a multi-year package of loans and grants worth some \$50 million \$US. This package would include forestry sector support for the Ministry of Environment as well as support to the ICCN.

5 ENVIRONMENTAL STATUS AND THREATS

This chapter presents the status and threats to the various components of the natural environment in the DRC. The state of complete economic and institutional collapse as a result of decades of mismanagement and, more recently, war is one of the root causes of many aspects of current environmental degradation in the DRC. It is also the reason why sound up to date information on many of these environmental components is largely lacking.

5.1 Freshwater, coastal, and marine resources

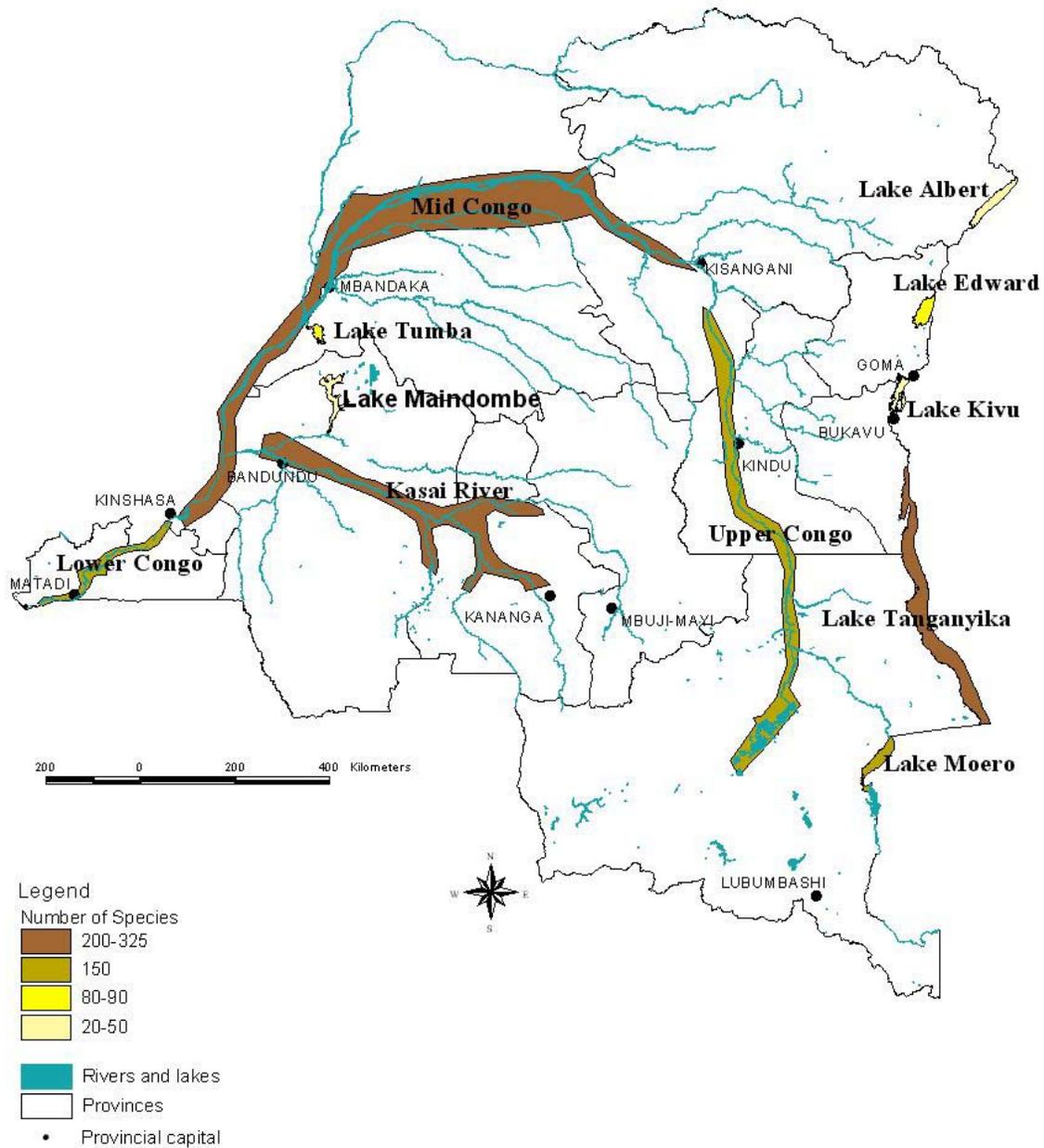
The DRC has an extensive network of rivers, lakes and wetlands (Groombridge, 1992; CEFDHAC, 2001). The Congo River Basin covers 4,000,000 km² and is the second largest in the world (Bailey, 1986; Groombridge, 1992; Chapman 2001). The Congo has many natural barriers for species dispersal (rapids and waterfalls) throughout its course to the Atlantic Ocean (Chapman, 2001). The Congo River can be divided into three main portions: (1) the upper Congo, (2) the mid Congo, and the (3) lower Congo (Bailey, 1986; Groombridge, 1992; Figures 4 & 5).

The Congo, in its three segments, has more fish species than any other African river (Groombridge, 1992). Lake Tanganyika (ca 32,893 km²), the largest lake of the Albertine Rift and one of the oldest lakes on the continent, contains a unique fauna of about 1300 species of vertebrates and invertebrates. Of the 325 known fish species (2001 Plumptre et al., in preparation), 289 are endemic (Kingdon, 1989). This high rate of endemism makes it one of the most important areas in the world for freshwater fish conservation (Groombridge, 1992; Plumptre et al., in preparation).

People living along the Congo River depend on fish resources both for subsistence and commerce (Banister, 1986). It is estimated that as many as 700,000 tons of fishes are consumed annually in DRC (Leonard, 1987; CEFDHAC, 2001). Fish provide an important source of protein to these people.

The objectives of this section are to provide the current status of the Congo watershed and to document known threats to both the biodiversity and water quality. Because both species diversity and water quality are functions of the environments through which the water flows, it is appropriate to divide the Congo River into three sections (upper, middle, lower). Lakes, wetlands and coastal waters are treated separately.

DEMOCRATIC REPUBLIC OF THE CONGO
FISH DIVERSITY IN RIVERS AND LAKES

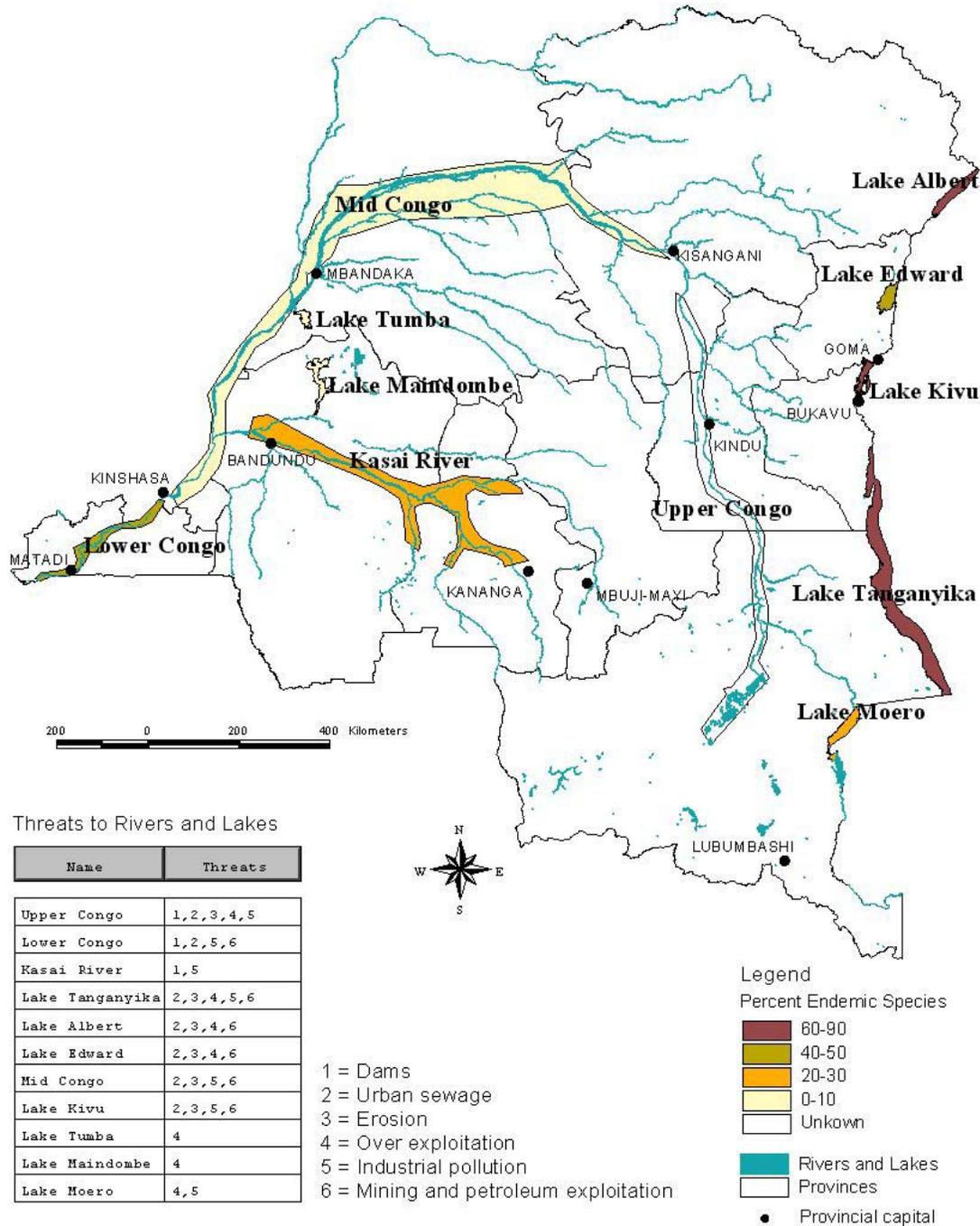


Sources: see citations in text
 Prepared by WCS for USAID Environmental Analysis. September 2003.

FIGURE 4 FISH SPECIES DIVERSITY IN THE DEMOCRATIC REPUBLIC OF CONGO

DEMOCRATIC REPUBLIC OF THE CONGO

PERCENTAGE OF ENDEMIC FISH SPECIES IN RIVERS AND LAKES



Source: see citations in text
 Prepared by WCS for USAID Environmental Analysis. September 2003.

FIGURE 5 DISTRIBUTION OF THE PERCENTAGE OF ENDEMIC FISH SPECIES IN THE DRC

5.2 The Congo River

5.2.1 The upper Congo

This portion of the Congo, also known as the Lualaba River, flows north as far as Stanley Falls from its source in Mushoshi in southern Katanga, close to the Zambian border (Corsi, 1984a; Bailey, 1986; Chapman, 2001). During its course northwards it is joined by two major tributaries, the Luvua and the Lukuga (Bailey, 1986; Banister, 1986).

The Congo starts from the grassy plateau of southern Katanga and flows over 1900 km to Kisangani via Bukama and Kongolo, dropping from 1450m to 660m asl. In this section the Congo crosses through a mountain chain composed of Mounts Hakansson, Mulumbe, and the Manika Plateau. The river also passes through several deep, narrow, rocky gorges. A number of artificial lakes of varying size have been created as a result of hydroelectric schemes. These include Lake Nzilo (200km² - also known as Lake del Commune), and the smaller Lake Marinel (Bailey, 1986).

Major habitats in this section of the river are swamps of extensive papyrus (*Cyperus papyrus*), catail (*Typha angustifolia*) and ambatch (*Aeschynomene elaphyroxylon*). Tilapia and catfish are fished in the artificial lakes. The fish production potential for Lakes Tshangalele, N'zilo and Kamalondo are estimated to be 4,460 tons/year, 2,500 tons/year and 30,000 tons/year respectively (DAFECN, 1983).

From les “Portes d’enfer” (Gates of Hell) the Congo goes through a series of rapids, which end near Kindu where the river broadens and the habitat along the banks is thickly forested (Bailey, 1986). From here the Congo becomes navigable for over 300km. It receives between 2000 and 5000m³s⁻¹ from the Elila, Ulindi and Lowa. Fish diversity in the region of the Stanley Falls is estimated at around 150 species (Kamdem et al., in preparation).

Transparency in the artificial lakes is low (≤ 45 cm) but there are high levels of planktonic seston throughout the year (Bailey, 1986). The lakes are moderately alkaline (pH 8.1), and downstream from the lakes the water becomes more acidic as it mixes with water flowing from forest tributaries.

A number of hydro-electric dams were built to supply the mining industries. These dams affected the course of the Congo by creating artificial lakes which has effected fish populations (Saunders et al., 2002; Parasuraman, 2003). Hydroelectric dams affect water levels and also large expanses of river bank are cleared during the construction phase. This can lead to serious ecological modifications and can have severe effects on the livelihoods of human populations (Poore and Sayer, 1993). There are plans for further expansion of new hydroelectric dams in this portion of the Congo and its tributaries. The impact of any new dams on fish populations of the Upper Lualaba will need to be evaluated.

5.2.2 The mid Congo

The 1700 km segment of the Congo that flows from Kisangani to Kinshasa is called the mid Congo. It is sometimes referred to as the Central Basin or the Cuvette Centrale (Banister, 1986; Chapman, 2001). Several tributaries join the Congo throughout the Cuvette Centrale. The main rivers in the east are the Lomami, the Lulonga, the Ruki-Tshuapa, and the Kasai-Lukenie-Kwango. To the west, the Ubangi joins the Congo downstream of Mbandaka.

The topography of this vast zone is mostly flat, with altitudes ranging between 300m and 700m asl. This section contains major swamps such as the Ngiri swamp, as well as large areas of seasonally and permanently inundated forest up to 5km wide on either side (Evrard, 1968; Bailey, 1986; Gauthier-Hion et al., 1999). These forest types have an open understory, the most important plant communities being *Raphia sese*, *Pandanus* sp., *Guibortia demeusi*, *Uapaca guineensis*, and *Uapaca heudelotii*. (Evrard, 1968).

The Central Congo has 206 species of fish, of which 11 (5%) are endemic (Kamdem, et al. in preparation). These include *Protopterus dolloi* and *Hydrocyon vittiger*, endemic to the DRC, and *Hydrocyon goliath* which is endemic to the Congo basin (Banister, 1986; Chapman, 2001). In general the catfishes represent 21% of the fish fauna in this region (Chapman, 2001). The fish production potential for the entire Cuvette Centrale is estimated to be 200,000 tons/year (DAFECN, 1983).

The eastern tributaries (Lulonga, Ruki-Tshuapa) originate from the humid tropical rainforest. Their water is deep brown and carries humic acids with a pH range of 3.5 – 5.2. Mineral ions that can neutralize the humic acids are scarce in this water (Bailey, 1986). The Lomami and the Ubangi rivers are more alkaline (pH 5.0 - 7.0) and drain modest levels of cations and variable quantities of bicarbonates (Bailey, 1986).

In this section of the river Congo large quantities of the water hyacinth *Eichhornia*, an introduced species, are found.

The REGIDESO has undertaken water quality studies of the water at Kinshasa. The results show that the subterranean water of Kinshasa, which is used by many inhabitants of the city, is acidic (mean pH 4.42). The low pH indicates a high content of carbonic gas (Rachidi, 2001). Studies at the sources of thirteen creeks flowing through Kinshasa show that they have low opacity, with mean turbidity of 3.35 mEq-g. This falls within the norms recommended by the World Health Organization. The low turbidity is due to the fact that Kinshasa is on sandy soils (Ndaya and Mfingulu, 2001). However all the rivers are polluted as they cross the city (Ndaya and Mfingulu, 2001). They carry high levels of organic matter which favor the transmission of water-borne diseases such as diarrhea, typhoid fever, and amoebas (Mbuyi, 2000).

Several large towns are located on this portion of the Congo River. Prior to the war the populations of Kisangani and Mbandaka were 557,615 and 240,230 respectively (De Saint Moulin, 1991). Kinshasa, with 2,664,000 people in 1984, now has more than 5,000,000 people and human density of 267 individuals/km² (De Saint Moulin, 1991; Ngondo, 2001). Other major towns along the Congo are Bumba, Lisala and Brazzaville (Republic of Congo). In these towns, urban and industrial wastes and sewage are dumped untreated in the Congo River. Residents also complain that the water tastes of diesel.

In the early 1980s ESSO explored the Congo River (Leonard, 1987). The presence of petroleum reserves at Mbandaka was confirmed, but exploitation was never initiated.

The zones on the northern bank of the Congo River between Kisangani and Mbandaka appear to have large human populations. Past cultivation of cash crops (cotton, coffee, cocoa, oil palm) has resulted in the clearing of large tracts of forest (Figure 8, see also the discussion in section 5.6.2.2. pages 58-60). In addition to loss of biodiversity through forest clearing, soil erosion and sedimentation undoubtedly affect water quality (Bailey, 1986).

The tributaries joining the Congo River from the Kasai province are affected by gold mining activities in the watersheds (Bailey, 1986, Kamdem et al., in preparation) where the uncontrolled use of mercury in the extraction process is a particular concern. In the Salonga-Ruki system the use of dynamite for fishing, a technique that has spread as a result of the war, is also a major concern.

5.2.3 The Lower Congo:

The final leg of the Congo River covers the section between Kinshasa and Banana in the Province of Bas Congo.

The Congo River flows through the Mount Crystal massif and is characterized by series of impressive rapids separated by large expanses of less turbulent water. Between Kinshasa and Matadi, a distance of 250km, the river descends 280m in altitude, discharging between 31,319 – 55,424 m³s⁻¹ into the Atlantic Ocean at Banana (Bailey, 1986). This region contains 150 fish species (Banister, 1986) of which 50% are endemic (Kamdem et al., in preparation).

The water is turbid and colored with humic substances (pH 7.0–7.5) and contains low bicarbonate alkalinities (0.68–0.40meq/L). A total of 35,427,000 tons/year of dissolved substances are discharged into the Atlantic at Banana (Bailey, 1986).

Human population numbers are high in towns like Kinshasa (estimates vary between 5 and 8 million inhabitants), Matadi (ca. 243,700) and Boma (ca.166,600 people; De Saint Moulin, 1991; Ngondo, 2001) and many other smaller sized towns are located along the lower Congo. As with the other sections of the river human and industrial waste are discharged untreated into the river. Activities in and around the port of Matadi also constitute a major source of pollution.

Logging activities occur throughout the Bas-Congo region (Leonard, 1987). Although no quantitative data are available on the effect of logging on the waters of the Congo River, it is known that denuded land seriously affects the river along its course (Saunders et al., 2002).

The Inga hydroelectric dam is a major barrier for fish species movement (Kamdem et al., in preparation), though there is no data available. It is known from other regions of the world that dams can lead to sedimentation of watercourses. It is therefore important to assess the ecological impact of Inga I and II, and evaluate the environmental implications of the Inga III phase.

5.3 The Coastal Waters

The DRC has a coastal section of little more than 40 km comprised essentially of the Congo River delta. The Réserve de Mangroves covers 66,000 hectares and includes 226 km² of mangrove forest. The reserve is made up of two management zones: a fully protected area of mangrove vegetation and a 2km-wide multiple-use zone of humid savannahs along the coast.

The mangrove ecosystem provides a nursery and breeding ground for many of the species of fish exploited commercially.

A full inventory of the fauna and flora of the reserve has never been undertaken (Sayer, 1992; Richard, 1996; Kamdem et al., in preparation). Wildlife species of this zone include the critically endangered West African manatee (*Trichechus senegalensis*), the hippopotamus (*H. amphibius*) and the sitatunga (*Tragelaphus spekei*). Three species of marine turtle, the leatherback (*Dermochelys coriacea*), the green (*Chelonia mydas*), and the hawksbill (*Eretmochelys imbricate*) are known to be present and a fourth, the olive (*Lepidochelys olivacea*) is suspected to be present. There are no quantitative data on species diversity and rates of endemism (Kamdem et al., in preparation).

The mangrove strip at the mouth of Congo River is affected by oil pollution from the oil terminals in the adjacent Angolan territory of Cabinda (Sayer, 1992) as well as the oil refinery at Kinlao. No quantitative data exist on the environmental impacts of the two principal Congolese oil drilling companies, Chevron-Texaco and PERENCO, though as American companies they must conform to US law and the companies insist that they maintain the highest possible standards (Chevron Website, M. Toelens, personal communication). Industrial logging occurred in the late 1980s (Sayer, 1992) and local people also currently exploit mangroves for firewood, charcoal and pit props (Richard, 1996; CEFDHAC, 2001).

Coastal fish production potential is estimated to be 6,000 tons/year (DAFECN, 1983; FAO, 1984) although quantitative data on actual production and actual catch rates are scarce. It is known however that Asiatic-owned trawlers, operating within the framework of an Angolan/Congolese agreement, regularly undertake illegal fishing activities in the Congo River delta and in the Reserve (Vunda, personal communication). These trawlers also regularly enter into conflict with local fishermen whose equipment is frequently damaged by the trawlers. The trawlers also apparently use nets below the legal mesh size which results in catches of fish of a size that is of no interest to them. These fish are sold to the local fishermen. This kind of operation is likely to be unsustainable.

Industrial, medical and household waste is present all along the coastline although quantitative data on this kind of pollution are lacking. Furthermore pollution emanating from the DRC is known to impact the coastlines of neighboring countries (and no doubt *vice versa*). For example, plastic and glass products bearing labels identifying their origin in the DRC are abundant on the beaches of Gabon and Cameroon.

5.4 The Lakes of DRC

5.4.1 Lake Tanganyika

The lake Tanganyika is over 700km long (CEFDHAC, 2001) and has a surface area of 32,893 km² (Groombridge, 1992; Plumptre et al., in preparation). Lake Tanganyika is the second deepest lake in the world (maximum depth 1,470m). It drains into the Congo River through the Lukuga River (BEPR, 1970; Plumptre et al., in preparation). Of its 325 known fish species, 289 are endemic. Over 80% of the species belong to the family of mouth brooding cichlids (Plumptre et al., in preparation), of which an extraordinary 33 genera are endemic to the lake (Kingdon, 1989). Fish production potential is estimated to be 400,000 tons/year (DAFECN, 1983).

Many large cities (Uvira, Bujumbura, Kalemie, Kigoma etc.) surround the Lake and pollution from untreated waste is likely to be high. Industrial fisheries have been operating on the Lake for a long time but data on the impact of these activities on the fish fauna are not available (DAFECN, 1983). The rugged terrain (steep slopes dropping down to the lake), combined with high human populations, exposes the area to high risks of erosion. Soil erosion, leading to sedimentation in the inshore sections of the lake, is likely to be affecting the survival of certain species of endemic cichlids whose ranges occupy little more than a few hundred meters of shoreline.

5.4.2 Lake Kivu

Lake Kivu (ca 2,370 km², 1,400 m above sea level, asl) covers a length of about 300km between the cities of Goma and Bukavu (BEPR, 1970). The region around the lake is mountainous, with maximum altitudes of 3500m asl in the Virunga volcanoes (Wills et al., 1976). The Ruzizi River drains the lake southwards into Lake Tanganyika (BEPR, 1970). Forests around Lake Kivu are severely degraded because of the rapidly expanding human population. Human densities can reach 300 people/km² (De Saint Moulin, 1991) in areas adjacent to the lake. The lake has relatively few fish species (17 – 23), of which 15 are endemic (Groombridge, 1992; Plumptre et al., in preparation). The low fish diversity is probably linked to the fact that the Lake is situated in a currently active volcanic zone and contains substantial gas reserves. It holds about 250 billion m³ of carbon dioxide, 55 billion m³ of methane, and 5 billion m³ of nitrogen (Chemonics International Inc., 2003). Nevertheless fish production is estimated to be 19,000 tons/year (DAFECN, 1983).

In the town of Gisenyi (Rwanda) a methane extraction plant, initially set as a pilot project by the Belgian Chemical Union in 1954, has been operational for many years. Large scale extraction of methane has, however, never been developed although in 1990 Zaire and Rwanda created a company called Socigaz to exploit the gas reserves on a commercial scale (Chemonics International Inc., 2003). This effort was halted by the civil war in Rwanda. No serious internationally acceptable environmental assessment has ever been done on methane extraction and this therefore remains an urgent requirement.

High human populations and intense agriculture (dominated by bananas) on the steep slopes causes considerable erosion (Wills et al., 1976) into the lake. Untreated sewage from Bukavu and Goma enters directly into the lake.

5.4.3 Lake Edward

Situated at an altitude of 916 m, Lake Edwards covers a surface area of 2,150 km² (BEPR, 1970) and falls within the central section of Virunga National Park (VNP). The eastern part of the lake

also falls within the contiguous Queen Elizabeth National Park in Uganda. The Semliki River drains the lake northwards into Lake Albert through the Semliki valley. Two main rivers, the Rwindi and the Rutshuru, feed the lake from the south.

Lake Edward has 81 fish species of which 56 are endemic (Plumptre et al. in preparation). Common species include the tilapia, *Oreochromis niloticus eduardianus* and *Propterus aethiopicus*. The fishery production potential is estimated to range between 16,000 tons (Vakily, 1989) and 20,000 tons/year (DAFECN, 1983). Tilapia is the principal species exploited. Prior to the war most of the commercial fishing was conducted out of two large fishing villages, Vitshumbi and Kyavinyonge, both of which are located within the boundaries of the national park. The population of these villages was estimated to be at least 20,000 people in 1991.

A spectacular wildlife feature of the lake was, until recently, the very high hippo numbers. A census in 1989 counted a total of 23,000 hippos in the Congolese section of the lake and its three main rivers in the PNV (Mackie, 1988). A decade of civil strife and war has had a devastating impact on wildlife populations in the park (Hillman-Smith et al., 2003) and the hippo population in the southern section of the park has plummeted to 1,500 (Demerode, personal communication). The Nile crocodile (*Crocodylus niloticus*), which interestingly only appeared in the lake for the first time in the mid 1980's (Verschuren et al., 1989), is still present in small numbers near the mouth of the Semiliki (Hillman-Smith et al., 2003).

The water has a pH of 7.4 with a high sodium concentration (Na = 158mg/L). This is a consequence of the hydrothermal water sources and dissolved alumino-silicates from the volcanic soil (Mankoto, 1989).

As many as 700 fishing vessels operated in Lake Edward before the war (Vakily, 1989). The situation worsened considerably during the war and dozens of unregulated fishing villages were established along the shores of the lake, particularly in the zone near Kasindi (ICCN, 2003). Fishing activities, using nets below the legally accepted mesh size, are concentrated in the breeding grounds in the shallow bays and are almost certainly unsustainable (Vakily, 1989).

5.4.4 Lake Albert

Lake Albert lies at 618 m asl and has a surface area of 5270 km² with an average depth of 25 m. The lake is drained northwards by the Nile. In the north, rocky escarpments (300 – 350 m high) and open savannas border the lake. Extensive areas of papyrus (*Cyperus papyrus*) are also present (Proude, 1984).

Lake Albert has 48 fish species, of which 23 are endemic (Groombridge, 1992; Plumptre et al., in preparation). The fishing potential is estimated to be 13,300 tons/year (DAFECN, 1983).

The water of Lake Albert is grey veering toward green due to a high proportion of plankton (Proude, 1984). The water is alkaline (pH 8.5), enriched in salt, and evenly oxygenated throughout all its depths (Proude, 1984). Industrial fishing occurred in the past but there has never been any evaluation of its impact on the fish abundance and diversity. Reports indicated that the *Hydrocynus forskahli* and *Lates niloticus albertianus* were over fished (Proude, 1984). Major reserves of

petroleum are thought to occur beneath Lakes Albert and Edward and a south African company has already introduced a demand for an exploration permit (Figure 8)

5.4.5 Lake Moero

Lake Moero (ca 4340 km², 922 m asl, maximum depth 12 m) is situated mainly in Zambia, with its western portion lying within the DRC (FAO, 1983; Banister, 1984). The Luvua River links it to the Congo River system (Banister, 1984). The Lake has 150 fish species of which 39 are endemic (Banister, 1984). The fish production potential is estimated to 12,000 tons/year (FAO, 1983; DAFECN, 1983).

No data are available on the water quality of the lake (FAO, 1983). Pweto, Kilwa, and Kasenga are the main medium-sized towns on the lake shore. The population of these towns and their immediate surroundings is estimated at 249,875 (De Saint Moulin, 1991; Ngondo, 2001). As with other populated towns of the DRC untreated waste is discharged directly into the lake. Commercial fishing on the lake has existed since 1958 (FAO, 1983) but the impact of this activity has never been assessed.

5.4.6 Lake Upemba

Lake Upemba has a surface area of 400 km² (Bailey, 1986). It is located in the Katanga province in a vegetation transitional zone, where the altitude varies between 585m and 1200m asl (Kamdem et al., in preparation).

The water of Lake Upemba exhibits super-saturation of dissolved oxygen, with a pH range of 7.2–8.1. Threats to the conservation of aquatic species include the introduction of an exotic fish species, *Oreochromis niloticus*, for fish farming (Kamdem et al., in preparation), and various human activities including mining and uncontrolled fishing (Thompson and Hasson, 2000).

5.4.7 Lake Tumba

Lake Tumba (ca 765 km², 350 m asl, depth 3-5 m) is situated in the central basin of the Congo River (Corsi, 1984b; Bailey, 1986; Kamdem et al., in preparation) and is surrounded by dense humid forest. Four tributaries (Loko, Bituka, Lobambo and Nganga) enter the lake and the Irebu channel connects it to the Congo River. Lake Tumba has 86 fish species (Corsi, 1984b). Two species of crocodile are present, the Nile crocodile *Crocodylus niloticus* and the slender snouted crocodile *Crocodylus cataphractus*. The dwarf forest crocodile, *Oteolaemus tetraspis*, is probably also present in the small streams around the lake but as with elsewhere in the Congo basin these three species of crocodile have been heavily hunted for several decades (first for the skin trade, and more recently for the bushmeat trade).

The water of Lake Tumba is dark, acidic (pH 4.5 – 5.5) and chemically impoverished (Corsi, 1984b, Bailey, 1986; Kamdem et al., in preparation). Transparency is limited to 2m and the water contains high levels of vegetable debris (Bailey, 1986). The region around the lake has been logged for

timber, and the human population is growing rapidly. Fishing intensity is high to supply markets in both Mbandaka and Kinshasa (Corsi, 1984b; Kamdem et al., in preparation).

5.4.8 Lake Maindombe

Lake Maindombe (ca 2300 km², 300 m asl) is also a shallow lake (Bailey, 1986; Kamdem et al., in preparation). Two main rivers feed the lake, Lokoro and Lotoi (Corsi 1984b). Lake Maindombe discharges its water into the Kasai River via the Fimi and Lukenie rivers (Corsi, 1984b). The habitat around the lake is a mosaic of dunes of bare sand, herbaceous savannas and degraded rain forest, with large expanses of *Raphia* swamps. Lake Maindombe has 41 fish species, of which three are endemic. High levels of fishing are also reported to supply both the local and the national market.

As its name indicates, the water is colored black (Corsi, 1984b), which indicates a low mineral content. The towns of Kutu and Inono are known to discharge their untreated wastes into lakes.

5.5 Air quality, urban water resources, urban and environmental management.

5.5.1 Air Quality

Little documented information exists on the nature and extent of air pollution in DRC. The National Environmental Action Plan (PNAE) cites figures for CO₂, CO, NO_x, CH₄, N₂O and SO₂ emissions from agricultural, industrial and the energy sector activities, although the sources of these data are not given (Table 1). According to the PNAE, agricultural activities (bush fires) are by far the most important sources of the greenhouse gas emissions, followed by fire wood and charcoal use. Petroleum and mining related activities apparently contribute the least.

TABLE 1 MOST IMPORTANT SOURCES OF AIR POLLUTION IN DRC

(adapted from PNAE, 1997)

Sector	Type	Emissions in Gg/yr					
		CO ₂	CO	NO _x	CH ₄	N ₂ O	SO ₂
Agriculture	Bush fires	40.10 ⁶	1,739,694	31,582	92,606	929	X
Industrial	Gécamines (mining)	+ 436	X	X	X	X	+ 29
	Cement production	+ 129	X	X	X	X	X
	Oil production	1619	X	X	X	X	X
Energy	Transport	1249	8,1	36,2	0,084	À,036	1,17
	Fuel oil	234	0,2	1	0	X	X
	Fuel wood	27639	15	32,7	4,5	X	X
	Charcoal	13276	11	74,8	0,1	X	X
Household	Solid waste	X	X	X	X	X	X

X = no data available

5.5.1.1 Agriculture:

Forest and bush fires are part of the annual agricultural cycle in central Africa. In the humid evergreen forests of the DRC, forest fires produced during slash and burn agricultural activities are very limited in spatial terms (Ehrlich, 1995) because the humidity of the forest vegetation prevents the fires from spreading. Bush / grass fires during the dry season are, however, very extensive indeed and their significant contribution to green house gas emissions is therefore not surprising. In DRC essentially all of the grasslands burn during the dry season.

5.5.1.2 Transportation-related air pollution:

Transportation-related air pollution (carbon monoxide, nitrogen oxides, hydrocarbons, particulate matter) is largely confined to the large urban areas, particularly Kinshasa and the other urban areas of Bas Congo. It is caused mainly by the ever increasing numbers of poorly maintained vehicles operating in heavily congested urban environments where transportation planning is non-existent. The vast majority of vehicles operating on the roads in urban centers, many of which are imported second-hand, receive no proper maintenance and emit significantly higher levels of pollutants than properly maintained modern vehicles. No reliable data exists on the number of vehicles operating in the DRC and their impact on air quality.

The DRC has no policy for phasing out the use of leaded gasoline which contributes to high levels of lead in the air. Furthermore no official standard exists for automotive emissions since the DRC has not yet formulated an Environment Law.

5.5.1.3 Industry:

Despite DRC's enormous potential for generation of hydro-electric energy, power cuts are frequent in the urban centers that are linked to the national grid. The use of generators as a back-up source of electricity is widespread both domestically and in the private and public commercial sectors. Once again no data exists on the extent of generator use but it is likely to be a significant additional source of air pollution in the urban areas.

5.5.1.4 Mining:

Little or no quantitative data appears to exist on the extent of air pollution from the mining industry. However in view of the staggering quantities of tailings created by the major mining companies¹ it is safe to assume that air pollution is a health hazard. The NEAP cites pneumoconiosis, silicosis, and acid rain as serious health and environmental hazards resulting from industrial mining. In the mining towns of the Katanga and Kasai provinces particulate air pollution from mining industry infrastructures are known to seriously affect the quality of life of the urban inhabitants. Further details on the environmental liabilities of industrial mining activities are presented below (section 5.5.4).

¹ In the preamble to the new Code Minier figures are given for the huge volumes of tailings produced by some of the major mining operations. For example Miba and Okimo have produced respectively 6,720,000 m³ and 64,364,000 m³ of tailings, and the tailings produced by Gécamines are quoted to contain 4,016,714 tons of Copper, 1,542,182 tons of Zinc and 603,703 tons of Cobalt.

5.5.1.5 *Oil extraction:*

On-shore and off-shore oil production in DRC is limited to the province of Bas Congo. Gas flaring from the production of fossil fuels, while undoubtedly contributing to air pollution, is therefore probably limited in extent. Gas flaring contributes to high levels of methane emissions, particularly if combustion efficiency is low. Methane, which traps 20 times more heat than CO₂, is an important greenhouse gas that contributes significantly to global warming.

5.5.2 *Urban water resources:*

Despite the enormous reserves of fresh water in the DRC the majority of its population (55% - UNICEF 2001) lacks access to safe drinking water. In some rural areas the figure is as high as 85%. One of the main causes of illness in the DRC is diseases contracted from contaminated water (UNICEF 2001, OXFAM, 2001). The main threats to water quality in the DRC are from insufficiently treated domestic, urban and industrial wastes. Although precise figures are not available, it is likely that thousands of cubic meters of untreated domestic and industrial waste are discharged daily into the Congo River from the urban centers along its course.

In urban areas access to safe drinking water has reduced significantly over the past decade. The REGIDESO, the parastatal body responsible for the production and distribution of urban water, faces enormous operational difficulties (e.g.: access to a regular supply of affordable chemicals, spare parts and a severely degraded infrastructure network) with the result that, in many provincial town and cities, their production and distribution plants no longer function. However considering the desperate economic context of the DRC it is perhaps surprising that in Kinshasa, for example, the REGIDESO manages to provide the service that it does. Supplies to the central communes are generally maintained but coverage of the more recent outlying communes is patchy. Nevertheless, in 2001, OXFAM reported that the inner-city infrastructure was so old and badly maintained that 53 % of its water is lost through leakage before reaching the user. There is also clear evidence of post treatment contamination of the water supply as a result of corrosion and leaks in the water distribution network (Musibono 2003).

Of the 65% of Kinshasa's population that have a water connection, only about half receive water regularly. More than two million people do not have access to the city's water supplies and rely on wells and springs, of which 60% were reported to be contaminated. In Mbuji Mayi only 20% of its 2 million inhabitants were receiving water regularly and in other provinces the situation is similar if not worse.

One of the immediate consequences of reduced access to clean water is that women and children, who bear the brunt of household chores, have to invest greater time and energy in searching for water. In the provinces, between 70 and 98% of the population walk for 15 minutes or more to collect water (MISC2/2001). This often results in them resorting to polluted sources, streams and rivers.

5.5.3 *Urban environment management:*

The Programme National d'Assainissement (PNA) is theoretically responsible for all questions relating to solid and liquid wastes, soil, air and water pollution, public health related disease vectors, and public awareness. In practice however the PNA has received neither equipment nor budget for

the past 10 years (with the exception of 143,000 \$US from the World Bank budget support program in 2003). Most of the 70 trucks acquired in 1989 with Japanese funds were lost or damaged in the episodes of looting in the early 1990's (Ngoy Mbele, personal communication). Currently only two vehicles are operational.

5.5.3.1 Sanitation systems:

A major problem facing urban residents in the DRC is the lack of adequate and safe sanitation systems. According to the PNA² there are no functioning sewage treatment plants in the whole of the DRC, and indeed there have not been since soon after independence. Even in colonial times only three existed (2 in Kinshasa, 1 in Bukavu). In Kinshasa for example all sewage entering the public drains system is evacuated untreated, directly into the Congo River.

According to the MISC2/2001 report, only 46% of the population of DRC are considered to have access to hygienically acceptable toilets, although if traditional covered pit latrines are excluded the figure drops to 10%. In Kinshasa, essentially only the central communes have toilets connected to the public sewers. In the outlying communes, households rely on soak-away pit latrines, septic tanks or simply use the open drains. Where the water table is high, as it is in many parts of Kinshasa, groundwater, which many families rely on for their water supplies, risks being contaminated. Septic tanks and soak away pit latrines are generally under dimensioned with respect to the number of people using them, so they usually need to be manually emptied at regular intervals. Since it is so expensive to have septic tanks emptied (prices vary between 30 and 150\$) households tend to avoid having this done. The result is that overflows are common, particularly during the rainy season when excess surface water floods the tanks and carry away the contents. The public health threat that this situation represents are all too evident, particularly in view of the appalling conditions of promiscuity in which most of Kinshasa's estimated 5 to 8 million inhabitants live.

5.5.3.2 Municipal solid waste:

The disposal of municipal solid wastes is an essential public service. Such wastes include refuse from households and institutions, non-hazardous solid waste from industries and commercial establishments, market waste, etc. In Kinshasa, one cannot fail to notice the enormous quantities of refuse that encumber the streets and sidewalks resulting from the complete break down of the public waste disposal services. In the central communes a small number of small private companies collect refuse using light pick-up vehicles. More often however individual households or commercial operations resort to paying operators of "pousse-pousse" (hand drawn carts) to dispose of their refuse. Since there is not a single officially designated and managed land fill site in Kinshasa the refuse is either incinerated on site or dumped somewhere else (rivers, drains, empty plots..). The hand cart operators have adapted creatively to the situation by selling the refuse to market gardeners who separate out the biodegradable (organic) matter for composting their gardens. The non biodegradable waste is either left *in situ* or is collected by the PAN³ or handcart operators and is used to fill in the hundreds of erosion sites that have appeared in the city as a result of decades of unplanned urban development.

² source: Directeur PNA

³ the market gardeners often fund the cost of removing the non biodegradable matter by providing fuel for the PNA vehicles

The recycling sector is poorly developed in DRC although a few examples of industrial-scale recycling of household or industrial waste do exist⁴

5.5.3.3 *Industrial Waste:*

As mentioned in section 3.6 the DRC has not yet enacted an Environment Code, although a draft text has existed for several years and several Ministerial texts have been signed in an attempt to regulate treatment and stocking of industrial wastes.

In 1995 the MECNT established a “Commission Paritaire Environnement / Profession Pétrolière” comprising representatives of four government administrations (Ministries of Environment, Energy, Planning and Finance) and representatives from four components of the petroleum sector (Production, Refineries, Transport and Distribution). Through this Commission, a number safety measures and environmental norms were developed, as well as emergency plans to be activated in the event of accidents⁵. The Commission also contributed to the elaboration of the draft Environment Law.

Largely in response to the workings of this commission and the ministerial directives issued by the Ministry, a certain number of enterprises in the petroleum sector have now installed used water treatment systems (e.g. FINA-Congo, SEP-Congo). The petroleum residues collected in the separation tanks are regularly collected and stored in drums for collection and disposal by the authorities (Ministry of the Environment). However, according to FINA-Congo⁶ these residues have never been collected.

In April 2003 an environmental assessment conducted on six Public enterprises⁷ on behalf of the World Bank highlighted a number of environmental concerns. In most cases liquid waste including used water containing hydrocarbons, solvents and other toxins, were evacuated into the municipal drains either without prior treatment, or after passing through non-functional filtration systems. Solid wastes were generally not collected by the municipality and are either left to accumulate on site (scrap metal etc..) or were simply thrown away in the close proximity of the site (other waste). In several cases underground and above ground storage of chemicals and fuel were also inadequate with a clear risk of soil contamination.

Evidence that significant quantities of industrial pollutants are leaking into the water system has recently been confirmed by a series of studies carried out by the University of Kinshasa’s Environmental Resources Management and Global Security Research Group. Alarming levels of lead were identified in filtered water, suspended solids and fish samples⁸ collected from the Congo River in the vicinity of Kinshasa (Musibono et al., 2003). Samples taken from downstream of the city were significantly more polluted than upstream samples. Musibono (1999) also showed that

⁴ PEGAL Industries recovers paper and cardboard for recycling into toilet paper, wrapping paper and cardboard. PLASTICA is able to recycle plastic but does not do it on a day to day basis

⁵ Rapport de la Commission Paritaire Environnement / Profession Pétrolière, 1997

⁶ Interview with Mr. Jean Simba Diayidi, FINA-Congo

⁷ Office Congolais des Postes et Télécommunications,(OCPT), Société National des Chemins de Fer Congolais (SNCFC), la Société National d’Electricité (SNE), Régie des Voies Aériennes (RVA), Lignes Aérienne Congolaises (LAC), and Société de Transport Routier – City Train (STRCT)

⁸ Kinshasa residents frequently complain that the fish “taste of diesel”.

levels of Chromium, Copper, Lead and Zinc in four rivers traversing Kinshasa were 10 times higher in the rainy season than in the dry season as a result of surface water run-off from the city.

Studies have also shown that motorized vehicles are the main source of lead in Kinshasa and that vegetables grown by market gardeners, particularly those close to roads, are a serious public health risk (Musibono et al, 2002)

In the face of the enormous environmental health problems presented above there is an urgent need for a truly *integrated health sector* approach from the government and the funding agencies, which addresses the entire range of environmental health issues (sanitation, treatment of solid and liquid wastes, clean water supplies) and does not just focus on a narrower health services approach.

5.5.4 Mining:

Copper and gold exploitation in the Congo basin dates back to at least the 16th Century. In modern times mining activities have been the basis of the economic wealth of the country, representing 80% of the export earnings of the country (PNAE, 1997). Mining products include copper, zinc, cobalt, cadmium, manganese, gold, tin, cassiterite, colombite, wolfram, diamonds and coal. In 1972 copper and zinc production reached 450,000 tons and 188,000 tons respectively, but with the collapse of the DRC's economy over the past decade, copper production had dropped to 21,000 tons by 2001.

5.5.4.1 *Environmental impacts of mining*

Katanga and Kasai are the principal industrial mining provinces (Figure 6) and are certainly the regions subjected to the most serious environmental pollution. Levels of soil, water and air pollution are high as a result of inadequate management of used water, tailings and smoke. A recent World Bank study of DRC's copper and cobalt mines speaks of "huge environmental liabilities"⁹. These are likely to require several hundreds (if not thousands) of millions of dollars to redress.

Environmental liabilities of the mining sector (mines and associated industries) in Katanga include:

- The systematic damming of river courses to create collecting basins for residues allows direct contact between surface waters and hazardous waste. Many of the dam walls have been breached;
- Untreated liquid effluents from factories is often discharged directly into the environment;
- Air pollution from wind erosion of tailings, containing arsenic, lead, cadmium and zinc, constitutes a serious health hazard (pulmonary and ocular syndromes) in adjoining human habitations;
- Certain factories linked to mining activities (foundries, acid production) are in such a poor state of repair that the health of workers is seriously compromised;
- The use of mercury for the artisanal extraction of gold from factory tailings is having a devastating impact on the aquatic ecosystems;
- Tailings containing high levels of Uranium radiation are used as construction materials (foundations, road fill, etc.). Extraction of Uranium from tailings, without proper equipment for monitoring and protection, is also reported to be occurring in Likasi and constitutes an enormous health hazard for local population.

⁹ World Bank web site

An exploratory environmental audit conducted by the University of Kinshasa's Environmental Resources Management and Global Security (ERGS) research group revealed that levels of lead, cadmium, zinc and copper in water and soil samples from 5 of the largest mines¹⁰ in Katanga were between 2 and 10 times higher than internationally accepted norms (Musibono, 2003).

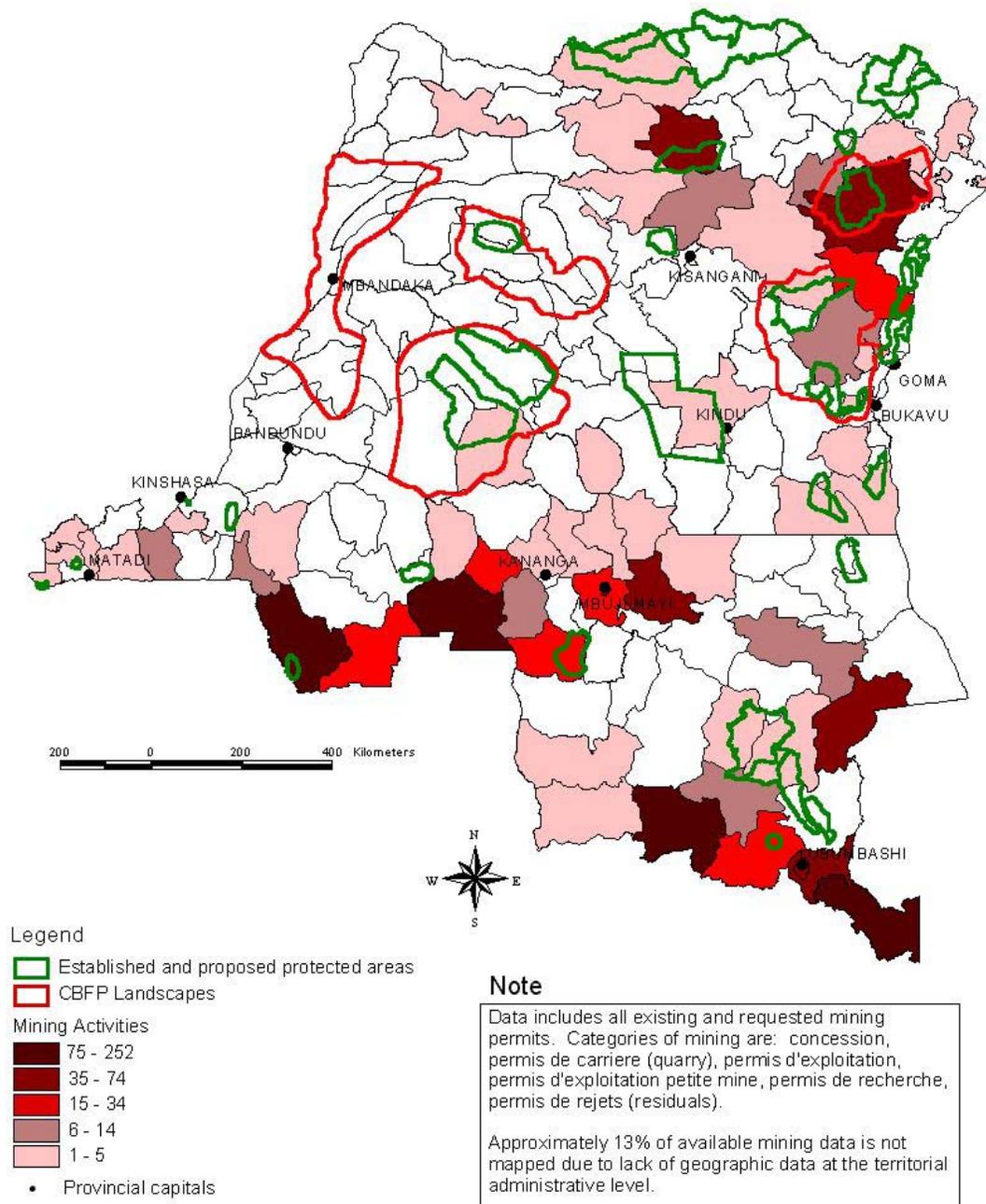
Diamond mining in Tshikapa and Mbuji Mayi (Kasai occidental), in addition to the physical impact on the natural environment (modification of the landscape), has also had a catastrophically destabilizing impact on the socio-economic fabric of the local populations¹¹.

The widespread use of mercury in gold extraction activities in the Kasai province is also likely to have had a serious negative impact on the natural environment and the human populations.

¹⁰ Gécamines, Exaco, Shituru, Congo Mineral, Sodimico

¹¹ unpublished report entitled "Diamonds of poverty, diamonds of blood – a study report from Tschikapa, Environmental Audit". Musibono, D.E. (2000).

DEMOCRATIC REPUBLIC OF THE CONGO
EXISTING & PLANNED MINING ACTIVITIES



Sources: Cadastre Minière
 Prepared by WCS for USAID Environmental Analysis, September 2003.

FIGURE 6 THE DISTRIBUTION AND DENSITY OF MINING PERMITS IN THE DRC

In the forest zones of Kivu, Oriental province and Maniema, widespread, illegal “artisanal” mining activities for gold, diamonds and coltan have also caused socio-economic misery and have seriously impacted the environment through deviation of water courses and associated hunting activities for the bushmeat trade.

5.5.4.2 New legal framework for environmental management of the mining sector:

The new Mining Code, promulgated in 2002, is particularly innovative and integrates a number of new initiatives aimed at providing a more responsible legal framework for addressing environmental issues related to mining activities. In particular the following dispositions have been introduced:

- An “Etude d’Impact Environnemental” (EIA or Environmental Impact Statement, EIS) is required prior to attribution of a mining exploitation permit. The EIA must present a scientific analysis of the level and acceptability of environmental impacts of the proposed mining activities, as well as a technical and economic analysis of possible mitigating measures to be applied during the exploratory phase;
- The EIE must be accompanied by a “Plan d’Atténuation et de Réhabilitation” which commits the operator to implement a number of mitigation and rehabilitation measures. The operator must provide a financial guarantee to cover the costs of these measures;
- For exploration permits, as well as temporary exploitation permits a “Plan de Gestion Environnementale du Projet” must be produced. This is a « cahier de charge » presenting a plan for the implementation of the mitigation measures identified in the EIA;
- A “Service Chargé de la Protection de l’Environnement Minier” is created within the Ministry of Mines. This service will operate in coordination with other state organs responsible for protection of the environment.

A further innovation of the new Mining Code is the introduction of a “Permis d’Exploitation des Rejets” to allow operators to exploit the enormous quantities of residues (tailings etc..) which contain high quantities of exploitable metals due to inefficient extraction methods used in the past (Code Minier, 2002). This measure will contribute to reducing negative impacts on the environment since treatment of the mountains of residues will involve rehabilitation of the sites post-treatment. Furthermore, reducing waste by more efficient processing techniques should, in theory, contribute to a more rational exploitation of the country’s mineral resources.

It is envisaged that part of the cost of the enormous “clean up” operation that is going to be necessary over the next few years could be financed through the revenue generated by the re-treatment of residues. The company America Mineral Fields (AMF) has already proposed this approach in Kolwezi.

Finally the new code specifically excludes hydrocarbon products in its definition of mining products. The legal framework for addressing environmental issues related to the oil industry will be defined in a separate code.

5.5.5 Energy:

5.5.5.1 Electricity

DRC has one of the highest potentials for hydro-electric power generation in the world. The Inga dam has a full production potential of 40,000 MW but currently only develops about 1,790 MW (i.e. 4.5% of its full potential). Phase three of the Inga project (Inga III) is projected to increase production by 3,500 MW, with the ultimate objective of linking the DRC grid to the whole of southern Africa.

The Inga dam plant provides power to Bas Congo and a high tension line brings power to Kinshasa and the major cities in the south of the country (Bandundu, the Kasais and Katanga). The other major cities of the country are supplied by hydroelectric plants or central generators.

Access to electricity in DRC is only about six percent¹², i.e. one the lowest percentage of access in the world. Access to electricity services, already low before the conflict, has fallen to dramatically low levels. The electricity sector has all but collapsed through lack of maintenance, capital investment and modernization. Several areas of the country have been cut off from the grid. The deterioration of electricity supply in DRC inevitably affects all sectors of activity both public and private. The mining sector is particularly affected by lack of electricity supply.

DRC's potential for producing "clean" energy has enormous positive implications for the preservation of the environment, particularly in urban areas where deforestation for firewood and charcoal exerts such a heavy toll on natural forests and woodlands.

5.5.5.2 Wood

Wood represents over 85% of energy consumption in the DRC. Paradoxically most of the major urban centers (those with the highest human populations) are situated in areas with the lowest natural forest cover. The consequence has been an ever widening "halo" of deforestation around these cities as people travel further and further a field to collect wood (Figure 8, see also discussion of deforestation in section 5.6.2.1. pages 57-60). In Kinshasa the burgeoning human population with no access to electricity is resulting in a dramatic increase in the use of firewood and charcoal for households and small enterprises¹³. Satellite imagery provides clear evidence of this phenomenon around all the major cities of central Africa (Mayaux et al., 2000). However quantitative ground data on deforestation rates and wood fuel consumption in DRC are scarce. Around the mining town of Kolwesi the radius of deforestation extends for up to 50km, covering an estimated 7,860 km², and it is estimated that over 1 million sacs of charcoal are consumed annually in Lubumbashi.

5.5.5.3 Crude oil production:

The DRC currently produces 24 million barrels of crude oil annually. Paradoxically all of the DRC's production is exported since the crude oil is too viscous to be treated by the oil refinery at Moanda. All oil refined at Moanda is imported.

¹² This percentage varies from 31% in Kinshasa, 7.1 % in Bas-Congo, 0.3 % in Bandundu, 0.9 % in Equator, 0.8 % in North-Kivu, 2.7 % in South-Kivu, 5 % in Katanga, and about 2 % Kasai.

¹³ Ten years ago a healthy gallery forest lined the banks of the Nsele river which descends from the Bateke plateau river and follows the outskirts of Kinshasa to the east and north of the city. Today almost nothing remains of this forest. The little remaining wood is being transformed into charcoal for household use, or sold to the hundreds of wood-fired bakeries in Kinshasa.

The old Mining Code, which was in force until 2002, laid the legal basis for oil production activities. However in the new Mining Code of July 2002, oil exploitation no longer features in the definitions of mining activities. Specific legislation for the petroleum industry (a Code Pétrolier) is being discussed but has yet to be finalized. In the absence of both a Code Pétrolier and a Code Environmental, the two large companies with onshore and offshore oil operations (PERENCO and CHEVRON) automatically apply standard internationally accepted environmental standards to their operations¹⁴. It is also worth noting that Chevron has already approached USAID with a view to collaborating in the CBFP partnership.

Incidents of sabotage of the oil pipeline from Moanda to Kinshasa are regularly reported and this obviously represents a serious source of (localized) pollution. The EA team was unable to identify reliable sources of quantitative data on this problem.

Vast untapped sources of oil and gas are reported to exist in Equateur and along the Albertine Rift (Orientale and the Kivu Provinces). If these ever come into production, the consequences for the protected areas, particularly along the Albertine Rift, are alarming. Figure 7 shows how an exploration permit requested by Heritage Oil overlaps almost entirely with the globally important Virunga National Park, one of the DRC's 5 World Heritage Sites.

¹⁴ sources: <http://www.chevron.com> and <http://www.perenco.com>

5.6 Status of biodiversity

5.6.1 Natural ecosystems

Spanning the equator in Central of Africa and climbing from the mangroves on the Atlantic coast in the west to the glaciers of the Rwenzori Mountain in the east, the Democratic Republic of Congo is clearly the rich, wet heart of Africa. Its waters are pumped through two major watersheds, the Congo and the Nile. It contains the entire Congo River, the largest share of the Congo basin and 50% of Africa's moist tropical forests.

5.6.1.1 *Range of ecosystems:*

Covering more than half of DRC (Table 2), dense forest formations fan east from mangroves and coastal forest to closed evergreen tropical forests, closed semi-deciduous tropical forests, riverine and swamp forests, and various drier forests, including miombo woodland in the south (Figure 1). Moving east the forests rise from the Congo basin, to upland plateau, to mountain forests and eventually to alpine vegetation on the Rwenzori Mountains, that soars more than 5000 m above sea level. Around the closed forest block, to the west and south and to the north-east are savannas, including some edaphic savannas as well as areas of savanna-forest mosaic and wooded savanna. Though not forest, if we consider forest-savanna mosaic and wooded savannas, the land in the DRC which permits or once permitted wood based economies and wood dependence includes more than 85% of the country, some of which has been heavily over-exploited (Table 2).

TABLE 2: AREA COVERED BY PRINCIPAL VEGETATIVE FORMATIONS IN THE DEMOCRATIC REPUBLIC OF CONGO

Vegetative Formation	Area (km ²)	% Total forest area	% National territory
Closed equatorial forest (evergreen and semi-deciduous)	872.251,16	68,14	37,20
Mountain forest			
- Closed mountain forest	38.612,39	3,01	1,65
- Bamboo forest	1.666,72	0,13	0,07
Open equatorial forest			
- Dry forest	51.946,17	4,06	2,22
- Open forest (Miombo)	102.225,61	7,99	4,36
Flooded forest	88.614,08	6,92	3,78
Gallery forest	2.500,05	0,19	0,11
Mangrove forest	555,07	0,04	0,02
Secondary forest	121.670,70	9,54	5,19
TOTAL FOREST	1.280.042,46	100,00	54,59
Forest-savanna mosaic	165.838,83		7,07
Plantations	555,57		0,02
Savannas, grass and wooded	768.358,82		32,77
Water	62.502,24		2,67
Un-interpretable (clouds)	67.502,24		2,88
COUNTRY TOTAL	2.344.800,00		100,00

Source : SPIAF, 1995 ; Synthetic forest map

5.6.2 *Agricultural sector*

The DRC has a wide range of agro-ecological conditions and abundant rainfall and is considered to have the highest agricultural potential of any country in the world (FAO, 2003). Tragically it is also the country that has showed the highest rate of increase of undernourished people over the past decade. Although it has the capacity to be a major exporter of food, the DRC currently imports large quantities of maize, wheat, rice, sugar as well as poultry, beef and fish.

The rural sector, practicing an essentially subsistence agriculture, currently accounts for over 70% of the population and contributes 53% of the GDP, compared with 34% in 1990. However this proportional increase is due to the collapse of the extractive and manufacturing industries, and not to a real increase in agricultural productivity.

5.6.2.1 *Agricultural profile*

Major crops vary by region, though manioc and corn are most widely grown as staples. The rich volcanic soils of the highlands of north and south Kivu favor a wide range of intensive agricultural activities. North Kivu is the only wheat growing area of the DRC and it is also the country's principal producer of beans, potatoes, sweet potatoes and a wide variety of vegetables of European origin. Perennial cash crops such as Arabica coffee, tea and quinine are also produced in this region.

The climatic and soil conditions also favor livestock production. The two decades prior to the war saw a spectacular increase in cattle production in the Masisi highlands (for meat and dairy products) with the successful introduction of breeds obtained by crossing European and local stocks. However the last decade of war has seen a reduction of 80% of the region's livestock (FAO, 1997).

In the lower altitude forested zones of Maniema province shifting slash and burn agriculture (principally for manioc, corn, rice, ground nuts) is the dominant form of agriculture. The prolonged period of isolation of this part of the country (1960 rebellion, "Zairianisation" in 1973, civil war in the 1990's) has meant that production of cash crops (coffee, oil palm, rubber) have been abandoned.

In Equateur province, subsistence agriculture by shifting cultivation (manioc, corn, peanut, squash, etc.) is currently the predominant form of agricultural activity. Rice production is also important. In colonial times, and in the post independence years up to the early 90's, major industrial-scale plantations (UNILEVER, ETERNIT, SCIBE) of cash crops such as coffee, cacao, rubber, oil palm and cotton were maintained but the past two decades of social and economic turmoil have seen the stagnation and even abandonment of most of these activities. There is a high, though as yet unrealized, potential for fish production in the Congo River and its tributaries.

The forest-savannah mosaic zones in the north of the Province Orientale (formerly Haut Zaire) are agro-pastoral zones *par excellence*. Food crops include rice, manioc, bananas, ground nut and corn. Until the beginning of the 90's a number of agro-industries were also active in the humid forest zone of the Orientale province producing robusta coffee, cocoa, rubber but many of these have been abandoned during the past decade. The potential for livestock production (cattle, goats, sheep, pigs and poultry) in the province is high. It currently produces 32% of the DRC's beef (FAO, 1997).

Katanga produces 17% of DRC's beef production and is also the country's principal fish producer (31%). Fish production is concentrated around the lakes (Tanganyika, Moëro, Upemba, Kisale) and along the Congo, Luvua, Luapula, Lovoi and Lufira rivers (FAO, 1997).

Because of their fertile soils and their proximity to Kinshasa and the urban centers of the Kasai, the provinces of Bas Congo and Bandundu are two of the most important agricultural areas of the DRC. A wide range of agricultural produce has been developed in these zones. In the outskirts of Kinshasa there has been an extraordinary development of market gardening (vegetables and fruit) to supply the burgeoning population of Kinshasa. Beef production is also an important activity in Bas Congo.

5.6.2.2 Food security and environmental consequences of current agricultural practices:

Given the enormous area of forest that covers the DRC, traditional slash and burn agriculture should not in itself constitute a major cause of forest degradation as long as sufficiently long fallow periods are maintained. However, the rapid population increase and the heterogeneous spatial distribution of the population mean that increasing pressure is being placed on cultivated land in certain areas. In these areas, average fallow periods are thought to have decreased from 15 years to less than five years with the result that forest regeneration is impeded and soil fertility declines. The dramatic human population growth will necessarily lead to human movements that will lead to deforestation as people clear land for agricultural production.

With a rate of urbanization in the DRC of 3.8% per year the peri-urban zones are among the most seriously affected in this respect. In the heavily populated Katanga and Kasai provinces the fragile gallery forest biotope in the forest-savannah mosaics are being submitted to particularly heavy pressure. Immigration and massive displacement of populations in the war zone of eastern DRC have also put heavy pressure on the DRC's richest agricultural highlands.

The satellite image presented in Figure 8 illustrates the extent of forest degradation in the DRC. The image clearly shows a pattern of forest degradation (light green areas) which exactly matches the road network and is the result of agricultural activities practiced by human populations established along the communications network in order to have access to markets. The pattern of forest degradation is still clearly visible in the central cuvette even though the network of roads in this area has been impracticable for vehicles for at least 2 decades. Forest degradation is also evident around urban centres where agricultural production has led to loss of forest cover (BOX 5-1).

AREAS OF FOREST DEGRADATION IN DRC

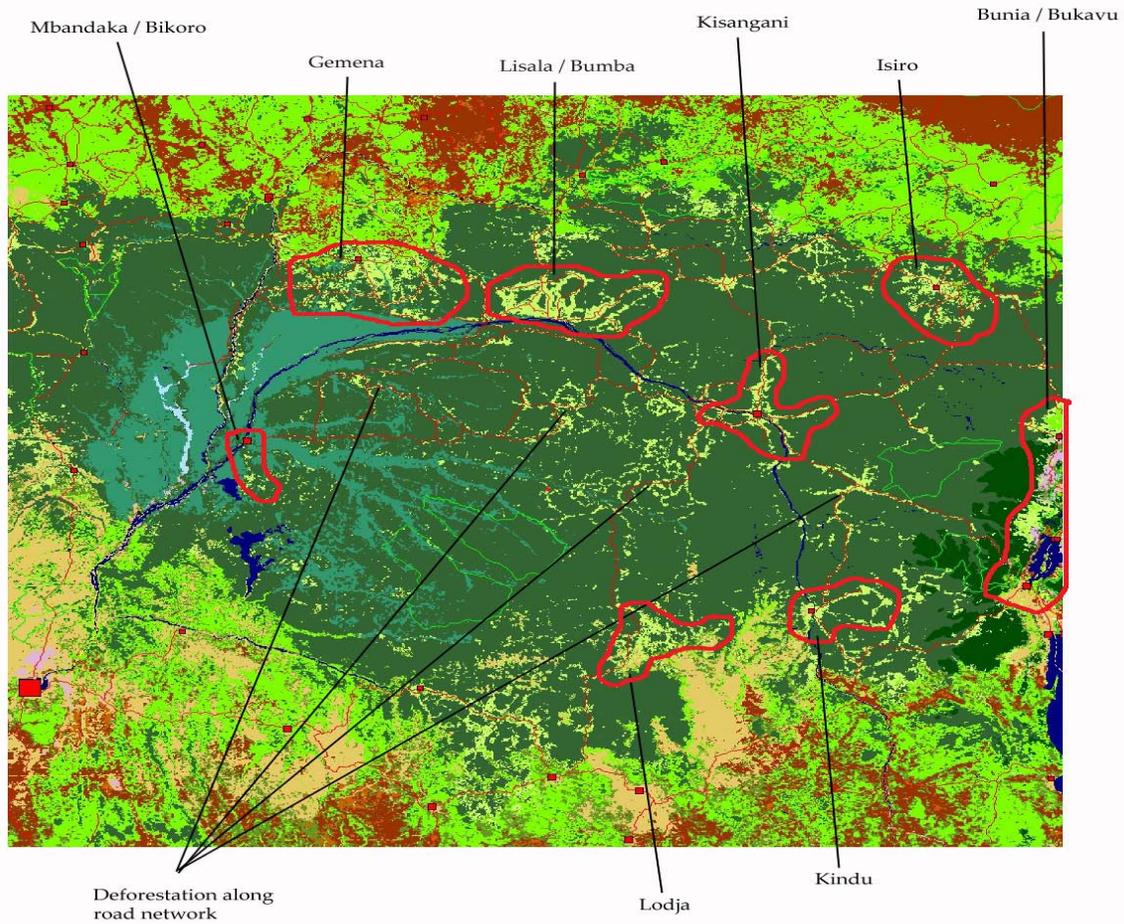


FIGURE 8 HOT SPOTS OF FOREST DEGRADATION IN THE DRC

Sources: *TREES* (Joint Research Centre, Ispra) and *SPIAF*

A number possible “hot spots” of forest degradation in the DRC have been identified by SPIAF and the TREES programme (TREES, 1998; Ipalaka et al., 1997, Figure 8). Forest clearance for agricultural activities appears to be the principal cause of degradation. The hot spots identified are:

- Gemena: Gemena is situated at the interface of the humid forest block and the forest-savanna mosaic and is the most populated (Figure 3) part of Equateur province. Until recently the area has been an important centre of food crop production (maize, peanuts, manioc) for Bangui (CAR), Brazzaville (Congo Republic) and Kinshasa. Small and industrial scale cash crop production is identified as the second cause of forest degradation in the region.
- Lisala-Bumba: The forests of Mongola and Northern Oubangui districts are under severe pressure as a result of food crop production (paddy rice, large fields of maize, manioc, plantains) and industrial plantations along the Lisala-Bumba-Aketi axis. Once again food produced here supplies Bangui, Brazzaville and Kinshasa. Historically the transportation system in this region has always been well developed and Bumba was the focal point of the road, rail and river network in the north of the DRC. Logging companies also have also been active in this area for many years.
- Kisangani: Forest degradation around Kisangani is a result of agricultural production to feed the city. Small openings have also been caused by diamond exploitation.
- Bukavu-Bunia: This is the area where the rate of forest degradation is highest in the DRC. It is being caused by rapid population growth and large scale population movement to an area of high soil fertility.
- Kindu: Forest degradation in this region has been caused by mining activities and their associated agricultural activities. Agricultural produce supplies the mining province of Katanga.
- Lodja: Agricultural activities in this zone apparently supply the mining centres in Katanga.
- Mbandaka-Bikoro: Deforestation here has been caused by agriculture to supply the city of Mbandaka. Industrial plantations are also identified as a source of forest degradation.

The breakdown the country’s communications (roads, river navigation) has had an immensely deleterious effect on food security. Links between productive agricultural areas and urban markets have been cut¹⁵ with the result that production in the traditional agricultural zones has been re-oriented toward home production while commercial production of food crops in the periurban zones has increased sharply as the urban populations resort to agriculture as their principal survival strategy. This pressure in peri-urban zones is leading to local impoverishment of soils. Compounding the problem of food security is the emergence of a manioc mosaic virus which is estimated to have reduced production of the county’s staple food by 20%, although considerable progress has been made recently to combat this problem with the introduction of mosaic virus resistant strains. The USAID has been an important partner in this effort.

¹⁵ In certain cases farmers and urban consumers have creatively adapted to changing circumstances. For example farmers in the Kivu provinces have tried exporting their beans to Kinshasa overland to Mombasa (Kenya) and then by sea via southern Africa, but the cost has been prohibitive.

Overall agricultural production has declined since 1998: -20% for cereals, -12% for roots and tubercles, and -6% for vegetables (FAO, 2003) and malnutrition has increased dramatically in urban areas. Families in Kinshasa devote some 62% of their monthly budgets for food. To survive more and more families have reduced the number of meals to one per day. Average daily calorific intake is currently estimated at 79% of the recommended level of 2,300 kcal per day¹⁶ and malnutrition is therefore having a significant impact on labor productivity, health and education.

Finding enough food to eat each day has become the overriding challenge for the majority of Congolese. More than ever before the Congolese have had to resort to the mythical “Article 15” of the Constitution (the “se débrouiller” coping strategy) as the informal sector devises ever more creative strategies for daily survival. However this is essentially a problem of generalized poverty and lack of purchasing power rather than a failure of the agriculture sector itself. With the return of peace the agricultural sector undoubtedly offers the most promising perspectives of sustained growth for the majority of the population. No other sector has the potential for mobilizing so many people and creating real wealth. Furthermore only relatively modest means are needed to revitalize the agricultural sector in order for it to contribute significantly to the economic growth of the DRC (FAO, 2003).

As the agricultural sector develops the environmental impacts will need to be closely monitored. Efforts to increase agricultural production will focus to a large extent on developing more efficient agricultural practices (improved varieties and seeds, various agro-forestry techniques, micro-irrigation techniques etc.). The most critical areas for improving agricultural productivity are in the already seriously degraded peri-urban zones. Here improved agricultural production should contribute to environmental improvement since it can only be achieved by restoration of the land’s productive capacity. Elsewhere, however, it is possible that the development of the agricultural sector will result in an overall increase in the surface area under cultivation, at the expense of natural ecosystems. The development and proper implementation of land use plans which address biodiversity conservation needs is therefore critical to ensuring sustainable growth in the agricultural sector.

5.6.3 Forests and Timber Exploitation

5.6.3.1 Early Forest Exploitation Milestones

Timber exploitation in the Democratic Republic of Congo dates far back into its colonial history just before the dawn of the 20th century with the first tests of different tree species for construction and furniture in Bas Congo. The completion of the railroad from the port of Matadi to Kinshasa in 1903 signaled the opening up of the territory for a variety of types of natural resource exploitation. The first timber companies were established in Bas Congo and Bandundu during the period of 1930 to 1949. The first forestry law was issued by decree in 1949 and represented substantial changes with regards to indigenous use of the forest as well as the classification of logs and methods of exploitation. Whereas the GDRC believes its potential annual harvest to be 10 million m³, it has never come close to reaching this desired level of production. Indeed timber production has gone

¹⁶ Imported flour at subsidised prices has had a perverse effect on eating habits in Kinshasa in that the price of bread now competes with the traditional staple, manioc. As a result there has been an explosion of bakeries in Kinshasa. Almost all the bakeries use fuel wood collected from the peri-urban zone, thus contributing significantly to deforestation around Kinshasa. It should be noted that bread also provides more proteins per kg than manioc.

through periods of fits and starts since independence with the highest reported annual harvests in the range of 500,000 m³ per year (Batunyi and Mbala, 2003).

5.6.3.2 Forestry Code of 2002

On 29 August 2002, a new Forestry Code was signed into law in the Democratic Republic of Congo. The motivations behind the elaboration of the new code were to update the law with regards to more modern approaches to dealing with local communities and managing forests for sustainable yield (Batunyi and Mbala, 2003).

The new Forestry Code summarizes the most important changes between the old and new Forestry Code as follows (Republique Democratique du Congo, 2002):

5.6.3.3 Institutional Changes

- GDRC is called upon to develop a National Forest Master Plan (NFMP) that lays out the management objectives and plans for economic development of the forestry sector. The document is to be periodically updated to reflect changing economic and social conditions;
- Forests classification will be the role of the Minister charged with forest management following procedures set out in a Presidential decree;
- Forested land is divided into three classes: Classified Forest or those forests benefiting from some level of judicial protection (including parks and reserves); Protected Forests or forests that are subject to a somewhat less restrictive protected status and are not subject to classification along the lines of the more formally recognized classification system of Classified Forests (these forests can include concessions attributed to local communities); and Production Forest or those forests that are to be managed for timber production. Forests can only be designated as Production Forest after having been subject to public review and/or consultation;
- The creation of both a national and provincial forest land registry that will include relevant information (management plans, concession boundaries, etc.) with the goal of improving management planning;
- The creation of national and provincial advisory councils in order to improve forest planning and management.

5.6.3.4 Management Changes

- Prior to designating a given area as a particular management unit, a study should be undertaken that includes consultation of local people to avoid conflicting land zoning plans and management objectives;
- To assure a sustainable development of the forestry sector, the concepts of forest inventories and management plans are written into the code as being underpinnings of future development in the sector;
- Timber concession contracts or agreements are now to be accompanied by “cahiers de charges” or documents describing the rights and obligations of the parties involved (including social obligations to be undertaken by the forestry concessionaire – schools and health centers);
- Forest concessions are henceforth to be attributed by public auction; however, in exceptional cases they may also be attributed through one on one negotiation;

- The forestry code specifically lists the percentage of taxes that are to be shared with regional and local governments.

Following the promulgation of new forestry code, the GDRC proceeded with a review of existing timber concessions to determine which ones met the criteria for being viable, legal concessions, and which ones were attributed based on speculation due to the exceedingly low surface area tax. This review resulted in the revocation of 25 million ha of concessions. Companies for whom concessions were retained were given one year to reapply for their Garantie d'Approvisionnement (the final stage of concession attribution). In addition to reviewing the status of timber concessions, the GDRC placed a moratorium on giving out new concessions until rules and regulations of the new law are promulgated¹⁷. Finally, the GDRC proceeded to initiate changes in the tax structure to avoid future land speculation with regards to forestry concessions¹⁸.

5.6.3.5 *Future Timber Production and the Economy*

The GDRC has expressed its wish to increase its timber production to close to 10 million m³ per year (Batunyi and Mbala, 2003). It recognizes the potential for the forest sector to contribute to the national economy through job creation and revenue generation. Paradoxically, today the GDRC expenses incurred in maintaining the branches of government responsible for making policy and regulating the forestry sector exceed revenues generated through taxes (A. Karsenty, personal communication).

As it stands now, roughly 10 million ha are attributed in legal forest concessions with another approximately 10 million ha in suspension (Batunyi and Mbala, 2003). The concessions that have been suspended are largely areas that were not controlled by government during the war and many of these should be coming on line in due course (Debroux, 2003). To put this into context, the total land in Gabon under concessions is approximately 10 million ha (Debroux, 2003). The fact that the GDRC actually revoked 25 million ha worth of concessions shows a remarkable willingness to reform the forest sector of the economy. Beyond the industrial timber concessions, small scale methods of exploitation by portable saw mills, chainsaws, and cross cut saw also make important contributions to the timber economy in at least some regions (Box 5.1).

5.6.3.6 *Obstacles to Increasing Future Timber Production*

Most observers agree that the new forestry code goes a long way towards providing for the rational and potentially sustainable exploitation of the DRC's forests in a way that allows government to derive economic value from this renewable resource. The foundation of sustainability will be built on one of transparency, good governance, and good faith. Assuming that these conditions are met, there still remain a number of obstacles that, if not overcome, pose serious threats to the DRC's tropical forests and biodiversity.

¹⁷ While the moratorium on timber concessions prohibits giving out of timber concessions, Debroux (2003) points out that the GDRC broke this ban and gave out 23 new concessions covering 6 million ha during the months of March and April of 2003. The issuing of these concessions not only broke the moratorium but also the way in which the concessions were given out (i.e. directly as concessions without having passed through either of the other two steps required by the new code) and raises concerns about GDRC commitment to the new code.

¹⁸ The previous area tax for forestry concessions was 0.0014 US\$/ha which represents an annual fee of \$280 for a 200,000 ha concession. The new area fee is planned to increase progressively to give timber companies a chance to restart work in a favorable economic environment (first to 0.25 \$ US/ ha then to 0.5 US\$/ha or an annual fee of \$100,000 for a 200,000 ha concession). Area tax fees in Cameroon, Gabon, CAR, and Congo are respectively about 8.0, 2.0, 0.75, and 1.0 \$ US/ha (Debroux, 2002)

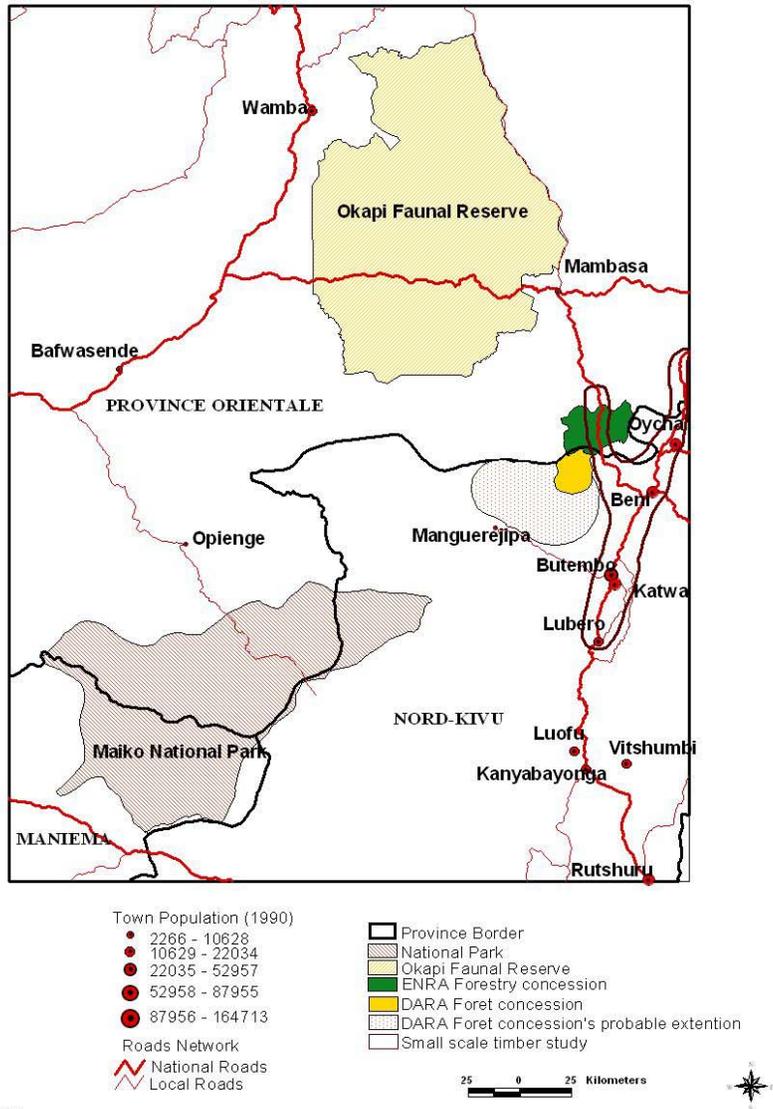
A number of obstacles stand between the GDRC's goal of dramatically increasing timber production and its realization. While some of these obstacles are the legacy of war, others are due to a combination of geography and infrastructure neglect. Those obstacles resulting from war include the looting of timber company facilities and the concurrent shutting down and, in many instances pulling out, of concessions.

It would be disingenuous to attribute obstacles such as transportation infrastructure problems and lack of trained personnel capable of implementing the new forestry code to war alone. Transportation network problems include the necessity to dredge the port of Matadi and the Congo River and its tributaries used for wood transport as well as improvements required in roads and railways. The fact that DRC imports far more goods in containers than it exports such that a surplus of containers clogs the port of Matadi leads to inefficiencies and excessive port fees (Roda and Erdlenbruch, 2003). All of these problems existed prior to the recent war.

It should be noted that geography also plays an important role in leading to high transportation costs. Products transiting the port of Matadi must be shipped to and from Kinshasa by rail and road as the approximately 200 km of waterfalls between Stanley Pool and Matadi make the Congo River impossible to navigate. At the same time, wood products derived from the DRC's eastern forests must be shipped over a thousand kilometers to the port of Mombasa, Kenya. The fact that the DRC's forests have remained relatively free of commercial timber exploitation is as much due to geography as any other factor.

The forest to the north and northwest of Beni (North Kivu and Orientale Provinces) maintain relatively high densities of some of the most desirable commercial species in Africa (MaKana, 2000). In 1982 the Enzyme Refiner's Association (ENRA) began commercial exploitation of a 52,000 ha concession approximately 30 km north of Beni. While some 15 years passed before a second company began industrial exploitation in the region (DARA Foret in 1998), the region nevertheless has experienced rather intense timber harvesting. Unconfirmed reports indicate that the waning years of the Mobutu regime saw a liquidation of African mahogany by locally based military officials within an arc extending 30 km north of Beni. Logs were apparently cut into quarters and exported illicitly to Uganda for transformation. This activity undoubtedly coincided with the high rate of forest conversion for coffee plantations when the price of coffee rose dramatically with crop failures in central and south America in the late 1980s. More recently, exploitation has taken an even more dramatic turn. Reports abound of the arrival of Ugandan chainsaw operators who were brought to the region to harvest and quarter both *Milica excelsa* and African mahogany for export under cover of military officials. The nature of the operations make it virtually impossible to quantify the level of exploitation but it is known that the bottom fell out of the Ugandan timber market in 2000 due to the flow of timber brought into the country from eastern DRC (Tshombe, personal communication). In spite of reports to the contrary, the system of quartering logs for export to Uganda appears to persist. A recent undercover study funded jointly by WCS and WRI, found 84 logging teams working along an area centered upon a 120 km section of the principle north-south "highway" centered around Beni (Figure 9). These teams harvest wood both within relatively small timber concessions obtained by authorization of local representatives of the Ministry of the Environment as well as by harvesting timber in fields resulting from the extraordinarily fast paced conversion of forest for agriculture land. The 2003 study (F. Amsini, unpublished data) reports some 17,700 ha of forest being locally delineated as these small-scale timber concessions. None of these concessions are recognized by the government in Kinshasa and they will all no doubt be subject to invasion and conversion to agriculture by the burgeoning local population.

DEMOCRATIC REPUBLIC OF THE CONGO
FORESTRY ACTIVITIES ALONG
BORDER BETWEEN NORTH-KIVU AND ORIENTALE PROVINCE



Source: WCS
 Prepared by WCS for USAID Environmental Analysis. September 2003

FIGURE 9 FORESTRY ACTIVITIES ALONG THE BORDER BETWEEN ORIENTAL AND NORTH KIVU PROVINCES IN THE DRC.

The lack of trained personnel capable of undertaking forest inventories, writing management plans, and overseeing timber company operations on government's behalf is particularly troubling. From the early 1970s to the early 1990s the GDRC benefited from technical assistance in training forestry personnel from the Canadian government. A number of Congolese completed advanced degrees in Canadian forestry schools and the post-secondary technical school for training forestry technicians at Bengamisa benefited from trained Congolese and Canadian professors as well as financial assistance. This bilateral aid was cut off during the political instability in the early 1990s and the level of training has declined (Batunyi and Mbala, 2003). Today this decade long neglect results in a serious lack of trained personnel just when the country plans to increase forestry activities far beyond their historical peak.

To help the GDRC overcome some of the obstacles to the forestry sector becoming a vibrant contributor to the economy, a number of donors and NGOs are partnering with government. The World Bank will continue to be involved in encouraging regulatory changes through a variety of financial instruments. Both the French and Belgian Cooperations have signaled a willingness to help with training costs and WWF Belgium is planning to work in two timber concessions to help companies work towards certification. FAO has and will continue to play an important role in elaborating rules and regulations for the new forestry code as well as providing technical assistance on zoning issues (Batunyi and Mbala, 2003). In addition, WCS is in discussion with donors to design a pilot zoning project in areas surrounding the Okapi Faunal Reserve in both North Kivu and Orientale Provinces.

Relief is also on the way to help logging companies overcome the financial burdens of what amounts in many instances to restarting their operations. The World Bank is working with the government to revise the tax structure reducing the number of possible taxes from 80 to a much more manageable level (Debroux, 2003). In addition, the recently approved surface area tax is being reduced to \$0.25 per ha for a period of time to reduce start up costs (Debroux, 2003).

5.6.3.7 Threats to Forest Integrity and Biodiversity

Threats posed by increased access

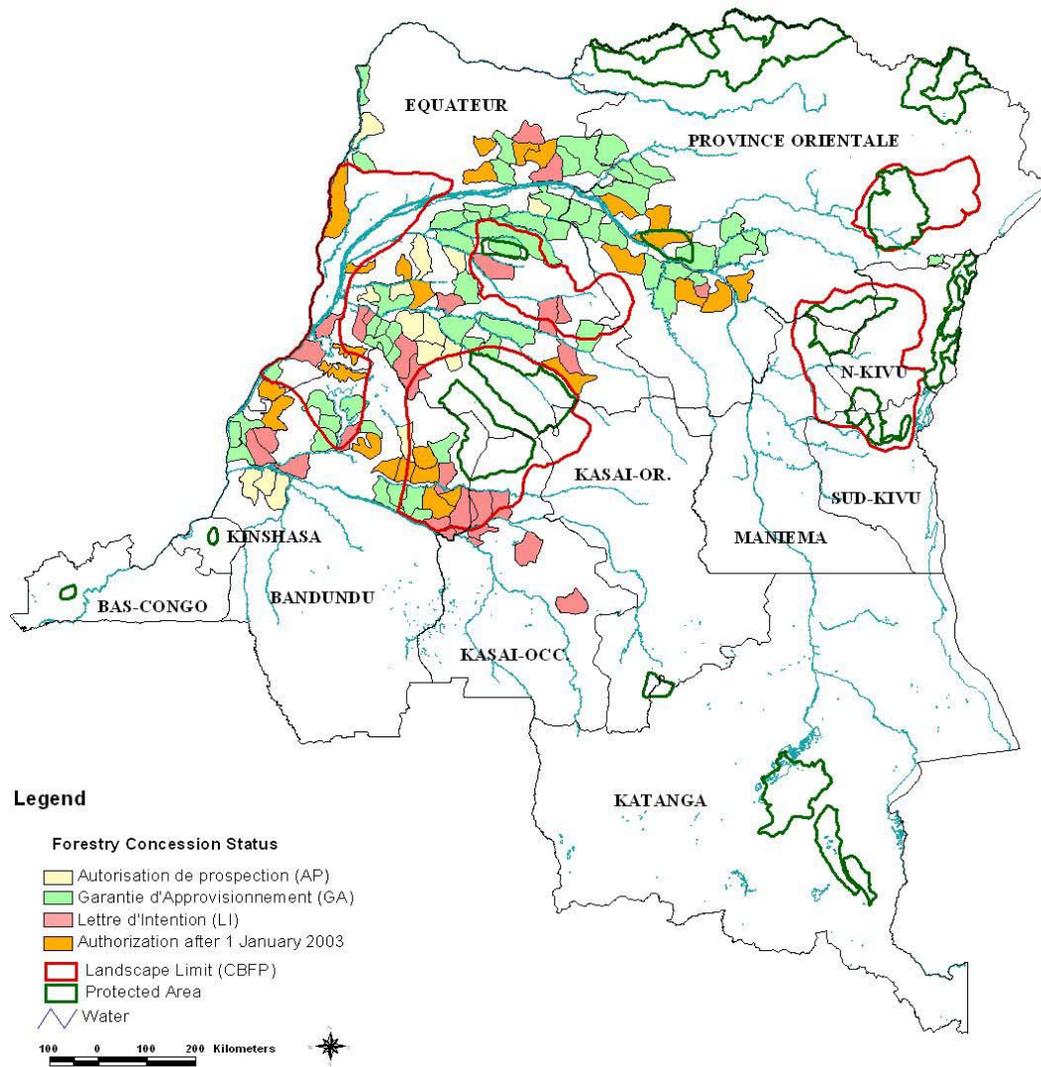
Perhaps the most obvious threat to forest integrity and biodiversity posed by the forestry sector is the one posed by opening up the forest to a variety of unsanctioned extractive activities such as elephant poaching, the commercialization of the bush meat trade (Wilkie et al., 1992), and the exploitation of minerals (e.g., diamonds, gold, cassiterite, colton). Timber companies throughout Central Africa are becoming sensitive to and making progress towards combating at least the first two of these activities. Local authorities must work together with timber companies to keep unauthorized miners out of the forest as the installation of mining camps can have devastating impacts on wildlife. Beyond these activities, facilitating access to the forest can have the unintended consequence of directing routes of human immigration. It is worth noting that in densely populated areas like North Kivu, forest conversion to agriculture is inevitable and not necessarily linked to forest concessions (BOX 5-4). Nonetheless, provisions in the new forestry code to obtain the buy-in of provincial and local authorities can theoretically allow land use planners to use forest concessions as multiple use buffers around protected areas. In such areas, lack of buy-in could not only lead to loss of forest cover in concessions but also put protected areas at increased risk (Figure 10).

Following the publication of the new Forestry Code in 2002, the Government of the Democratic Republic of Congo undertook a review of existing forestry concessions. The objective was to eliminate concessions held by speculators and resulted in the annulment of some 25 million ha of forestry concessions. The new Forestry Code also required timber companies to resubmit applications for “Guarantee d’Approvisionnement” within one year of the signature of the code (i.e. 30 August 2003 deadline). The code emphasizes the need to work with local communities in delineating concessions and includes provisions for both sharing tax revenue with communities and elaborating “cahier de charge” or specific actions required by timber companies to be undertaken on the communities behalf (e.g., building schools and health centers).

An example of where the shortcomings of the old forestry code in this regard have had dramatic negative impacts is the ENRA concession north of Beni in the Orientale Province (Figure 11). ENRA began timber exploitation in its approximately 52,000 ha concession in 1983. Their concession was inventoried and mapped by SPIAF (Service Permanent d’Inventaire et d’Aménagement Forestiers) and efforts were made both to appropriately place roads and seek guidance on regeneration methods. However, the success of managing the concession for timber production was doomed from the beginning. While the company worked with government to provide for long-term management, there was clearly insufficient effort expended to obtain local buy-in to the concession. Even before the first logs were being taken from the concession, immigrants from the Butembo region to the south were negotiating with village leaders claiming traditional authority over the land to obtain land for cultivation. This immigration was spontaneous and independent of logging activities. Today over 70% of the concession is represented by a mosaic of fields and remnant patches of forest. ENRA has been forced to negotiate with the recent arrivals to get them to leave valuable timber trees when converting forest within the concession to agriculture.

The situation along the eastern forest boarder in the Kivu and Orientale Provinces will provide one of the first challenges to the effective implementation of the new Forestry Code. The adjacent agricultural lands have one of the highest human population densities in DRC while the forests maintain relatively high densities of valuable timber species. It is inevitable that large tracts of forest will be converted to agriculture in the next few decades. Forestry concessions managed for timber production can serve as important sources of revenue, buffers around and corridors between forested parks and reserves, and provide a variety of non-timber forest products. The first test of the GDRC to effectively negotiate with local leaders to recognize zones for timber production may come in the form of a concession being sought by DARA Foret in the forest northwest of Beni. The 30,000 ha concession being sought by DARA Foret is presently protected from immigration by a river near the eastern boarder (Valinande, personal communication). A bridge across this natural barrier to immigration could lead to unwanted human immigration should traditional land claimants be unsatisfied with the benefits negotiated in the cahier de charge. Such immigration and land conversion might be all the more attractive given that concession roads would facilitate the link between Beni and Manguerejipa (60 km west of Beni). Failure to maintain forest cover here would represent more than a symbolic failure as this would orient immigration towards an axis that would eventually separate the contiguous forest that links Maiko National Park and the Okapi Faunal Reserve. Given the biological affinities between these two protected areas, if they were to become separated, this would be a serious loss in the struggle to protect and conserve DRC’s biological resources.

DEMOCRATIC REPUBLIC OF THE CONGO
PROTECTED AREAS AND FORESTRY CONCESSIONS



Sources: SPIAF Septembre 2003, CARPE, USAID
 Prepared by WCS for USAID Environmental Analysis : September 2003

FIGURE 10 TIMBER CONCESSIONS IN RELATION TO PROTECTED AREAS IN THE DRC.

Threats posed by lack of trained personnel

The effective implementation of the new forestry code will require dozens if not hundreds of trained personnel, particularly should the GDRC come close to achieving its timber production goal. Specialists will be required to complete floristic inventories prior to the granting of concessions. Silviculturalists and forest planners will be required to write management plans and social scientists will be required to work with local communities to facilitate zoning and assure their interests are properly taken into account. Beyond these individuals, the GDRC will need numerous individuals capable of understanding and applying forestry regulations to be based at national, provincial, and local levels of government. Herein lies a challenge as the GDRC recognizes its tremendous personnel gap (Ipalaka, personal communication). The lack of trained personnel could easily lead to a combination of poorly written management plans, lack of adequate consideration of local people's rights and needs, and poor application of the rules and regulations implementing the law. The net result will be a variety of activities that will lead to forest degradation and/or conversion.

Threats posed by inappropriate management strategies

While relatively few floristic inventories have been completed in DRC (Figure 11, see also section 5.6.4.3), it is clear that high quality timber species are found throughout much of its forest be it lowland moist and semideciduous forests from the central Congo basin and northeastern sectors, swamp areas around Lac Maindombe, or Mayombe forests of Bas Congo. It is important, however, to keep in mind that timber species are not evenly distributed throughout the forest and that top quality species selection changes by region. When managing a forest for timber production it is imperative that species' ecological characteristics (silvics) be taken into consideration in the design of stand manipulations. Further, it is essential that regeneration and/or recruitment requirements be taken into consideration prior to exploitation and that interventions are designed accordingly. One would think that this basic principle of forestry need not be mentioned; however, it is only with the new forestry code that timber companies are required to write management plans in DRC and it is a matter of great concern how few companies in Central Africa actually do this.

A second basic principle of forest management that is repeatedly ignored (see e.g., Baker et al., 2003) is the inappropriateness of highly selective logging (high grading). Single tree selection can only be justified for shade bearing species that have numerous stems in the smaller size classes and then exhibit a gradual decrease in numbers of individuals with increasing size class. Under such circumstances one could theoretically harvest the bigger trees and then wait for the smaller ones to push up through the shady middle story, eventually becoming large canopy trees. Even then the forester must consider the negative effects due to soil compaction and damage to the residual stand when choosing this harvesting method (Smith et al., 1996). As it turns out, of the high quality timber species found in Central Africa, most require significant amounts of light to regenerate such that surgically removing trees is an inappropriate way to assure their regeneration (Hall et al., 2003). Indeed at least 10 out of 16 species listed by Baker et al. (2003) as being the most valuable timber species logged in DRC fall into this category¹⁹.

¹⁹ Of the remaining 6 species two are known to be shade bearers. The shade tolerance of the remaining four species are unknown to the authors of this report.

LOCATION OF FLORISTIC AND FAUNAL SURVEYS IN CENTRAL AFRICA

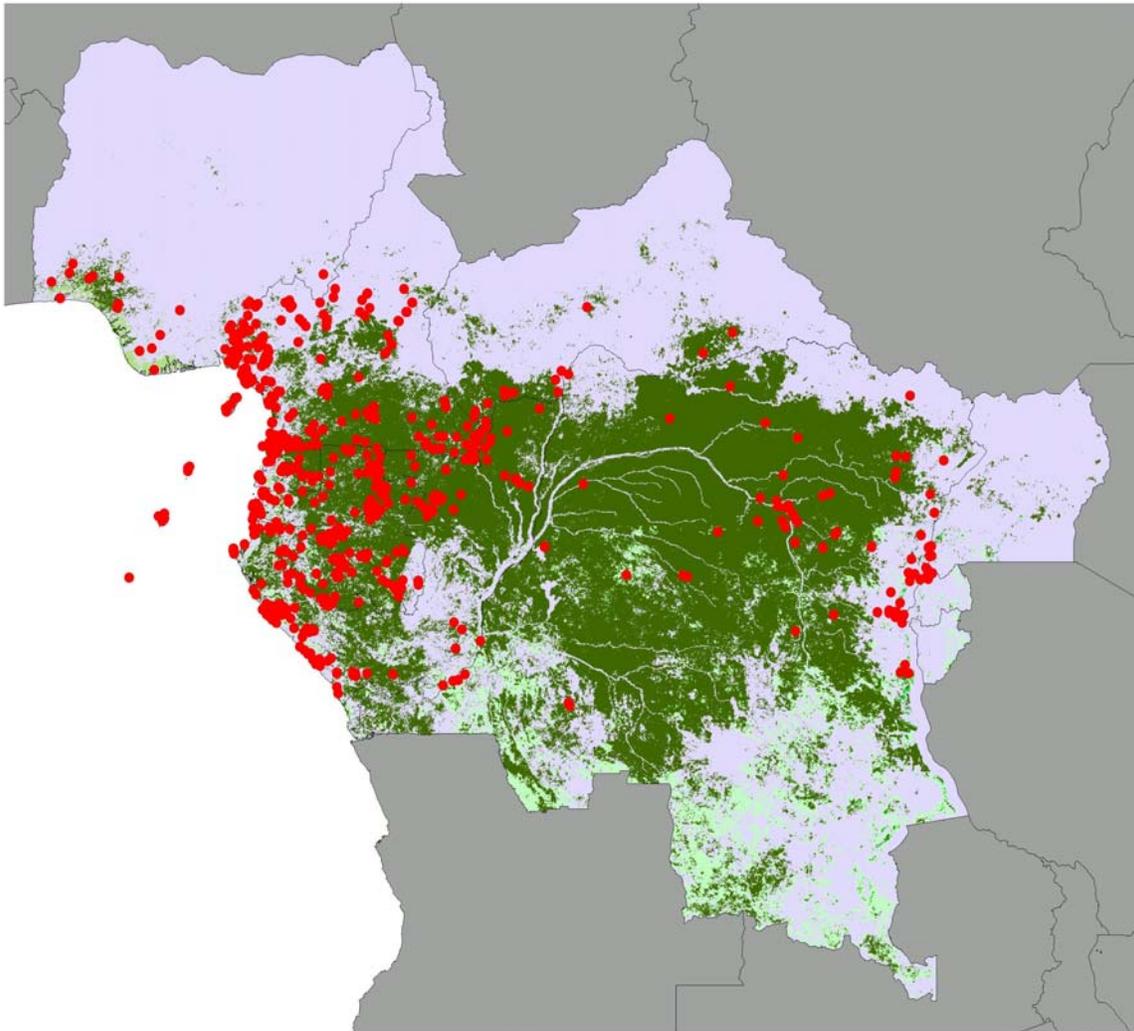


FIGURE 11 LOCATION OF FLORISTIC AND FAUNAL SURVEYS IN CENTRAL AFRICA

Source : André Kamdem WWF

A third basic principle that is also repeatedly ignored is the fact that a forester never simply lets a logger mine the forest for the most valuable trees. Stand manipulations are designed such that along with the most valuable individuals or species, loggers must also take less valuable trees. These “extra” trees are taken in order to create the desired conditions for regenerating the forest (e.g., for light demanding species, let in more light to the understory). The logger takes these “surplus” trees and executes the desired treatment because s/he can still make money on the operation, albeit not as much. Many forests in DRC have the advantage that while these seemingly secondary species are not as valuable as the exceptionally valuable species (i.e. Wenge, African mahoganies or Aframosia) they are still well known by markets (see e.g., Valinande 1988). Thus, loggers should be able to sell these species, though perhaps only within DRC. Indeed it is the high value of these exceptionally valuable species that helps pay for the manipulations necessary to regenerate the forest. However, the equation changes once these high value individuals are removed from the forest. Unless markets or transportation costs change, it becomes exceedingly difficult to make a profit by harvesting secondary species and performing the interventions necessary to regenerate the stand.

In African forests relatively close to ports (e.g., Ghana, Côte d’Ivoire, western Cameroon, and Bas Congo, DRC) loggers have returned to exploited forests to take out less valuable species. This has become economically feasible as with local commercial extinction of high valuable species and individuals, markets have changed such that species that were once seemingly worthless can now, in turn, be selectively logged out of the forest. As harvesting often continues to be selective, insufficient light is let into the understory to favor regeneration and recruitment and the forest canopy becomes successively degraded. The degradation of forests in relatively proximity to ports can lead, in turn, to inappropriate harvesting further up country and create a band of ever-increasing forest degradation. Thus the continued extraction of less and less valuable species leads to long term degradation of the forest and poses a serious threat to long term sustainable timber harvest (Hall et al., 2003). It is therefore imperative that the requirement of concession holders to write a management plan not be relaxed as part of an investment incentive package and that management plans take into account and plan for regeneration and/or recruitment before the first tree is felled. It is not sufficient to simply include provisions for reduced impact logging (RIL). It is important to reduce the damage to the residual stand caused by logging but silvicultural prescriptions aimed at regenerating the stand and/or providing for recruitment of timber trees from small to large size classes must also be applied. Given that much still has to be learned with regards to many timber species, silvicultural research and provisions for adaptive management strategies must also be part of the management plan process.

5.6.4 Status of biodiversity in the Democratic Republic of Congo

The range of natural ecosystems in the DRC are described above in section 5.6.1 and represented in Figure 1 and Table 2. There are several areas to consider when discussing the status of biodiversity in the DRC.

5.6.4.1 *Transboundary areas*

Being a large country with only a small coastal area and being surrounded by countries mainly much smaller than itself, the DRC has extensive terrestrial borders and many neighbors. In the east, the DRC's highest concentration of biodiversity is in the Albertine Rift formation that is shared with Uganda, Rwanda, Burundi and Tanzania (Figure 12). Two of DRC's parks, the Virunga National Park and Kahuzi Biega National Park and one proposed protected area, the Itombwe plateau, are part of this rift (Figure 13). To the north, Garamba National Park sits on the border with Sudan (Figure 14). Farther west a second large transboundary area that has had little exploration and no recent inventory is the combined Bili Urere / Bomu Reserves (Figure 14). Recognizing the importance and particular vulnerability of transboundary systems, the CARPE/CBFP program has traced an important landscape on the border with Congo Brazzaville, the Lac Tele-Lac Tumba landscape that includes the potential protected area of Ngiri (Figure 13).

The transboundary protected areas have the potential advantage of providing easy access to international tourists. Prior to the war this was the case for gorilla-viewing visitors to both Virunga NP and Kahuzi Biega NP. Unfortunately such transboundary wildernesses also have the disadvantage of providing easy access to cross-border poachers and natural resource exploiters. This was certainly the case during the armed conflict and anarchy of 1996 to 2003 when timber, coltan, diamonds, and gold, much of it coming out of DRC protected areas, transited to Uganda and Rwanda, and when both Ugandan, Rwandan and Sudanese poachers were active in Virunga NP and Garamba NP (F. Amsini, 2003; d'Huart and Hart, 2000).

5.6.4.2 *Internal areas of importance*

Less well known and less protected are the internal areas of Congo. There are large concentrations of biodiversity and endemic species that fall within neither park nor reserve. For example the Lomako area and the Lomami-Tshuappa area both in currently relatively low population territories (Figure 3).

Official protected areas within the DRC have had for the most part less foreign assistance from international NGOs than those on the national borders. This is spectacularly the case for the two Katanga National Parks, Upemba and Kundelungu, as well as Maiko National Park largely in Province Orientale. The latter, essentially abandoned during the war, has numerous groups of armed militias each roaming and poaching through its specific "territory" as well as a massive influx of itinerate miners seeking gold and diamonds from small illegal concessions (Mwinyihali, unpublished 2003). Two internal parks that have some support are the Okapi Faunal Reserve and Salonga National Park. Both are World Heritage Sites, the latter alone being larger than Belgium (World Heritage Center, 2000). However the majority of the reserves within DRC have had almost no support during the last decade (Figure 15).

AFRICA'S PLANT AND PRIMATE DIVERSITY

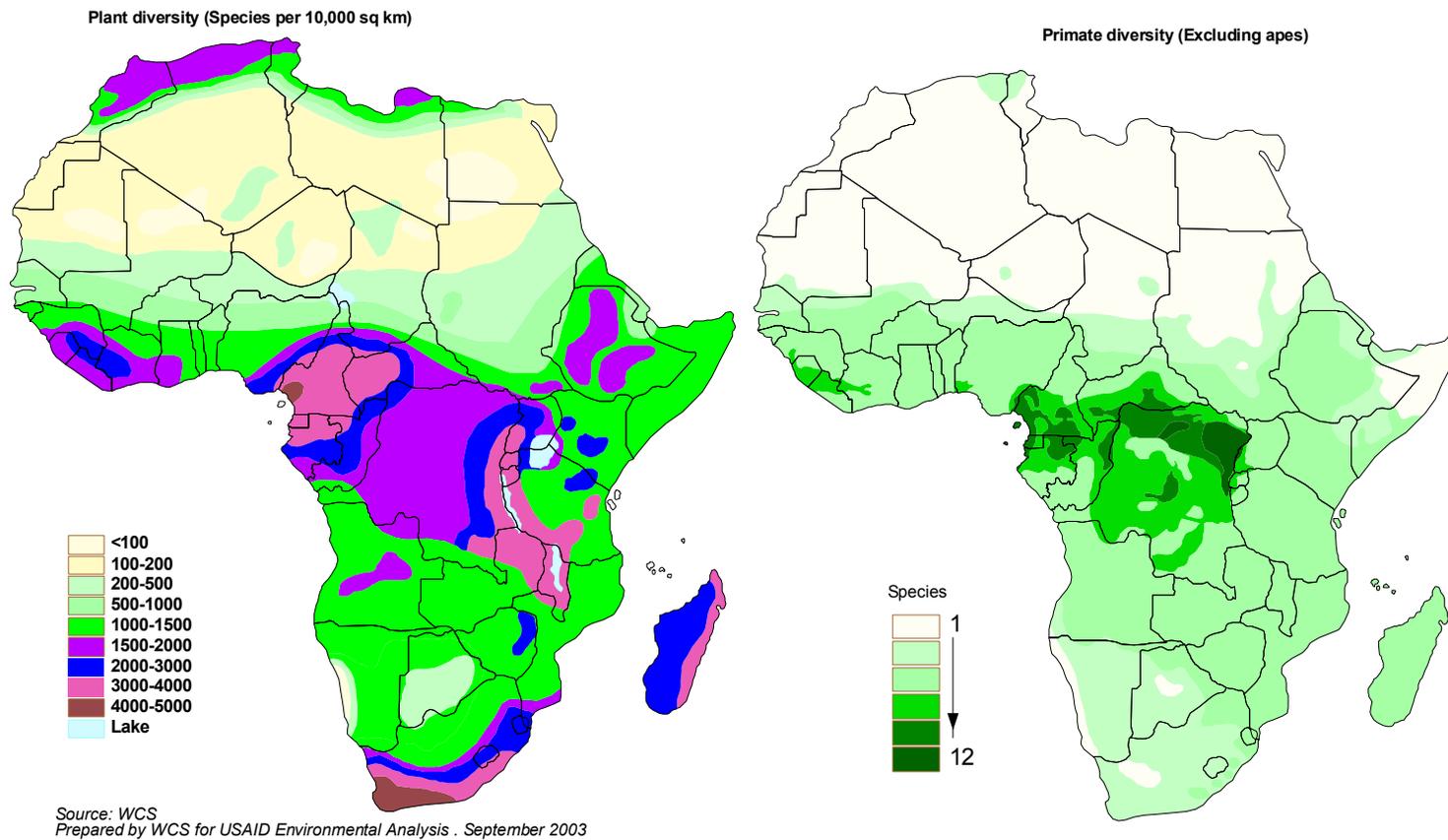
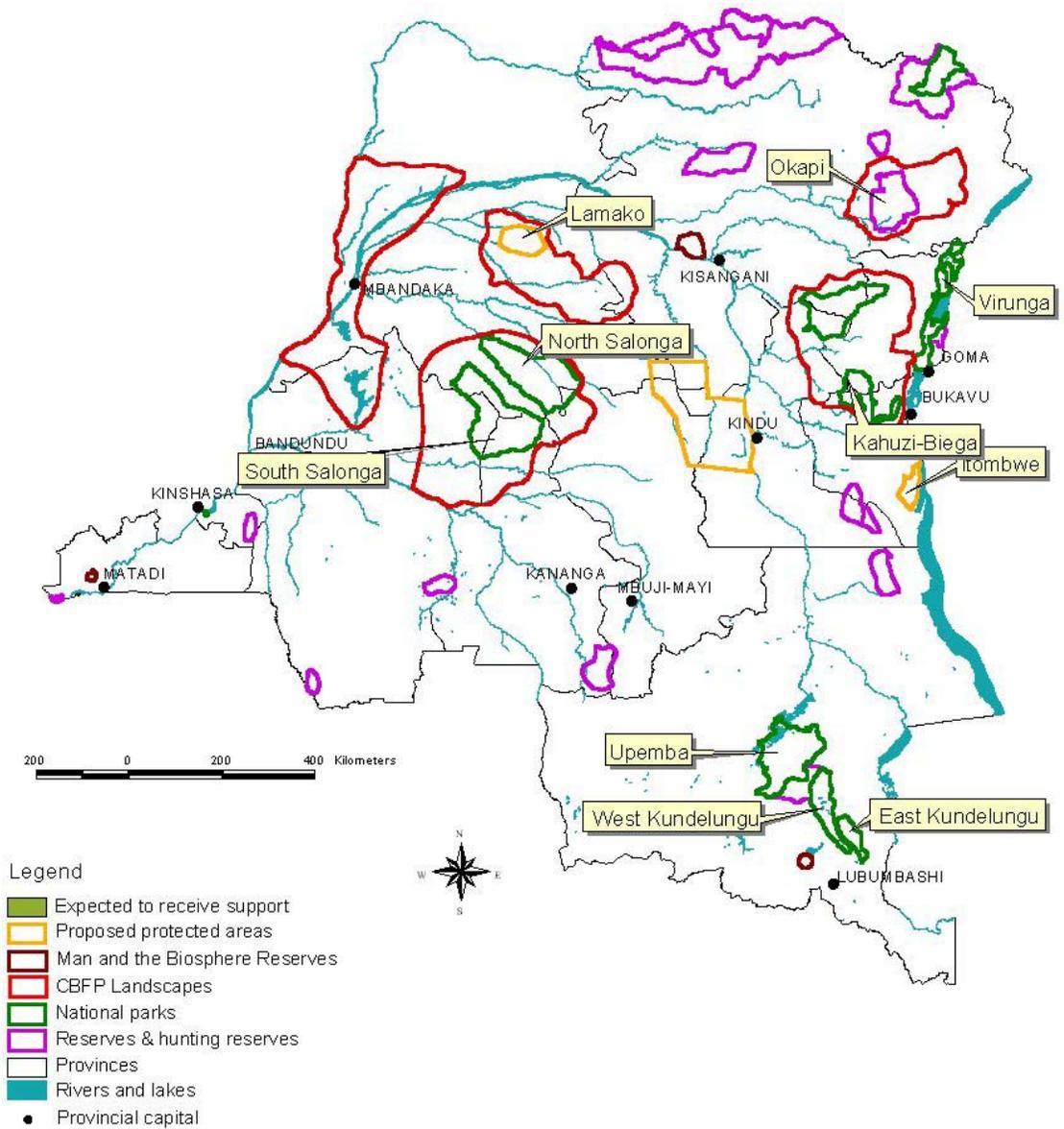


FIGURE 12 DISTRIBUTION OF FLORISTIC AND PRIMATE DIVERSITY IN AFRICA

DEMOCRATIC REPUBLIC OF THE CONGO

PROTECTED AREAS & PROPOSED PROTECTED AREAS EXPECTED TO RECEIVE SUPPORT IN THE NEAR FUTURE

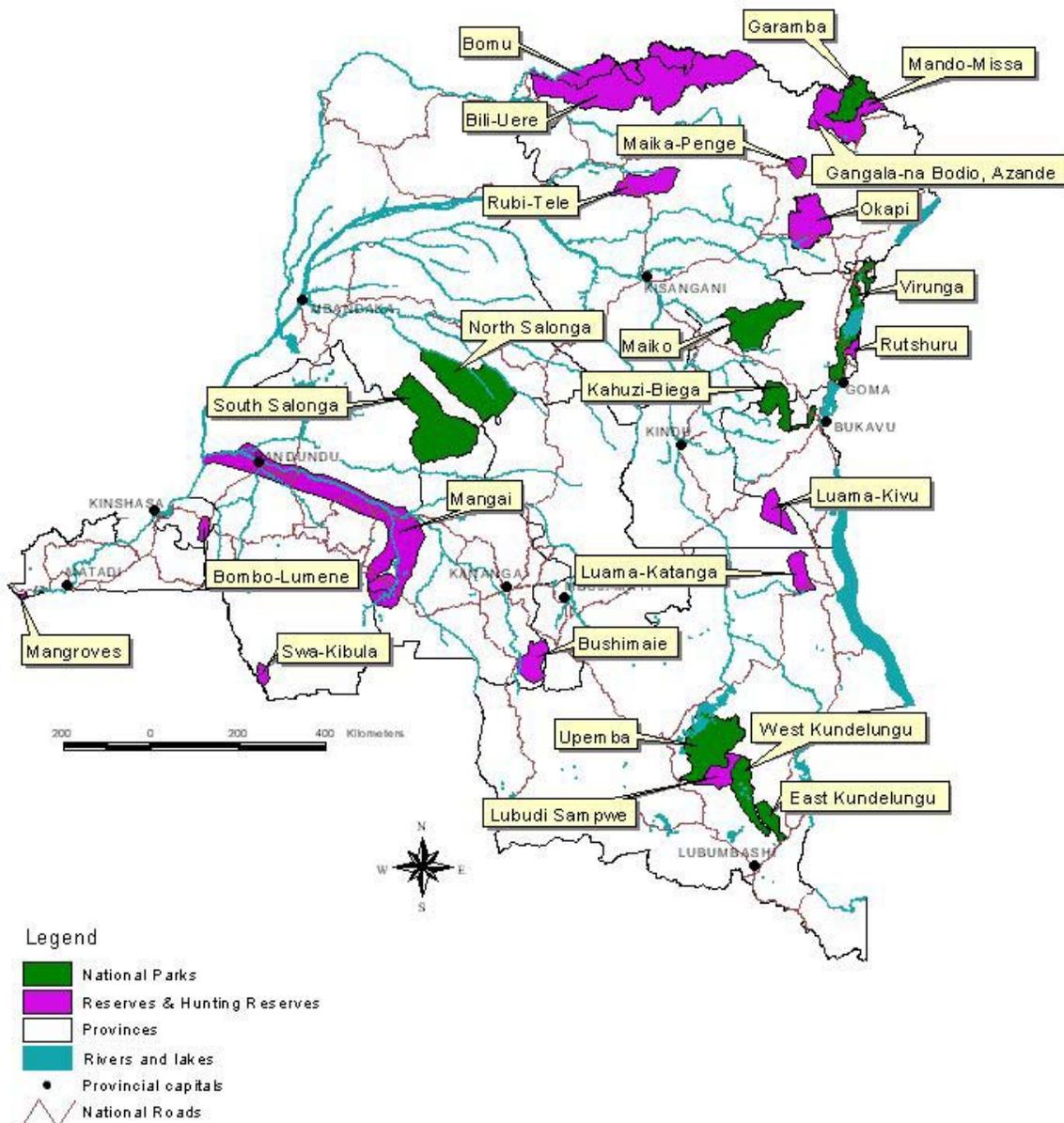


Sources: CARPE, ICN, WCS
 Prepared by WCS for USAID Environmental Analysis. September 2003.

FIGURE 13 CONSERVATION AREAS SLATED FOR FUTURE FINANCIAL SUPPORT IN THE DRC

DEMOCRATIC REPUBLIC OF THE CONGO

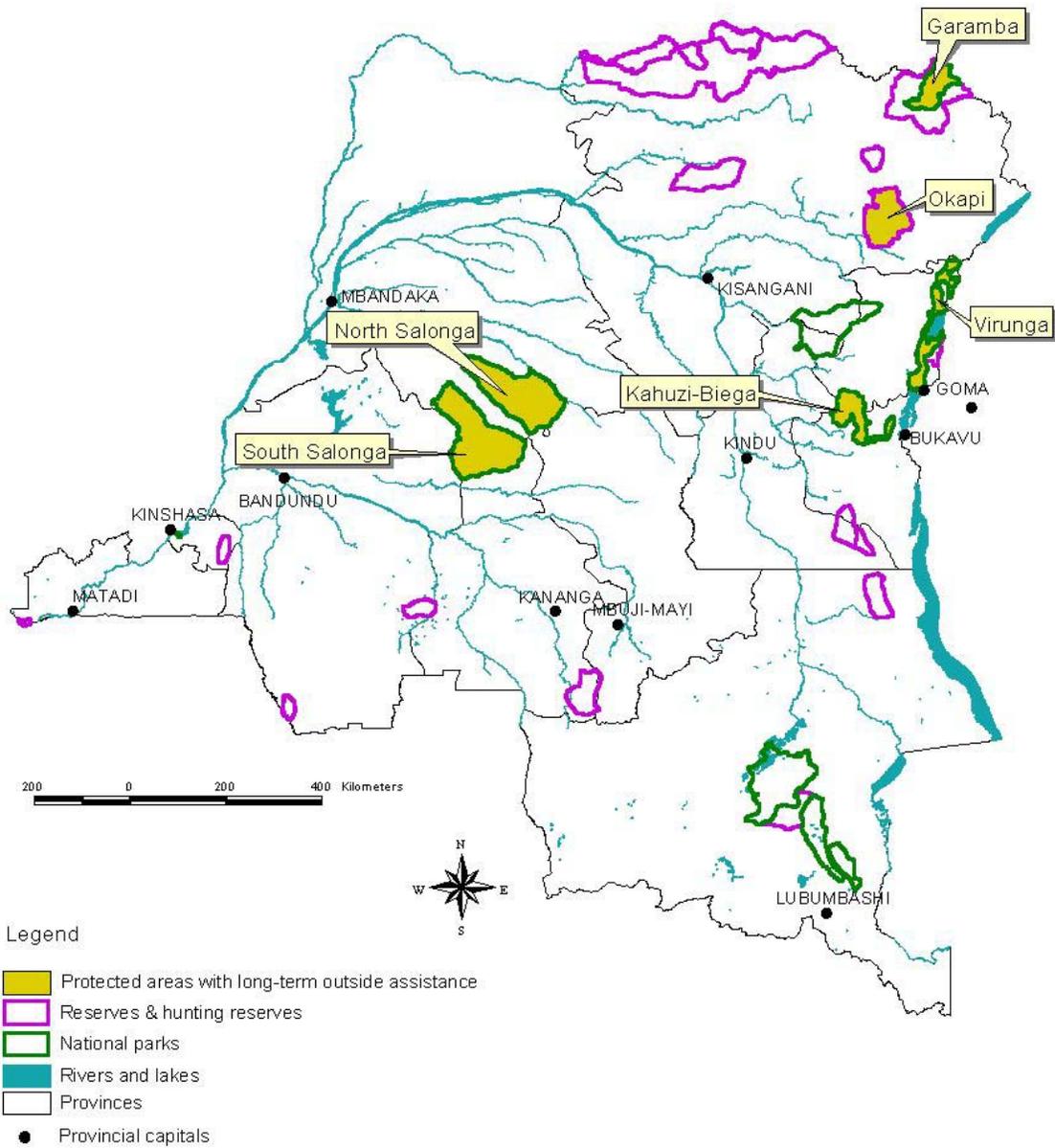
NATIONAL PARKS & RESERVES MANAGED BY THE INSTITUT CONGOLAIS POUR LA CONSERVATION DE LA NATURE (ICCN)



Source: ICCN
Prepared by WCS for USAID Environmental Analysis, September 2003.

FIGURE 14 ICCN MANAGED PROTECTED AREAS

DEMOCRATIC REPUBLIC OF THE CONGO
PROTECTED AREAS WITH LONG-TERM CONSISTENT OUTSIDE SUPPORT



Source: ICCN and WCS
 Prepared by WCS for USAID Environmental Analysis, September 2003.

FIGURE 15 PROTECTED AREAS WITH LONG TERM OUTSIDE SUPPORT IN THE DRC

5.6.4.3 *Species Diversity*

Although maps showing relative concentrations of African plant biodiversity are probably generally correct even for the DRC, the best diversity information exists for large mammals such as primates (Figure 12) and ungulates. The data are of progressively poorer quality with respect to smaller mammals, amphibians, insects and non-flowering plants for which there is much less information. What is striking about central Africa is the hole left in the center of the DRC when biodiversity surveys (= information) are mapped (Figure 11). The few clusters of dots in the DRC represent the better known protected areas and old Belgian research stations (i.e. Yangambi downstream from Kisangani). The vast areas without any information include some of suspected fascinating diversity and of probable importance for protection. However even when endemism and diversity is only considered for the large mammals and flowering plants, the DRC emerges as being of absolute and critical importance as a global center of biodiversity.

5.6.4.4 *Overall diversity*

A biodiversity tally shows that DRC possesses more species of birds and mammals than any other African country and is one of the most flora-rich countries on the continent (Sayer et al. 1992). It ranks sixth highest among countries worldwide for total numbers of mammal species and 9th highest for numbers of birds. (World Conservation Monitoring Centre 1992). What was originally the old Belgian Congo, which included Rwanda, Burundi, and the DRC, contains about 9,500 species of seed plants and of those already described, approximately 15 percent were considered new to science when included in the *Flore du Congo Belge* (Léonard 1994). Even with very little botanical exploration over the last decade new species continue to be found including a large tree new to science in the forests of the Ituri only described during the recent war (*Pradosia spinosa*). The importance of the DRC's biodiversity is illustrated by a comparison (Box 5.3) between selected taxa in the Ituri Forest (DRC) and the Adirondack Park (USA).

BOX 5-4 A SPECIES DIVERSITY COMPARISON BETWEEN THE ITURI FOREST, DRC AND THE ADIRONDACK PARK, USA .

The DRC's great biological richness is only partly due to its large size (Hart, T.B. and R.K. Mwinyihali 2001). It is larger than all the European countries that had African colonies in the early 20th century combined (i.e., Britain, France, Belgium, Spain, Italy, Germany, and Portugal), or about the area of the United States east of the Mississippi River. Even in relatively small areas, however, remarkable diversity can be found. In the OFR, which is smaller than New York State's Adirondack Park (5300 square miles versus 9375 square miles), there are 97 known species of mammals, even though rodents and bats have not been adequately inventoried (Hart and Bengana 1997, unpublished report of the Centre de Recherche et de Formation en Conservation Forestère, or CEFRECOF). An exhaustive survey of the Adirondack Mountains (DiNunzio 1984), on the other hand, documents only 59 species of mammals. There are 376 known species of birds in the OFR (unpublished compilation by Sacchi and Rüegg 1996) and only 296 in the Adirondacks (DiNunzio 1984). This is despite the fact that the OFR does not have the habitat variation of the Adirondacks, from high peaks to low valleys, nor is the OFR inventory complete; most of the area has had no animal census work. The most striking contrast is with woody plants. When the entire Adirondacks, all altitudes, were inventoried, there were fewer than 85 woody species (DiNunzio 1984), whereas when just 40 ha of homogeneous altitude was inventoried in the OFR there were more than 670 species (Makana 1999).

5.6.4.5 *Endemic species*

Some of Africa's large mammals can only be found in DRC. The northern White Rhino is known nowhere except on the Congo's north eastern savannas in the Garamba National Park. Grauer's gorilla, or the eastern lowland gorilla, is found further south but only on the DRC's side of the Albertine Rift and in the immediately adjacent lower elevation forests. Further west and north the okapi, a giraffe of DR Congo's closed equatorial forest, which, although the size of a small horse, did not become known to science until the beginning of the 20th century. The bonobo chimpanzee is found further west still in the Congo River's central basin. Among the endemic birds the best known is the Congo Peacock whose nearest relatives are Asian (see also discussion in section 3.2., p18-20).

Although less spectacular there are many endemic species among smaller mammals and other taxa. Overall at least 10% of plants, 6% of mammals and 32 % of birds are endemic to the country (World Conservation Monitoring Center, 1992; Davis, Heywood and Hamilton, 1994; Birdlife International 2000)

The Albertine Rift contains a greater concentration of endemic vertebrates than anywhere else on mainland Africa (Plumptre et al. 2003) and the rift lake, Lake Tanganyika, has the record for endemic fish. Of 325 fish species, 89% are found only in L. Tanganyika (Birdlife International, 2000). The two rift protected areas in the DRC, Virunga NP and Kahuzi-Biega NP, contain the highest number of endemic vertebrates and plants of all protected areas in the Albertine rift, itself, and probably in all of mainland Africa (Plumptre et al. 2003).

5.6.4.6 *Rare and endangered species*

The IUCN Red List of threatened or vulnerable species (plants and animals) for the DRC lists a total of 325 species (Table 3). However the list is almost certainly incomplete since good quantitative data on status, distribution and trends have never been collected for most plant and animal species in DRC. Notable exceptions are the white rhino and the mountain gorilla. These emblematic species are confined to very small areas and have benefited from sustained long term funding from the international conservation community. As a result precise population data has been collected over the years using total count techniques repeated at regular intervals (Hillman-Smith, 2002, Aveling and Harcourt, 1983, Kalpers et al. 2003). This kind of fine scale monitoring is only possible because the two species have extremely limited distributions (the southern part of Garamba National Park for white rhino, and the southern part of Virunga National Park for mountain gorilla) with very small numbers: 30 for rhinos, <400 for the Virunga mountain gorilla population (Emslie, 2002; Kalpers et al. 2003).

Coarser scale evaluations have been made, using systematic sampling techniques, for a small number of other species including: Grauer's gorillas (Hall et al, 1998), savannah elephants (Hillman-Smith and Smith, 1997; Hillman-Smith, 2002), forest elephants (Hall et al., 1997) and okapi (Hart and Hall, 1996) but given the size of the country, the difficulty of access to much of it and the cost of biological monitoring, it is clearly impossible to apply this level of monitoring for more than a handful of species.

For the vast majority of species in the DRC knowledge is limited to mere presence/absence information.

Table 3 below presents a list of animal species that appear in the IUCN Red List of vulnerable and threatened species for DRC. The list is certainly incomplete (for example the endangered Grauer's gorilla is not listed) and is in need of updating.

TABLE 3 ANIMAL SPECIES FOR THE DRC IN THE IUCN RED LIST OF VULNERABLE AND THREATENED SPECIES.

Primates:		
<i>Cercopithecus dryas</i>	Dryas Guenon	DD
<i>Cercopithecus hamlyni</i>	Owl-Faced Guenon	LR
<i>Cercopithecus lhoesti</i>	L'hoest's Guenon	LR
<i>Euoticus elegantulus</i>	Elegant Galago	LR
<i>Galago matschiei</i>	Eastern Needle-Clawed Bushbaby	LR
<i>Gorilla beringei</i>	Eastern (Mountain) Gorilla	EN
<i>Gorilla gorilla</i>	Western Gorilla	EN
<i>Lophocebus aterrimus</i>	Black Crested Mangabey	L
<i>Pan paniscus</i>	Bonobo	EN
<i>Pan troglodytes</i>	Chimpanzee	EN
Carnivores		
<i>Acinonyx jubatus</i>	Cheetah	VU
<i>Crocuta crocuta</i>	Spotted Hyaena	LR
<i>Lutra maculicollis</i>	Speckle-Throated Otter	VU
<i>Lycaon pictus</i>	African Wild Dog	EN
<i>Osbornictis piscivora</i>	Aquatic genet	DD
<i>Panthera leo</i>	Lion	VU
<i>Potamogale velox</i>	Otter shrew	EN
<i>Profelis aurata</i>	African Golden Cat	VU
Hoofed animals		
<i>Cephalophus callipygus</i>	Peter's Duiker	LR
<i>Cephalophus dorsalis</i>	Bay Duiker	LR
<i>Cephalophus leucogaster</i>	White-Bellied Duiker	LR
<i>Cephalophus nigrifrons</i>	Black-Fronted Duiker	LR
<i>Cephalophus rufilatus</i>	Red-Flanked Duiker	LR
<i>Cephalophus silvicultor</i>	Yellow-Backed Duiker	LR
<i>Cephalophus weynsi</i>	Weyn's Duiker	LR
<i>Ceratotherium simum</i>	Square-Lipped Rhinoceros	NT
<i>Giraffa camelopardalis</i>	Giraffe	LR
<i>Hippotragus equinus</i>	Roan Antelope	LR
<i>Hippotragus niger</i>	Sable Antelope	LR
<i>Hyemoschus aquaticus</i>	Water Chevrotain	DD
<i>Kobus ellipsiprymnus</i>	Waterbuck	LR
<i>Kobus kob</i>	Kob	LR
<i>Kobus leche</i>	Lechwe	LR
<i>Kobus vardonii</i>	Puku	LR
<i>Loxodonta africana</i>	African Elephant	EN
<i>Manis temminckii</i>	Cape Pangolin	LR
<i>Neotragus batesi</i>	Bates' Pygmy Antelope	LR
<i>Okapia johnstoni</i>	Okapi	LR
<i>Oreotragus oreotragus</i>	Klipspringer	LR
<i>Ourebia ourebi</i>	Oribi	LR
<i>Redunca redunca</i>	Bohor Reedbuck	LR
<i>Syncerus caffer</i>	African Buffalo	LR
<i>Taurotragus derbianus</i>	Giant Eland	LR
<i>Tragelaphus eurycerus</i>	Bongo	LR

Tragelaphus oryx	Common Eland	LR
Tragelaphus spekii	Sitatinuga	LR
Tragelaphus strepsiceros	Greater Kudu	LR
Bats		
Casinycteris argynnis	Short-Palate Fruit Bat	LR
Micropteropus intermedius	Hayman's Epauletted Fruit Bat	DD
Miniopterus schreibersi	Common Bentwing Bat	LR
Plerotes anchietae	D'anchieta's Fruit Bat	DD
Rhinolophus blasii	Blasius' Horseshoe Bat	LR
Rhinolophus maclaudi	McLaud's Horeshoe Bat.	LR
Rodents and shrews		
Crocidura attila		VU
Crocidura caliginea		CR
Crocidura congobelgica		VU
Crocidura kivuana		VU
Crocidura latona		VU
Crocidura monax		VU
Crocidura polia		CR
Crocidura stenocephala		VU
Crocidura zimmeri		VU
Hystrix cristata	Crested Porcupine	LR
Idiurus macrotis	Long-Eared Flying Squirrel	LR
Idiurus zenkeri		LR
Praomys jacksoni		DD
Praomys minor		VU
Praomys mutoni		LR
Ruwenzorisorex suncooides	Ruwenzori Shrew	VU
Marine mammals		
Megaptera novaeangliae	Humpback Whale	VU
Sousa teuszii	Atlantic Hump-Backed Dolphin	DD
Trichechus senegalensis	African Manatee	VU
Reptiles		
Crocodylus cataphractus	African Sharp-Nosed Crocodile	DD
Kinixys erosa	Common Tortoise	DD
Kinixys homeana	Home's Hinge-Back Tortoise	DD
Osteolaemus tetraspis	African Dwarf Crocodile	VU
Pelusios upembae	Upemba Mud Turtle	DD

Categories of threat used in the IUCN Red List are:

Critically endangered (CE), Endangered (EN), Vulnerable (VU), Near threatened (NT), Least concern (LR), Data Deficient (DD)

5.6.4.7 *What we don't know, we don't control*

Among African countries, during the colonial epoch, the Belgian Congo was among the first to support scientific explorations and produced an impressive library promising continuing discoveries (Lebrun 1971, Chapin 1932, Schweinfurth 1874). Realizing both the unknown but potential economic wealth of its colony's natural resources, in the 1940s and 50s, the Belgian government built scientific stations and funded research not only into natural resources of immediate economic return but also into biological diversity. The era was short-lived. Immediately after independence the government of what was to become DRC, supported conservation, created new parks and consolidated most protected areas under a single national authority. The new government did not, however, invest in biological research. Although some Belgian researchers continued to work, there was a steady decline in activity nor was there ever the active participation from international

scientific groups. For instance the great international herbaria of Wageningen (Holland), Kew (England) and Missouri (USA) are active in many African countries and all three work in numerous places (Gabon, Cameroon...) but none of them have developed a long term commitment in the DRC.

The lack of information and the lack of programs to seek critically needed information is largely a result of the difficulty of working in the DRC. Infrastructure and support services in the remote areas where work is needed were unreliable thirty years ago and have only gotten worse. The government's support to major national parks started to fall off in the mid 1970's; their infrastructure has progressively degenerated. In most areas conditions for short term research became too unreliable to be tenable. Although there were a few centers where independent researchers could continue to come for one or two year projects, mainly around operating protected areas and facilitated by outside groups (EU-Virunga, GTZ-KBNP, WCS/CEFRECOF - Ituri), these too became nearly unusable in the early 90s as anarchy increased and eventually armed conflict swept across the country.

The result is that knowledge about Congo's ecosystems is very patchy, and, although a few new patches have been added since independence there is no cohesive coverage of biological information to guide development. There are large forested areas in the center of the country, home to bonobo, okapi, elephants, and gorilla that must be developed to assure that the DRC is able to reduce poverty and assume its place among developing countries. This should, however, be done in conjunction with well-placed protected areas to assure maintenance of critical plants and animals, not only as relicts for tourists but as a reservoir to repopulate hunted areas and to allow for sustainable harvest of non-timber forest resources in multi-use buffer zones. Furthermore the informed placement of roads and other infrastructure can guide the geographic development of a region so as to minimize overexploitation of key resources. However in most cases the critical information concerning what controls the density and distribution of key species is lacking. In many cases, critical habitat of endemic and/or endangered species could be destroyed without even a nod of international concern because the knowledge to determine what is and is not critical is still lacking.

5.6.4.8 Conservation in and around Protected Areas

Declared protected areas with national and international support are probably the clearest and most certain method to protect specific areas and/or specific species. But even for this method to be a success the nation of the Democratic Republic of Congo must make conservation and its protected areas system a national priority. Although foreign aid is essential now and in the foreseeable future, the foreign aid will only have long term impact as the country itself elevates the importance of conservation. The major challenge is therefore that in order for conservation to successfully increase its status nationally its place must be painted into the vision of sustainable development and poverty reduction. Although the DRC is operating largely on emergency measures now, and its foreign aid is often provided as a response to human crises, it is essential that the current and long-term need for a healthy and fully diverse environment be integrated into top priorities.

5.6.4.9 The actual state of conservation in Congo

The Institut Congolais pour la Conservation de la Nature (ICCN) manages the protected areas network including national parks and all Reserves except Man and the Biosphere Reserves and Reserves created under the forestry code. ICCN is the only functional specialised protected area authority in the whole of central Africa and in this respect it has long been ahead of the field in protected area management among the central African countries. The economic and social difficulties experienced by the country over the past two decades have, however, left their mark on the Institute. Not only has it had to operate without any kind of meaningful budget for many years, but perhaps more seriously, almost no recruitment and training of young staff to replace the “old guard” has been possible for over a decade.

Protected areas now cover 180,000 km² or 7.69 percent of the country (Wolfire et al. 1998) although what exactly is a protected area is debatable. The ICCN’s interpretation of its network (Figure 14) includes many more areas than are currently being actively managed, even in a token manner. The five protected areas that have had long-term support, all World Heritage Sites (Figure 15, Table 4), have received aide from outside conservation organizations that work in conjunction with ICCN (albeit in a non-standardized manner and generally without management plans). These five sites have received critical help during the recent war years through a project of UNESCO/UNF (World Heritage Centre 2000).

The current state of Protected Area management in DRC is weak and ineffective (Figure 16). This has been compounded by the recent war and fundamental hurdles that will remain as peace is established include:

- ICCN’s nearly complete reliance on outside support (funneled mainly through international NGOs),
- ICCN’s inadequately trained personnel and large proportion of retirement age personnel, and
- ICCN’s weak position within the government.

Currently the ICCN is rarely consulted on significant national issues of pertinence to the environment (PRSP for example). The headquarters of the ICCN (Direction Générale – DG) in Kinshasa receives funding for its protected areas network from outside sources that usually comes already packaged into a budget and work-plan, usually having had little or no input from the national authority.

Outside priorities, even before the war, were focused on a few protected areas, primarily those containing large endemic mammal species, having potential for generating tourist revenues and often designated as World Heritage Sites (Table 5). During the war it was only the DRC’s five World Heritage Sites that continued to receive funding from international conservation groups (mainly NGOs) that had long-term commitments (Figure 15). These NGOs also worked with the UNESCO/UNF project for DRC’s five “WHS in Danger from Armed Conflict” to assure some minimum support to the ground. Each of these groups averaged a minimum of 100,000 \$US per year per protected area. Other protected areas had little or no support, and areas long-proposed as protected areas received no further exploration or planning.

TABLE 4 WORLD HERITAGE SITES RECEIVING SUPPORT FROM INTERNATIONAL ORGANIZATIONS DURING THE PERIOD OF ARMED CONFLICT.

WORLD HERITAGE SITES	CONSERVATION GROUPS WITH PERSONNEL ON THE GROUND *	PERIOD OF FUNDING
Garamba National Park	International Rhino Fund (IRF)	Early 90s to present
	World Wide Fund for Nature (WWF)	Early 90s to 2001
Okapi Faunal Reserve	Wildlife Conservation Society (WCS)	Mid 80s to present
	Gilman International Conservation (GIC)	Mid 80s to present
Virunga National Park	International Gorilla Conservation Program (IGCP)**	Early 90s to present
	World Wide Fund for Nature (WWF)	Late 80s to present
	Dian Fossey Gorilla Fund – e (DFGF-e)	Mid-90s to present
Kahuzi-Biega National Park	German Technical Assistance (GTZ)	Late 80s to present
	Wildlife Conservation Society (WCS)	2001 to present
Salonga National Park	Zoological Society of Milwaukee (ZSM)	Late 90s to present
	Max Planck Institut	Mid 90s to present
	Lukuru Wildlife Project (LWP)	Early 90's to present
	Wildlife Conservation Society (WCS)	2003 to present

* Without fully paid and full-time personnel on the ground, an outside organization can make very significant contributions but is unlikely to have long-term commitment

** IGCP is a coalition composed of WWF, WCS, and FFI.

A number of bi-lateral and multi-lateral organizations have projects proposed to start in the near future, that will provide significant support (greater than 100,000 USD per protected area) to world heritage sites, other protected areas and proposed protected areas. The sites and the organizations are listed in Table 5.

It is likely that during the next few years ICCN will receive substantial projects for the support not only of the five protected areas mentioned above but for several other key areas as well as several important areas that are being proposed for protected areas status (Figure 13 Table 5). The areas under discussion as proposed protected areas are all areas that have been promoted previously and signaled as being important biodiversity centers. They include Lomako (Equateur), Lomami-Tshuapa (Equateur-Province Orientale) and Itombwe (South Kivu).

These projects will bring ICCN closer to its Target Situation for ten years from now (Figure 13). In its target projection, the Kinshasa headquarters of ICCN would receive updated information from the field regarding the state of conservation not only in the five world heritage sites but in other protected areas that now have almost no management and from new protected areas as well. The DG recognizes that information, well used, is power. The DG would be able to use the knowledge from the field concerning the changing state of the parks and the state of conservation activities to advise other ministries and influence legislation as well as to communicate needs to possible foreign funding sources (Figure 16 vs. Figure 17). This knowledge is imminently pertinent to resource extraction and human population movements.

TABLE 5 PROTECTED AREAS SCHEDULED TO RECEIVE SUPPORT FROM BI-LATERAL AND MULTI-LATERAL ORGANISATIONS

SITE	SIZE km ²	ORGANIZATION
Virunga NP	12,100	EU, World Bank
Kahuzi Biega NP	6,000	CARPE-CBFP
Salonga NP	36,000	EU, CARPE-CBFP
Garamba NP	4,900	World Bank, UNDP
Upemba NP	10,000	UNDP
Kundelungu NP	7,600	UNDP
Maiko NP	10,000	CBFP/CARPE , World Bank
Okapi RF	13,700	CARPE-CBFP,UNDP
Domaines de Chasse adjacent to Garmaba NP (Ganala na Bodio, Azande, Monda-Missa)	8,600	World Bank
Bombo Lumene DC	3,500	EU
Lomako	xx	CBFP-CARPE
Itombwe	xx	WORLD BANK
Lomami-Tshuapa	xx	WORLD BANK

In order to assure both good protection and good information all functioning protected areas would have, as part of their management structure: (1) surveillance and control, (2) inventory, monitoring and database management, (3) community conservation activities. There must be trained personnel capable of assuring each line of activity and a management unit capable of assuring that the information is transferred in a usable manner to all concerned people (the DG and supporting groups/NGOs).

Ten years from now, the ICCN recognizes that it must expand from the five central World Heritage Sites that now receive outside support to include the other protected areas that have been nearly abandoned as well as to include new protected areas. The list in Table 5 shows areas planned for immediate outside support. Although considerably broader in its coverage than the current reach of the ICCN, the improved scope still fails to include even all the most important areas. Significant in its absence is the Moanda Marine Reserve the only DRC protected area with mangroves and access to marine mammals. Equally important are Reserves of significant size that once had extensive and diverse animal populations such as Bili Uere, Bushimaie, Rubi-Tele, Luama Ki and Luama Kat, Maika Penge and others. More information about their current state of protection and remaining animal populations is needed. It is probable that even if poaching was fairly severe that small populations could recover with appropriate management.

FIGURE 16 CURRENT SITUATION (2003) OF THE DRC PROTECTED AREAS SYSTEM MANAGED BY ICCN

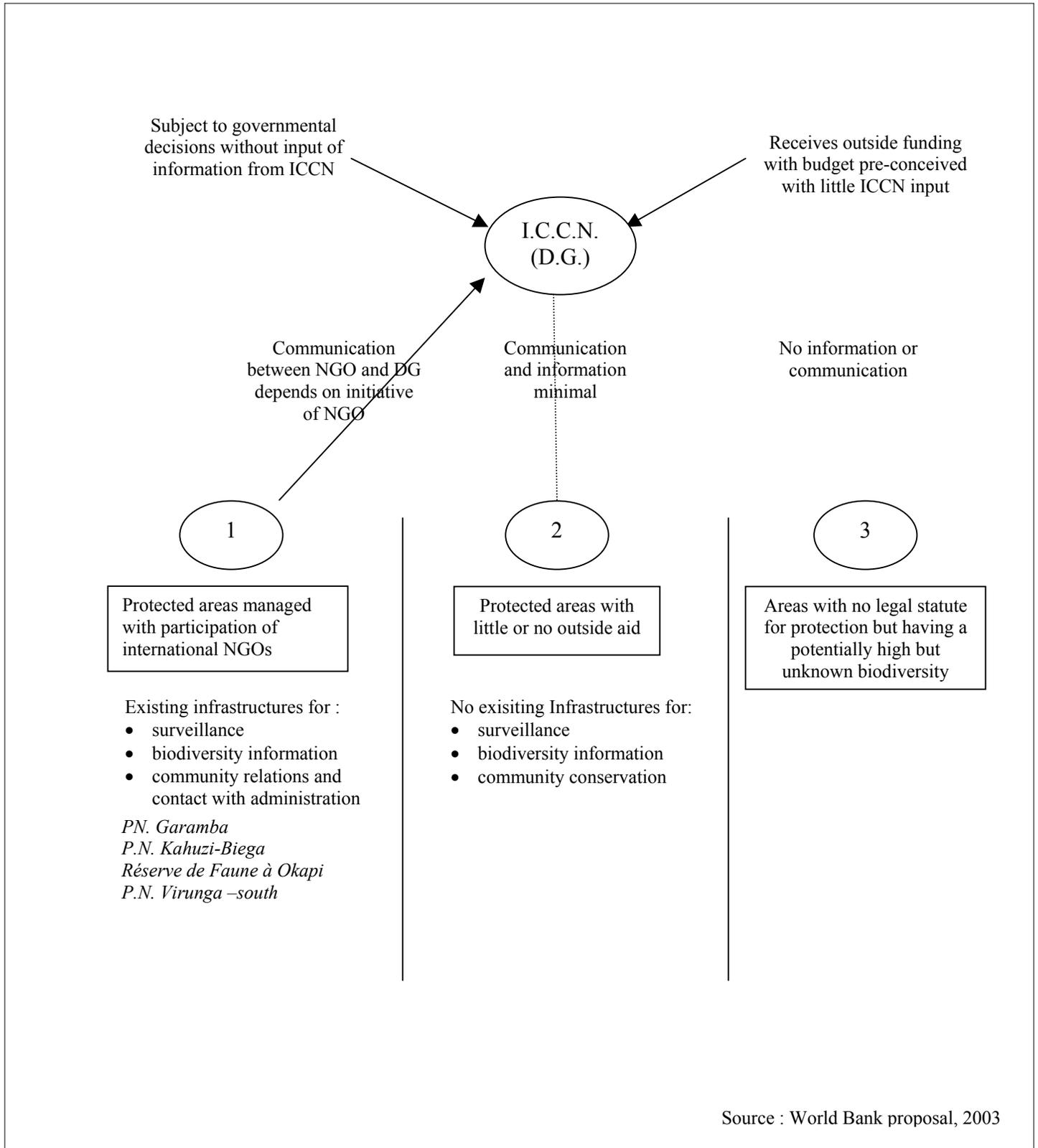
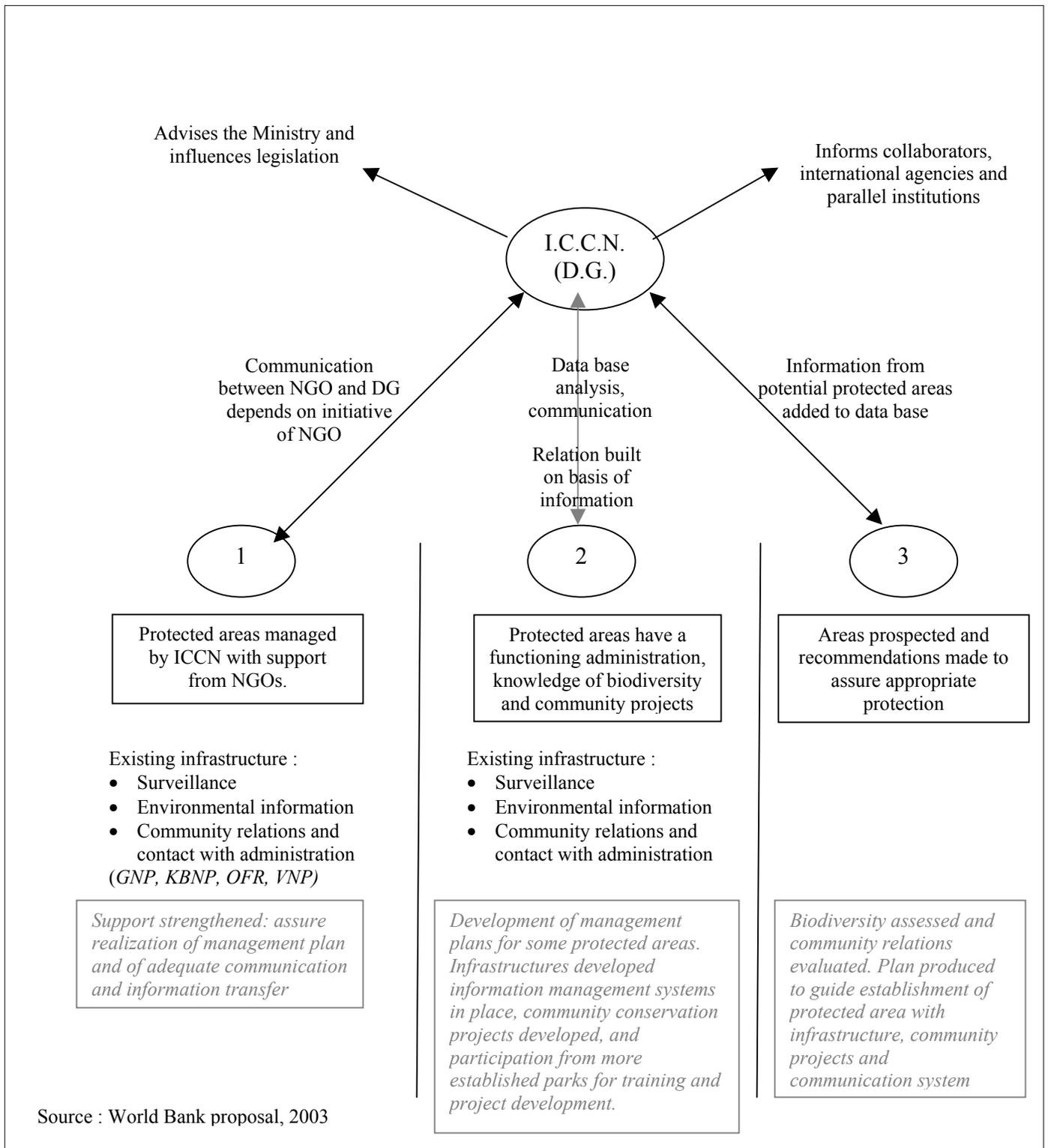


FIGURE 17 TARGET SITUATION FOR THE DRC PROTECTED AREAS SYSTEM WITHIN TEN YEARS



5.6.5 Threats to biodiversity and tropical forests

It is clear from the discussion above that DRC is one of the most important countries in Africa for biodiversity conservation. Not only does it harbor spectacular endemic species and subspecies like the okapi, northern white rhinoceros, Grauer's gorilla, bonobo, and Congo peacock, but its size and wide range of habitats make it a critically important global center of biodiversity. Given that it possesses 50% of Africa's tropical forest its importance in helping to maintain global climatic cycles and both regional and local weather patterns cannot be denied. Indeed the conversion of its forests to agricultural land will result in an extraordinary increase in atmospheric carbon dioxide (CO₂), dramatically impacting efforts to combat global warming. As over 50% of the rainfall received in the region results from local cycling of water through evapo-transpiration, loss of forest cover will result in both less precipitation and an increase in the severity of droughts. Thus the threats to DRC's biodiversity and tropical forest simply cannot be ignored.

The consequences of environmental degradation for the long-term sustainability of most subsistence activities and its particularly severe impact on marginal peoples, requires diverse and innovative approaches. In their most summary descriptions, such approaches include: conservation, reduced/ameliorated impact, and rehabilitation. Conservation includes the simplest measures and is the easiest to evaluate. In the DRC, and in this report, this approach is referred to in terms of support and collaboration with the Institut Congolais pour la Conservation de la Nature (ICCN). Reduced/ameliorated impact is the most widely pertinent, and is relevant to almost any development activity. It generally requires the greatest information and regular evaluation. In this report some "impact" observations are given with respect to each SO. Rehabilitation can be associated with both of the former.

Given the threats posed by the decade long cycle of political instability that culminated in war, the plundering of natural resources with complete disregard for impacts on biodiversity and the environment, and the necessity of local people to do whatever they could to survive, it is remarkable how much of eastern DRC's phenomenal biodiversity remains. Much of the credit is due to the ability of the ICCN and its partners to work across lines of conflict to maintain the integrity of the country's protected areas network. One cannot say enough about the courage, daring, and professionalism of the men and women responsible for holding the line in DRC's parks and reserves during this period. It is crucial that these efforts not be thwarted by peace and repaid by ambivalence.

The coping strategies devised to reduce the loss of biodiversity during the recent period of armed conflict and chaos are not adequate or even appropriate to address the new threats posed by large scale investment and infrastructure development in a country that has little history of lawful control. Even under the best of circumstances, planned improvements to the transportation infrastructure (roads, railroads, and river) will orient the burgeoning human population towards the forest. The challenge is to plan this expansion in such a way as to take pressure off important areas for biodiversity conservation and maintain as much forest cover as possible. While development of DRC's mineral and timber resources will play an important role in the country's economic development, maps of existing mining and forestry concessions highlight the threats posed by these industries (Figure 6, Figure 10).

Primary threats like the loss of forest posed by agricultural expansion are well understood. The explosion of the bushmeat trade as well as the over exploitation of fisheries (be it lake, river, or ocean) could result in seemingly pristine yet empty forests and rivers. While each of these threats are (intrinsically) important in and of themselves, they are nonetheless interrelated and differ in severity depending upon the ecological, social, and economic context within which they occur. Thus they are perhaps best treated/discussed in the context of eco-development zones.

The Democratic Republic of Congo can be divided into 11 eco-development zones (Figure 18). Each of these eco-development zones is distinct with regards to its economic, social, and ecological context. As a result, the economic sector of each can be characterized by its specific agricultural, forestry and hydro-electric, and mining development, as well as other zone specific economic activities (Table 6). Likewise, each zone can be characterized in terms of its demographic, socio-economic context and ecological constraints (Table 7). Finally, these zones can be viewed in terms of their biodiversity and conservation importance, including biodiversity value, existing protected area coverage, threats, and potentially environment friendly development approaches (Table 8). Assessing the opportunities for development and threats to biodiversity within this context affords a clear way forward in planning for and mitigating the threats posed by development.

5.6.5.1 *Albertine Rift*

The Albertine rift is perhaps the single most important eco-development zone in terms of biodiversity conservation. While high rates of endemism and species diversity make it a global conservation priority, it is also severely threatened (Tables 6-8). The high human population growth rate coupled with fertile soils has led to large tracts of forest being cleared (Figure 8). Fortunately a protected areas network was established long ago²⁰ and includes in the Rift, Virunga National Park and the upland sector of Kahuzi Biega National Park. A key protected area still needs to be created in the Itombwe Forest (Figure 13). Beyond this, the chaos of the last decade has led to severe degradation of parks with elephants being virtually exterminated from the mountain sector of Kahuzi-Biega National Park as well as the devastation of hippopotamus populations and severe poaching for meat in Virunga National Park²¹. Over harvesting of *Prunus africanus*²² has severely threatened the survival of this species (thus contributing to forest degradation) in forests of the Albertine Rift particularly in Kahuzi Biega National Park. With invasion of exotic lianas (*Sarostachys*) threatening to completely grow over and exterminate essential gorilla foraging plants once the elephants were eliminated.

²⁰ Established in 1925, the Albert National Park (now Virunga NP) is the oldest national park in Africa.

²¹ As high demand for bush meat has led to the emptying out of forests within a 50 km radius of Beni, poachers have taken advantage of the anarchy brought on by war and begun poaching animals in the northern sector of Virunga NP (Mapilanga, pers.com). Beyond small mammals like porcupines, all bush meat originating from large mammals sold in Beni results from poaching in VNP or occasionally long-distance transport from the Oriental Province.

²² In the early 1980s it was discovered that medicine derived from the bark of this high altitude tree was effective in treating prostate disease. This led to buyers, working out of Bukavu, to purchase large quantities of bark much of which was harvested illegally and unsustainably (ring barking) from the Kahuzi Biega National Park.

DR Congo Eco- Development Regions

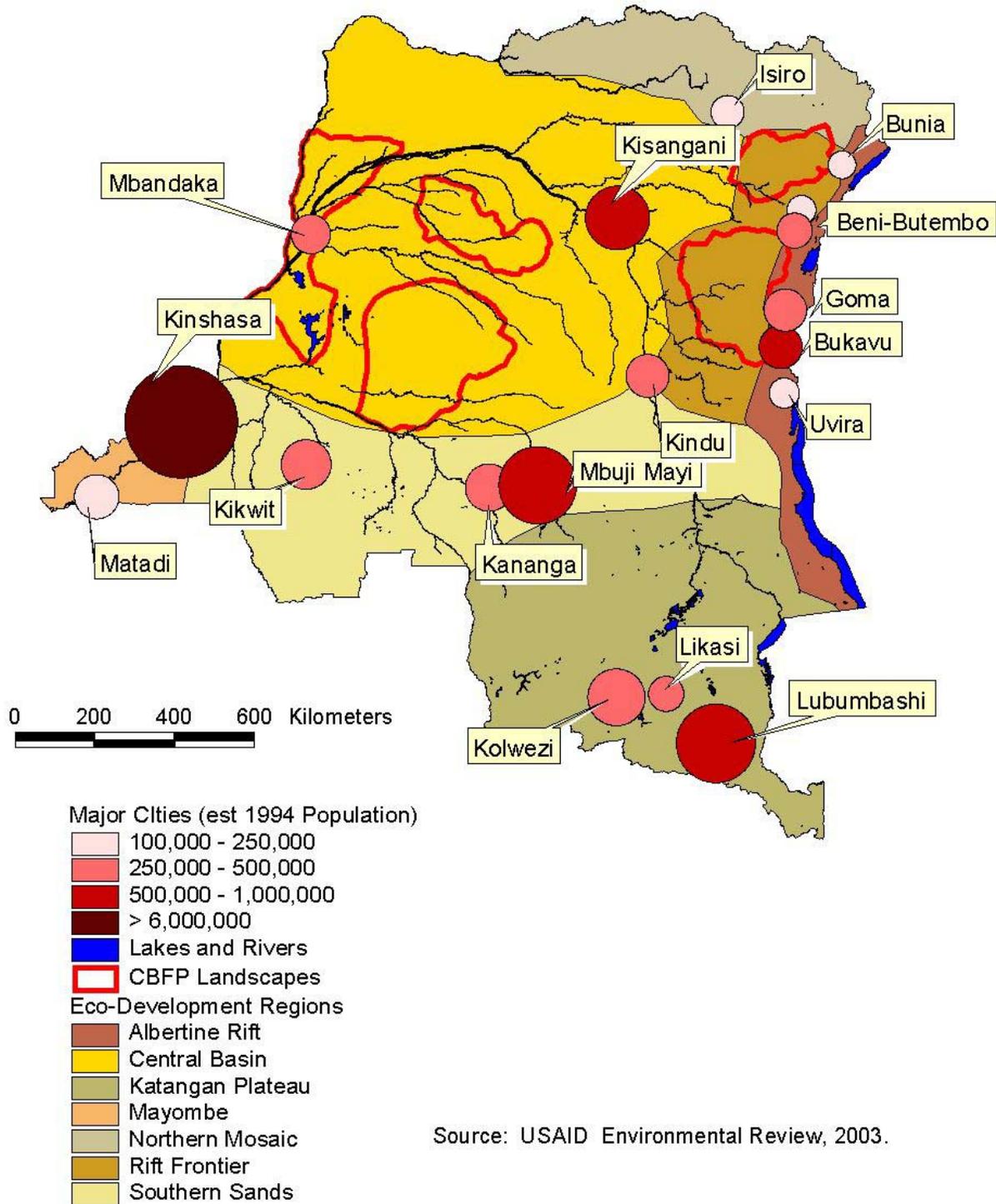


FIGURE 18 ECO-DEVELOPMENT ZONES IN THE DRC

TABLE 6 ECO-DEVELOPMENT ZONES: ECONOMIC SECTOR CHARACTERIZATION

<i>Ecological Development Zone</i>	<i>Agricultural Production</i>	<i>Forestry Potential</i>	<i>Hydro-Electric Potential</i>	<i>Mining Development</i>	<i>Other development potential</i>
Albertine Rift	High . Production and crop diversity high	Low . Plantation forestry only real option	High . Important small scale potential	High , potential for small scale to industrial scale operations	Livestock, small industry
Rift Frontier	Localized high production . Crop diversity moderate	High : variable scale operations growing to meet local and regional demand	High Potential small scale to large scale installations	High , potential for small scale to industrial scale operations	
Northern Mosaic	Localized high production . Crop diversity moderate	Localized high potential for industrialized export	Intermediate Potential small scale to large scale installations	High , potential for small scale to industrial scale operations	Sport hunting
Central Basin	Low Localized high production	High potential industrialized export	Low	Low . Unknown potential for hydrocarbons	
Katanga Plateau	Low Localized high production	Low Miombo woodlands over exploited in many areas	High Potential small scale to large scale installations	High . Major industrial development, currently at low production	Livestock, small industry
Mayombe	Moderate to High , Crop diversity moderate	Low . Plantation forestry only real option	High Potential small scale to large scale installations	Low .	Small industry
Southern Sands	Low	Low . Plantation forestry only real option	High Potential small scale to large scale installations	High , potential for small scale to industrial scale operations.. Diamonds	
Riverine	Not applicable	Not applicable	Mainly restricted to headwaters and Lower Congo	Not applicable	Artisinal fisheries
Great Lakes	Not applicable	Not applicable	Not applicable	Not applicable	Fisheries
Peri-Urban	Localized high production , crop diversity high	Low Major Reforestation required in many areas	Not applicable	Not applicable	Development of small scale industrialization

TABLE 7 ECO-DEVELOPMENT ZONES: DEMOGRAPHIC, SOCIO- ECONOMIC CONTEXT AND ECOLOGICAL CONSTRAINTS

<i>Ecological Development Zone</i>	<i>Population density</i>	<i>Socio-economic context</i>	<i>Ecological constraints</i>
Albertine Rift	High to very high	Saturated population density, Inadequate land tenure. History of ethnic conflict. Moderate levels urbanization	Deforestation, erosion and soil fertility loss, destabilization of slopes.
Rift Frontier	Low to high	Rapid demographic expansion associated with agriculture, and mining. Little economic or administrative integration at present. Potential ethnic conflict. Low levels urbanization.	Deforestation, overexploitation of natural resource base
Northern Mosaic	Low	Low density and isolated populations. Very low urbanization.	Overexploitation of natural resource base Loss of wildlife resources
Central Basin	Low	Low population density, concentrated along rivers, Long term declining economic base (collapsed industrial agriculture) Emerging forestry sector. Potential market access via rivers.	Low biological productivity linked to low soil fertility
Katanga Plateau	Low to high	History of industrial-based mining, high rates urbanization	Low biological productivity linked to low soil fertility. Localised pollution.
Mayombe	High	Subsistence hinterland to Kinshasa. Major hydro potential on lower Congo. Moderate to High rates of urbanization	Deforestation, erosion and soil fertility loss, destabilization of slopes.
Southern Sands	Low	Artisinal mining Low levels of urbanization.	Low biological productivity linked to low soil fertility and vulnerability to drought
Riverine	Not applicable	Artisinal fisheries are potentially overexploited in some areas.	Low potential productivity in some basins
Great Lakes	Not applicable	International borders, high potential for fisheries, b ut poorly managed.	Productivity linked to
Peri-Urban	Very high	Poorly developed agricultural, water and transport support for large and impoverished populations	Localized pollution moderate to serious. High demand and poor management threaten water resources. Cities on slopes vulnerable to erosion and landslides.

TABLE 8 ECO-DEVELOPMENT ZONES: BIODIVERSITY AND CONSERVATION CONCERNS

<i>Ecological Development Zone</i>	<i>Biodiversity value</i>	<i>Existing Protected area coverage</i>	<i>Threats</i>	<i>Potential development. Approaches linked to biodiversity conservation</i>
Albertine Rift	High diversity, globally significant endemics	Good. Protection of Itombwe needed	Fragmentation, degradation and loss of natural ecosystems.	Reforestation , Urgent need to conserve remaining natural forests. High potential for community-based integrated conservation and development. Livelihood alternatives to unsustainable natural resource extraction needed.
Rift Frontier	High diversity, globally significant endemics	Good. Buffer zone activities needed around protected areas	Wildlife depletion, deforestation	Natural resource use zoning associated with protected areas. Livelihood alternatives to unsustainable natural resource extraction needed.
Northern Mosaic	Moderate diversity, important wildlife populations	Good. Evaluation and rehabilitation of existing areas needed.	Wildlife depletion, deforestation	Natural resource use zoning associated with protected areas. Livelihood alternatives to unsustainable natural resource extraction needed. High potential for community-based integrated conservation and development. Potential for sport hunting.
Central Basin	Moderate diversity, bonobo critical endemic species	Inadequate. Exploration, evaluation for protection needed in several areas	Wildlife depletion	Livelihood alternatives to unsustainable natural resource extraction. High potential for community-based integrated conservation and development.
Katanga Plateau	Moderate diversity, depleted wildlife populations	Moderate? Evaluation and rehabilitation needed	Wildlife depletion, deforestation. Pollution from mining	Land and natural resource use zoning associated with protected areas. High potential for community-based integrated conservation and development
Mayombe	High diversity, highly threatened ecosystems	Inadequate. Existing sites degraded. Evaluation of potential new sites needed.	Fragmentation, degradation and loss of natural ecosystems	Reforestation, watershed protection. High priority to conserve remaining natural forests. High potential for community-based integrated conservation and development projects.
Southern Sands	Moderate diversity, depleted wildlife populations	Inadequate. Exploration, evaluation for protection needed in several areas	Wildlife depletion, deforestation	Reforestation, watershed protection. High priority to conserve remaining natural forests.
Riverine	High diversity, globally significant endemics	Non-existent. Fisheries management zones needed	Over exploitation of low productivity fisheries.	Artisinal fisheries Assessment and management of fishing activities needed.
Great Lakes	High diversity, globally significant endemics	Non-existent. Fisheries management zones needed	Over fishing, introductions, pollution, degradation of lacustrine-upland link	Fisheries management. Potential integrated development with protected areas.
Peri-Urban	Low diversity with localized exceptions	Non-existent. Urban green zones needed	Erosion, land cover loss, pollution	Watershed and land cover protection. Especially in urban floodplains . Control of pollution and management of refuse.

About 920 km² has been lost on the eastern edge of the main forest block of the western Albertine Rift (DRC's area of greatest diversity) since the mid-1980s. This estimate is based on analysis of Satellite photos by WCS in conjunction with Woods Hole (Plumptre and Laporte personal communication).

With the Albertine Rift being saturated with people in North Kivu, it is critically important to buttress the ICCN efforts throughout the Virunga National Park. Similar efforts are necessary for Kahuzi-Biega National Park and community conservation initiatives must be maintained in the Itombwe Forest. Fortunately, efforts are underway to do just this with help from a variety of donors²³ (Tables 7 to 9). Reforestation and livelihood activities could help take the pressure off the parks but it is evident that people will continue to immigrate to the hinterlands of the Rift Frontier in search of land and opportunity.

5.6.5.2 *Rift Frontier*

The Rift Frontier is loosely defined as 200-400 km wide band of forest extending from the northern edge of the Ituri Forest to the forest edge southwest of Uvira (Figure 18). The area is also known for its high species diversity and endemism²⁴. This eco-development zone is bearing the brunt of emigration from the neighboring Albertine Rift zone and subsequent forest conversion to agriculture. Commercialization of the bushmeat trade has depleted wildlife populations in the eastern sector of this zone (Mapilanga, pers. comm., USFWS study-unpublished and in progress) but significant wildlife populations remain to the west, including within three protected areas (Okapi, Maiko, Kahuzi Biega all of which will receive renewed conservation support from the Congo Basin Partnership through CARPE. Maiko is also proposed for World Bank support.

The zone is rich in minerals (e.g., gold, coltan, cassiterite) and thus suffers from the negative effects of the frontier life of miners who move in large numbers along with rapidly built villages, agriculture and subsistence trade. The fact that the Ministry of Mines has given out mining permits within protected areas (Figure 6) demands urgent attention as such activities are prohibited by law and not compatible with conservation.

It is inevitable that people will continue to immigrate into this eco-development zone but early action could help mitigate the most severe negative effects of the expected mass movements of people. Livelihood projects aimed at sustainable use of natural resources would be appropriate development interventions as long as they were located in such a way as to take pressure off parks and reserves.

The northeastern block of this zone maintains relatively high densities of timber species. Zoning activities aimed at determining appropriate areas for production forest could be most helpful as timber concessions could serve as buffer zones and corridors linking protected areas. Whatever the activities, it will be important to plan for development here instead of letting immigrants take the path of least resistance leaving conservation planners to react to an unfortunate reality.

²³ New projects of significant size include those of UNDP/GEF, EU, CBFP/CARPE, and WB/GEF. All of these have some element of investment in the western Albertine Rift.

²⁴ The Ituri Forest region has the highest number of diurnal primates (13 species) of any forest yet studied in Africa and is also home to the Okapi, the fishing genet, and significant populations of elephant. Examples of well known endemics in Rift Frontier south of the Ituri include Grauer's gorilla, and the Congo Peacock.

5.6.5.3 *Northern Mosaic*

The northern mosaic eco-development zone is relatively sparsely populated and, at least on paper has a rather high percentage of land zoned as protected areas (Garamba, Gangala na Bodio, Maika Penge, Bili Urere). There are locally high levels of agricultural production and apparently good potential for timber exploitation. Perhaps the biggest threat is derived from political instability in neighboring Sudan. Refugees have set up camp adjacent to Garamba National Park²⁵ and have been responsible for high levels of poaching of elephants and other animals within the park. Garamba, as one of DRC five World Heritage Sites (along with Virunga, Kahuzi Beiga, Salonga and Okapi) has retained emergency funding (IRF and UNESCO) throughout the war and has been proposed to receive more substantial funding through a possible WB/GEF project. In addition to Garamba, the Bili Urere Game Reserve covers a vast expanse of land along DRC's northern border with Central African Republic. This reserve has been subject to heavy poaching both before and during the war and needs to be assessed for wildlife conservation value and probably be divided up into areas selected for conservation and others for community development.

In all cases it is necessary to develop community conservation projects surrounding parks and reserves with the express goal of reducing pressure on the park. Furthermore, in the case of reserves, it may be that the most efficient and effective way to manage them will include zoning within the reserve to trace areas of multi-use and clearly differentiate it from areas of strict protection. This must be grass-roots zoning done in close collaboration with the local population. An example of an ongoing zoning project within a protected area is now taking place in the Okapi Faunal Reserve .

5.6.5.4 *Central Basin*

The Central Basin eco-development zone is best known for DRC's second and lesser-known endemic great ape, the bonobo. (The eastern lowland gorilla, or Grauer's gorilla of the Rift and Rift frontier is also endemic) Beyond this species the Central Basin probably harbors the highest density populations of the endemic congo peacock (Van Krunkelsven et al, 2000) and important endemic sub-species of primate (M.Colyn, 1992). However, it has been virtually ignored with respect to biological inventories and at least one area that does not benefit from protection, Lomami-Tshuapa, is believed to be extremely important for biodiversity conservation (Mwinyihali, in preparation). The vast expanse of forest here is extremely important for regional hydrological and global climate cycles²⁶ and that alone justifies and the large size of the only park currently established within this region, the Salonga National Park, the largest forested park in Africa. The Lomako area to the north of Salonga and the Lomami-Tshuapa area to the east are both being considered as locations for additional protected areas. At present Salonga is the only protected area covering (part of) the bonobo range. Lomako and Lomami-Tshuapa would expand the bonobos protection and add diversity both vegetatively and zoologically.

The human population density of this area is relatively low and soils are generally of low fertility. At least the western portion of this forest has served as a hinterland for Kinshasa with enormous

²⁵ Home of the northern race of the white rhinoceros.

²⁶ By virtue of the high forest surface area it represents a very large reservoir of carbon. If the forest is converted to agricultural land or severely degraded, huge amounts of CO₂ would be released, resulting in a significant increase in atmospheric concentrations of this greenhouse gas.

quantities of bushmeat being smoked and shipped on river boats and large canoes with outboards. The bushmeat trade has also entered the Salonga national park where “mamas commerçantes” come up from Kinshasa to purchase full cargos of bushmeat for sale in the city.

One potentially appropriate economic activity here is that of industrialized forestry. Care has to be taken to mitigate against negative secondary effects of timber extraction such as facilitating access and bushmeat trade in remote areas. Strong government zoning and regulation to forestry could be the best use of this lightly populated area and without it, logging will almost certainly happen anyway in an anarchistic fashion leading to forest degradation over time.

5.6.5.5 *Katanga Plateau*

The Katanga Plateau eco-development zone is located in the extreme southeast of DRC and consists of Miombo woodlands and savanna ecosystems but localized gallery forests and swamps are also important. Although no current inventories are proposed, historical information suggests that the most southern “Botte de Sakinia” would be an important area to receive support and eventual protected area status (J.J. Symoens, personal communication, WB PDF proposal). It contains the best DRC example of Miombo woodland.

Further north and west, the Katanga province includes two important, largely savanna, national parks. Upemba dating from 1939 and Kundelungu from 1970, both projected to receive some support through the UNDP/GEF although not from the other major funders who are concentrating their efforts mainly in the forest and to the north. Both of these parks have been heavily poached over the past two decades when they were essentially without significant outside support (d’Huart 1991, Thompson 2000) and it is believed that the local flagship species, the cheetah, may now be extinct within DRC.

The parks require evaluation missions followed by conservation zoning efforts. The Miombo woodlands are reportedly highly degraded but the relative homogeneity of and potential for Miombo woodlands to coppice affords the opportunity to rehabilitate and manage forests for wood production. The zone has been the home to large cattle ranches and is currently the focus of USAID livelihood projects.

5.6.5.6 *Mayombe*

The Mayombe eco-development zone of Bas Congo is anchored by the port city of Matadi to its southwest and Kinshasa to the northeast. With these two major urban centers and with DRC's only port to the sea, it is clear that biodiversity conservation has particular challenges in the region. It has a relatively well-developed transportation network linking the two urban centers and maintaining a high human population density. By virtue of geography, its forests have been subjected to extensive industrialized timber exploitation and are considered highly degraded. The Mayombe zone serves as a hinterland for Kinshasa providing agricultural products as well as much needed fuel wood and charcoal. The high hydroelectric potential of the area is being minimally exploited as Inga dam only operates at 10-15% of capacity and there is the potential for numerous smaller dams.

Two significant protected areas, the Mangrove Reserve at the mouth of the Congo river and the Luki Biosphere Reserve, exist here. Both suffer from neglect and require rehabilitation, including conservation zoning efforts to make them truly functional. Such efforts should be a priority as these

reserves are DRC's only representatives of Mangrove and Mayombe forests. Natural resource management recommendations include efforts at reforestation and watershed protection. Plantation forestry using native timber species like *Terminelia superba* has proven successful here and elsewhere and is a viable option for timber production and reduction of pressure on the natural forest of Luki Reserve.

5.6.5.7 Southern Sands

The Southern Sands eco-development zone represents a band of land characterized by sandy soils sandwiched between the Central Basin to the north and the Katanga Plateau to the southeast (Figure 17). The low fertility soils support relatively low human population densities with the exception of urban areas such as Muji Mayi, Kananga, and Kikwit. The first of these cities serves as a diamond trading center in the mine-rich province of Kasai Orientale. Wildlife populations in the zone have been depleted and people are looking to the northern eco-development zone of the Central Basin for provisioning in bushmeat.

All of the protected areas within this zone need to be inventoried and evaluated both biologically and socio-economically for possible rehabilitation. The current protected areas include the reserves of Luama Kivu, Luama Katanga, Mangai, and Swa Kibulu (Figure 13). None of these are projected to receive outside funding in the near future, nor have they received significant support over the past three decades.

5.6.5.8 Riverine

Rivers and riparian zones not only represent an important ecological region (Figure 1) but are also an extraordinarily important eco-development zone (Table 8) with a particular economic potential both for transport and protein production through fish. They maintain a variable yet high species diversity, including many endemic species and globally significant species. Many protected areas contain important river habitats but protected areas often neglect to manage these. Fishing rights are distributed and not effectively controlled in both the Okapi Faunal Reserve and Salonga National Park.

The fisheries found in DRC's rivers are extremely important for the subsistence of people inhabiting adjacent lands as well as providing incomes to fisherman. At traditional levels of exploitation, these fisheries have been sustainable for generations, however, destructive methods including fishing with dynamite and synthetic poisons have been introduced locally (Inogwabini, in preparation). Efforts in community based management of natural resources such as those being financed by USAID hold promise for long term management and additional efforts are warranted.

5.6.5.9 Great Lakes

The Great Lakes eco-development zone is closely linked to that of the Albertine Rift and, like its terrestrial neighbor, is recognized globally for its extraordinary levels of endemism and diversity of selected taxa, most notably fish. With the exception of Lake Edward, all of the Great Lakes have important urban centers on their banks. Lake Edward is the only one of these lakes to be found in a protected area but all of the lakes serve as important fisheries for the densely populated Albertine Rift zone. Within Virunga National Park, Lake Edward has seen an explosive expansion of its fisheries as

well as those on the banks of the Semiliki River, pulling illegal populations into the park where they build houses and clear land for agriculture (d’Huart and Hart 2000).

Fisheries management is complicated by the fact that all of these lakes represent transboundary eco-development zones and all are considered to suffer from over harvest of fisheries. Lakes bounded by mountains and hills also suffer the effects of poor land management leading to serious erosion problems. Watershed management around these lakes should be given a high priority.

5.6.5.10 *Peri-Urban*

Peri-Urban eco-development zones represent zones occupied by DRC’s major cities (Figure 15). These zones are invariably surrounded by an urban halo of deforestation or habitat conversion that is visible from satellite images (Figure 8). These cities rely on adjacent hinterlands for agricultural products, bushmeat, fish, as well as fuel wood and charcoal. Gallery forests around the cities in the south of the DRC are under particular pressure. Although there have been some projects intended to reduce the negative impact of these cities on the environment (for example plantations set up as part of an EU project in the Bateke plateau east of Kinshasa) few if any of these resources are managed for sustainable yield. While an important source of nutrition, urban agriculture practiced in the major cities can lead to environmental degradation and health problems. Toxicology studies have found high levels of lead in gardens near roads in Kinshasa and the cultivation of land on slopes often leads to erosion and landslides.

6 SUMMARY OF CURRENT DONOR ACTIVITIES IN THE ENVIRONMENT SECTOR

The DRC relies very heavily on international donors and NGO’s for support in the environment sector. Indeed without this sustained support over the past 20 years it is probable that many of the most important protected areas, particularly those in the east of the country, would have ceased to exist by now.

The three tables below present a summary of currently active initiatives providing direct support to ICCN (Table 9), initiatives that are planned to start in the near future (Table 10), and initiatives that have a regional dimension which include the DRC (Table 11).

TABLE 9 CONSERVATION PROJECTS CURRENTLY SUPPORTING ICCN

(adapted from d’Huart, 2003)

Date started	Organisation	Site(s)	Project	Objectives and activities
1984	FZL	Garamba NP	Conservation of white rhinos in Garamba NP	<ul style="list-style-type: none"> • Provision of a light aircraft for surveillance, monitoring, transport.
1987	WCS	Okapi FR	CEFRECOF	<ul style="list-style-type: none"> • Training, research and conservation for forest ecosystems. • Biological inventories, monitoring, zoning,

1988	WWF	Virunga NP	PEVi - Kacheche	<ul style="list-style-type: none"> • Community based natural resource management • public awareness • tree planting, boundary marking, and mapping
1989	GIC	Okapi FR	Conservation of Okapi in the OFR	<ul style="list-style-type: none"> • Support to ICCN • community development • public awareness
1989	IRF (WWF : 89 to 99)	PNG	Conservation of white rhinos the GNP	<ul style="list-style-type: none"> • Support to ICCN • support of field personnel • equipment • research • training
1990	WCS	Maiko NP	Park exploration	<ul style="list-style-type: none"> • Biological exploration • Training in inventory methods • Threats assessment
1991	AWF-FFI-WWF	Virunga NP (south and east) and contiguous p/a in Rwanda & Uganda	International Program for the Conservation of Gorillas (IPGC)	<ul style="list-style-type: none"> • protection of mountain gorillas and their habitat • equipment and training • support to ICCN
1994	GTZ	Kahuzi-Biega NP	Integrated conservation and development in KBNP	<ul style="list-style-type: none"> • Support to ICCN • conservation of gorillas • public awareness • buffer zone development • equipment and training
1994	WCS	Kahuzi-Biega NP, Itombwe Forest	Biological Inventories and Park exploration	<ul style="list-style-type: none"> • Large mammal inventories • Training of ICCN staff in inventory methods • Human use and threats assessment
1998	DFGF (Europe et International)	Virunga NP (north)	Mount Tshiaberimu; Tayna Community Reserve	<ul style="list-style-type: none"> • Support to ICCN • protection of Grauer's gorillas • monitoring • community development, • equipment • public awareness.
1998	Max Planck Institut	Salonga NP (south)	Bonobo research, ethnobotany	<ul style="list-style-type: none"> • support to ICCN • research • training
1998	GTZ	DG ICCN Kinshasa	PARCID	<ul style="list-style-type: none"> • technical and financial support for the restructuring of the ICCN HQ • training • equipment • management.
1999	SZM	Salonga NP	Conservation of bonobos Salonga NP	<ul style="list-style-type: none"> • support to ICCN • equipment • research • biological inventories.
2000	CITES/MIKE (WCS)	VNP, SNP, GNP, KBNP Okapi Res.	Monitoring of elephant populations	<ul style="list-style-type: none"> • surveillance • surveys • inventories • mapping • training

2000	UNESCO/UNF	VNP, SNP, GNP, KBNP, OR	Biodiversity conservation in regions affected by armed conflict: World Heritage sites in DRC.	<ul style="list-style-type: none"> • collaboration with conservation partners on the ground (WCS, WWF, FZS, AWF, FFI,) • payment of bonuses to guards • law enforcement monitoring • community development • equipment • diplomatic missions • creation of a Comité de Coordination du Site” (<i>CoCoSi</i>) at each site to plan and execute site activities. • Creation of a national coordinating structure, “Coalition pour la Conservation au Congo” (<i>CoCoCongo</i>), for overall coordination of conservation activities in DRC.
2000	IUCN	VNP	Parcs for Peace	<ul style="list-style-type: none"> • Collaborative management of trans-boundary protected areas.
2001	WCS	VNP	Biological inventories and monitoring; training	<ul style="list-style-type: none"> • Collaboration to help in biological inventories and training.
2001	Lukuru Wildlife Research Project	SNP (south)	Study on the status of bonobos in south of SNP.	<ul style="list-style-type: none"> • research, logistical support to ICCN.
2001	Nouvelles Approches	KBNP, Upemba NP KundelunguNP	Support to protected areas in DRC.	<ul style="list-style-type: none"> • entomological research, • equipment • support for personnel • improvement of communications.
2002	ACACIA	Mwadingusha Ornithological Reserve	Protection of the reserve and development of tourism.	<ul style="list-style-type: none"> • public awareness • development support • protection.
2002	ZSL	VNP (north)	Support to ICCN	<ul style="list-style-type: none"> • support to ICCN • training • equipment • monitoring.

TABLE 10 PROJECTS UNDER PREPARATION

Organisation	Project	Site(s)	Objectives and activities
European Commission (7m Euros)	Renforcement des capacités de gestion et réhabilitation des aires protégées en République Démocratique du Congo	VNP, SNP, and ICCN and IJZBC headquarters	<ul style="list-style-type: none"> • reestablish control and protection of the unique biodiversity of VNP and SNP • restructure, equip and train site staff in • rehabilitate key infrastructures in PNVi and PNS, as well as 2 other sites close to Kinshasa (Bombolo Mbene Reserve and Kisantu Botanic Gardens) in order to allow ICCN and its sister organisation IJZBC to generate revenue and attain a certain degree of financial autonomy • support for relocation of displaced families resident in the PNVi and support for community development activities in the communities bordering the two parks

			²⁷ <ul style="list-style-type: none"> • achieve administrative reunification of ICCN in the post war period • favor transfrontier collaboration for the management of the contiguous protected areas in Rwanda and Uganda • ensure coordination of activities of NGO's and other funding agencies supporting conservation initiatives in the DRC
European Commission (2m Euros for the DRC component)	Appui régional à l'Ecole National des Eaux et Forêts (Gabon), et Ecole Régionale d'Aménagement Intégré des Forêts Tropicales (DRC)	ERAIFT (DRC) ENEF (Gabon)	<ul style="list-style-type: none"> • capacity building through support to post university training in natural resource management.
PNUD (7,8 m \$US)	Réhabilitation des aires protégées en République Démocratique du Congo	ICCN (hq and all sites)	<ul style="list-style-type: none"> • support a process of institutional restructuring of ICCN • re-establish basic operational activities in protected area network. • Associate local communities in the management process of protected areas
World Bank	Projet National Forêts et Conservation de la Nature	MinAFET and ICCN, selected field sites (to be determined)	<ul style="list-style-type: none"> • support to MinAFET and ICCN • assistance for the rehabilitation of a number of national parks of high biodiversity value. • As the program has similar objectives to those of the PNUD, the EC and UNESCO a concerted and coordinated approach is necessary.
French Cooperation	Implementation with the EU programme	VNP	<ul style="list-style-type: none"> • Support to the communities living in the buffer zones of the VNP.
WWF / Université de Gembloux	Réseau de partenariat pour la gestion durable des forêts d'Afrique cent.	Bas Congo and Bandundu	<ul style="list-style-type: none"> • Collaboration with the 2 timber concessions in support of sustainable forest management and certification

²⁷ The EC's agriculture program (Contribution à la relance de la production agricole) also plans to support the process of resettlement of the people currently occupying the Virunga National Park.

TABLE 11 PROJECTS / ORGANISATIONS WITH REGIONAL DIMENSIONS WHICH INCLUDE THE DRC

Organisation	Partners	Site(s)	Objectives and activities
ECOFAC (Programme régional de conservation et utilisation rationnelle des écosystèmes forestiers en Afrique centrale)	European Commission, central African governments	A network of the following protected areas: Salonga and Virunga NP (DRC), Odzala NP (Congo Rep.), Lopé NP (Gabon), Dja Reserve (Cameroon), Monte Alen NP (Equatorial Guinea), Obo NP (Sao Tomé and Principe), Ngotto Forest (Central African Rep), Sangha-Gounda-St. Floris complex (Central African Rep).	<ul style="list-style-type: none"> • support to protected area management • capacity building • monitoring • revenue generation for local communities through natural resource use (tourism, sport hunting) • Regional collaboration and integration for natural resource management
COMIFAC (Conférence des Ministres Chargés des Forêts d'Afrique Centrale)	Central African governments in partnership with international funding agencies and NGOs.	Central Africa (DRC, Congo Rep, Gabon, Cameroun, Equatorial Guinea, CAR, Chad, Rwanda, Burundi, ...)	<ul style="list-style-type: none"> • Emanation of Heads of State Summit held in Yaoundé in March 1999 on the conservation and sustainable development of forests • The strategic plan developed by COMIFAC is the <i>Plan de Convergence</i>. It identifies a number of national and transborder priority actions. • The DRC's national priorities have been integrated into the <i>Plan de Convergence</i>
CBFP (Congo Basin Forest Partnership) (53m \$US over 3 years)	CARPE partners (international funding agencies and NGOs)	11 landscapes in the Congo basin forest zone (of which 5 are in DRC): <i>Lac Tele - Lac Tumba Swamp Forest Landscape</i> : Lac Tele / Lac Tumba (Congo and DRC) <i>Maringa / Lopori - Wamba Forest Landscape</i> : Maringa - Lopori - Wamba (DRC) <i>Salonga - Lukenie - Sankuru Forest Landscape</i> : Salonga (DRC) <i>Maiko - Lutunguru Tayna - Kahuzi Biega Forest Landscape</i> : Maiko / Lutunguru / Tanya / Kahuzi-Biega (DRC) <i>Ituri - Epulu - Aru Forest Landscape</i> : Okapi (DRC) <i>Gamba - Conkouati Forest Landscape</i> : Petit Loango / Moukalaba / Mt. Doudou - Conkouati (Gabon, Congo and DRC) <i>Bateke Plateau Forest Savanna Landscape</i> : Mpassa / Haute Ogoué (Congo and Gabon) <i>Monte Alen - Mont de Cristal Inselbergs</i> : Mbe / Mt. Seni (Gabon and Equatorial Guinea) <i>Lope - Chaillu - Louesse Forest Landscape</i> : Lope / Waka / Dimonika (Gabon, Congo) <i>Dja - Minkebe - Odzala Tri-national Forest Landscape</i> : Boumba Bek - Nki / Minkebe /	<ul style="list-style-type: none"> • Support to management of protected areas • Buffer zone management • Community development • Capacity building • Monitoring

		Loudie - Louye / Langoue - Ivindo / Odzala (Cameroon, Congo and Gabon) <i>Sangha Tri-national Forest Landscape:</i> Dzanga Sangha / Nouabale Ndoki / Lobeke (Cameroon, Congo and Central African Republic)	
RAPAC: (Réseau des Aires Protégées d'Afrique Centrale)	EC, France (FFEM)	Central Africa (DRC, Congo Rep., Cameroon, Gabon, Equatorial Guinea, Sao Tome and Principe, Central African Rep., Chad)	<ul style="list-style-type: none"> • capitalize on achievements of 11 year old EC-funded ECOFAC program • promote the development of protected areas in central Africa • federate the various partners supporting conservation in the region • ICCN is represented on the Conseil d'Administration (Board of Directors).
OSFAC: (Observatoire des forêts d'Afrique Centrale)	ADIE, EC, World Bank	Central Africa	<ul style="list-style-type: none"> • strengthen capacities of central African states to implement their forest legislations • assembling, in partnership with national and international institutions, data on central African forests (biodiversity, threats, and legal measures in force).
MIKE (Monitoring of Illegal Killing of Elephants)	African and Asian elephant range states, with funding from EC, USFWS and NGO's (notably WCS)	African and Asian elephant range states	<ul style="list-style-type: none"> • supply the governments of elephant range states with information which will help them develop and implement effective policies of management of elephant populations. • DRC's 5 World Heritage Sites are have been selected as MIKE sites where elephant monitoring programs will be implemented
GRASP (Great Apes Survival Project Partnership)	African and Asian great ape range states, UNEP, NGO's	African and Asian great ape range states	<ul style="list-style-type: none"> • reduce the threats to the great apes: bonobo, gorillas, chimpanzees and (in Asia) the orang utan. • in partnership with the range states and a number of other partners (which ones??) the GRASP program aims to raise funds to finance a series of priority projects that have been developed by each country

7 REVIEW OF USAID STRATEGIC OBJECTIVES IN VIEW OF THREATS TO BIODIVERSITY AND TROPICAL FORESTS

7.1 Strategic Objectives

7.1.1 *Use of Key Health Services in Both USAID-Supported Health Zones and at the National Level Increased*

No matter how one measures it, DRC's health indicators are among the worst in the world. Malaria, measles, neonatal tetanus, and prevalence of water born diseases all pose significant health risks to children and are major causes of mortality. Malnutrition, tuberculosis and other infectious diseases (including HIV/AIDS) pose additional significant health problems. USAID has a long and remarkably successful track record of working with rural health zones to improve the health status of impoverished people in the DRC. Unfortunately the recent political instability and war has led to major setbacks in the health arena. USAID proposes to continue to work within the Health Zone system of DRC and to expand their program beyond the 91 health zones within which they presently work. USAID's program will strive to achieve the following interim results over the course of their strategic plan: IR 1, Increased availability of key health services and practices; IR 2, Improved financial access to key health services; IR 3, Enhanced quality of key health services; IR 4, Increased awareness and practice of healthy behaviors; IR 5, Increased use of key HIV/AIDS prevention, care and support services and practices.

7.1.1.1 *Threats and Opportunities*

The direct link between this program and threats and opportunities with respect to biodiversity and tropical forests are relatively minor. Health zones would be expected to take appropriate precautions when disposing of hospital and other waste. While incinerators are likely not available in most health zones, burning combustible waste at a site sufficiently removed from people would be appropriate. Burying of glass, needles and other noncombustible waste must be done in deep pits far removed from human habitations, areas important for biodiversity conservation, and slopes prone to erosion. One would also expect sufficient care would be taken to avoid inadvertent negative environmental impacts due to construction (e.g., erosion). The indirect link, however, is much more profound. Human population growth rates in eastern DRC in the areas bordering Uganda and Rwanda are among the highest in Africa. This area also happens to be one of the most important areas for biodiversity conservation in Africa. Be it birds, plants, fish, or mammals, the Albertine Rift region has phenomenal rates of endemism and extraordinarily high levels of diversity. The human population places tremendous pressure on the environment for land conversion to agriculture and harvesting of wood for fuel. The USAID HIV/AIDS prevention program could provide an opportunity to become involved in family planning activities. Such activities would not only be expected to have positive impacts on the environment but also improve the overall health and economic status of the families involved.

Placement of health facilities is also critical and a major factor in the distribution of population centers. This can be either positive or negative with respect to biodiversity conservation. A major health center within a protected area (or logging concession) would pull immigrants into the protected area (or concession). But it is also true that at a distance of 30 to 60 km a health center could encourage emigration from the protected area of potential poachers, miners, etc. and thus have

an important positive impact. This might be considered in future collaborations between USAID funded health programs and CBFP. When such synergies are sought, it is important that local people be made aware that the presence of the protected area is one reason for the health center financing. It is important that people get a feeling for some of the positive benefits of protected areas as opposed to simply thinking of them in terms of restrictions.

7.2 A Successful Democratic Transition Promoted

For all intents and purposes, the people of the Democratic Republic of Congo have never experienced life in a democracy or known what it means to live under the rule of law. Recent wars have only exacerbated a bad situation in this regard and led to the death of millions of innocent people. The recent peace process has led to the formation of a transition government that brings together many of the Congolese warring factions with the goal of moving towards fair and free elections over the next three years. Substantial work must be completed in order to prepare for elections and life in a society where people can expect to experience the freedoms afforded by a democracy. The goal of USAID's Democracy and Governance program is to support the nascent justice, political, electoral and legislative reforms and institutions now being developed in order to realize a successful transition from conflict to sound governance based on democratic principles of participation, representation, and accountability.

The USAID program centers around three objectives: 1, Helping to establish internal security and stability and human rights protection; 2, Supporting the development of transitional political processes and institutions in order to promote accountable, representative and effective government at the local, regional and national levels; 2, Improving communications and access to information. USAID's implementation mechanism revolves around funding a variety of NGOs with on the ground experience to implement field based activities.

7.2.1 Threats and Opportunities

Good governance, the rule of law, and the ability to participate in the selection of individuals called upon to make policy and decisions that both affect the quality of daily life and set the course for the future are extremely important for environmental management. Assuming the thoughtful implementation of governance activities these should enhance the long term protection of biodiversity and maintenance of forest cover. Nevertheless, governments do have the right and obligation to set a national policy and promulgate and enforce laws that provide for the long term protection and sustainable use of biodiversity and forest resources. While communities must be afforded the opportunity to participate in decisions that affect them, there will none the less be rules, regulations and laws written with long term sustainability in mind that are unpopular in selected communities.

The government has recently or is currently considering rewriting laws on mining, forestry, nature conservation, and land title with careful consideration of balancing long term economic and sustainability interests while at the same time affording communities the opportunity to participate in activities such as zoning. Governance activities should enhance community participation in efforts such as zoning while at the same time help communities understand the process by which decisions

are made that are in the interest of the nation but not necessarily in the short term interests of a particular group of individuals.

An example of how USAID funded governance activities could make a positive impact in this arena lies with the new forestry law. The forestry code was signed into law in August 2002 and the rules and regulations implementing the law are currently being written. The law provides for community participation in zoning areas for timber production and requires timber companies, through a cahier de charge (an official document listing the rights and responsibilities of the timber company managing the concession) to list social obligations such as the construction of schools and health centers. While this is not an aspect that the USAID mission is planning to work on, the Governance programs located adjacent to timber lands could facilitate community participation in these activities. In addition, the law calls for the sharing of revenues generated from the surface area tax applied to timber concessions. These will amount to substantial revenues to be shared at both the provincial and local government levels. Governance activities could help assure the correct transfer of funds to the local level. At the same time, they should help communities understand that the laws/rules governing timber concessions are to be respected and that the arrival of a concession is not an invitation to use company infrastructures to facilitate the commercialization of the bush meat trade. Communities should also be helped to understand that once zoned as a forest concession, land is off limits for agricultural activities.

An additional environmental concern with this program involves access to remote areas. USAID governance activities are apparently facilitating, albeit in a minor way, access and transportation into remote areas within the forest via the river network. Implementing parties of governance activities should make sure that the project transportation infrastructure (i.e. boats and vehicles) is not used to facilitate the commercialization of the bush meat trade or the overexploitation of fish resources. This can be avoided by having and enforcing strict rules and regulations prohibiting project boat captains and drivers of vehicles from transporting these and other forest products²⁸.

7.3 Rural Incomes Increased in Targeted Areas

Be it recommended daily caloric intake, median daily income, comparison of agricultural growth rate to population growth rate, or any other measure of the economic and/or livelihood status of the people of DRC, it is clear that the people of the country are on the edge of what human dignity can endure. The World Bank recognizes that the potential for short-term economic growth in the GDRC economy lies with the agricultural sector. In order to promote the economy's productive sectors and exports, the GDRC has opted to play a regulatory role that supports private initiatives in the agriculture, livestock, fishing, mining, forestry, services and commerce growth sectors of the economy as part of the Poverty Reduction Strategy Paper (PRSP). Along these lines, USAID has chosen to work towards achieving three interim results: IR 1, Increased agricultural production; IR 2, Improved access to markets along selected corridors; IR 3, Improved access to financial services.

²⁸ This is analogous to what timber companies have been pressured to do with respect to controlling the role they have unwittingly played in the bush meat trade. In many areas it is the drivers and other employees of these companies that hire hunters and then transport bush meat out of concessions. Many timber companies are now addressing this issue in neighboring countries and have a strict code of conduct that employees are required to adhere to.....with severe sanctions, including being fired if rules are broken.

The mission will work towards these objectives by initially working in the provinces of Bandundu, Equateur, and Katanga.

7.3.1 Threats and Opportunities

Work in the agriculture sector is critically important to improving the well being and economic status of those who need it the most. USAID livelihood projects have the opportunity to enhance the long term protection of biodiversity and tropical forests by promoting sustainable use. Activities can also help orient people away from critical protected areas as well as other areas highlighted as important for conservation. At the same time, livelihood projects that do not plan for possible negative environmental consequences run the risk of contributing to the degradation and/or loss of forest cover and biodiversity.

The livelihoods strategic plan states that the program intends to improve transportation networks in selected areas with the intention of improving access to markets for agricultural goods. While absolutely essential to improving the economic status and well being of isolated rural populations, such activities could have a negative effect on the environment, facilitating the overexploitation of natural resources by bringing down transportation costs for bush meat as well as facilitating human immigration into remote regions. This is particularly important as the USAID livelihoods program is working in a CBFP landscape in the Province of Equateur. Community based natural resource management efforts are a critical component of the biodiversity conservation puzzle. However, improving transportation infrastructure here could have negative effects such as facilitating the commercial bush meat trade. This is important to keep in mind, as there has never been a case of sustainable harvest of bush meat when trade has been commercialized (L. Bennett, personal communication). To the extent that facilitating human movement between commercial centers and remote areas is a component of this or any livelihood project working in or adjacent to areas of high biodiversity importance, measures should be taken to mitigate such potential problems. It is critical that the ICCN and the Ministry of Forests (responsible for managing biosphere reserves) be contacted and brought into the planning process when such activities are to be undertaken. This will not only help avoid unintended consequences but could play a positive role by acknowledging the importance of protected areas. It is also imperative that vehicles and boats managed by USAID funded projects not transport bushmeat.

7.4 Improving Basic Education. Especially for Girls, in Targeted Areas in DRC

While the GDRC was close to attaining universal primary education nearly thirty years ago, in the 2001-2002 school year enrollment was only 55%. The situation can only be characterized as bad for all children and it is particularly bad for girls. Statistics indicate that fewer than 10% of all girls complete five years of primary education. Schools were closed throughout most of the country in 1991 after the GDRC failed to pay teachers and now parents are forced to shoulder the entire burden of supporting schools directly. The state of the education system undermines efforts to create viable, long-term structures that will enable Congolese to enjoy better health, nutrition, sanitation, and higher incomes. As part of an effort to improve the overall status of the Congolese, USAID proposes to intervene in the education arena and strive towards meeting the following interim results: IR 1, Improved quality of basic education, particularly for girls, through innovative, community-based

programs; IR 2, Improved community participation in basic education; IR 3, Increased access, retention, and achievement among girls.

7.4.1 Threats and Opportunities

There are few if any negative impacts that can be envisioned by this USAID program with respect to the environment in general and biodiversity and tropical forests in particular. In contrast, improving the education level of the Congolese people in general and girls in particular is key to improving their economic status as well as understanding their relationship to the global economy. This should have positive impacts on the environment. Further, the program's intention to incorporate environmental education into curricula and its activities and to strengthen links to the CARPE program will have positive long term impacts on the environment. The use of radio as an environmental extension tool has had positive impacts in DRC in the past (e.g., Ituri Forest, N. Kivu) such that the mission's consideration of such activities are viewed in a positive light with respect to the protection of biodiversity and tropical forest conservation. Incorporating environmental lessons into their internet training activities should have similarly positive impacts.

7.5 A Comprehensive DDRRR Program Functional and Operational in the DRC

The Democratic Republic of Congo is in critical yet fragile phase in its history as it transitions from a state of war where numerous foreign armies, rebel groups and irregular militias scrambled for power and resources. While reliable numbers may be hard to come by, the best estimates are that up to 150,000 armed members of the various factions remain in the countryside. The process of determining who and how many combatants enter the unified army is highly political but it is clear that some 70,000 individuals will require demobilization. In a coordinated yet independent effort with other donors, USAID proposes to participate in three areas:

1. Participate in the planning process to develop a national demobilization and reintegration strategy
2. Reintegration of irregular groups
3. Reintegration of regular groups.

The strategies employed to reintegrate regular and irregular forces will be decidedly different. In the first instance, some sort of symbolic cash payment may be made to individuals leaving the regular military. However, reintegration programs will center on offering individuals a menu of options that may include participating in some sort of community corps or the opportunity to enroll in a variety of educational programs. Children under the age of 16 will receive counseling and be assisted to return to school.

In contrast, the reintegration of irregular forces will be geographically based. Broad based programs will be implemented with the objective of collecting guns and finding productive things for individuals to do in the community in which they are found. USAID will only deal with Congolese soldiers and will not undertake any reintegration activities with Interahamwe or other foreign combatants wishing to remain in DRC. Children here will be dealt with in the same manner as those having fought with the regular military.

7.5.1 Threats and Opportunities

Much of the combat that has taken place over the course of the recent war has taken place in or adjacent to some of the most important areas for biodiversity conservation in Africa: Virunga National Park, Kahuzi-Biega National Park, Maiko National Park, Salonga National Park, the Okapi Wildlife Reserve, and the Itombwe Forest. All factions have been implicated with pillaging resources including ivory poaching, mining (colton, cassiterite, diamonds, and gold), and bushmeat hunting both within and outside protected areas. In addition, the instability within the regions of eastern DRC has facilitated the occupation of protected areas for cattle farming (KBNP) and the exploitation of forests for charcoal production.

Given the geographic position of the various warring factions in relation to key protected areas at the end of hostilities and the fact that the majority of the combatants will be demobilized, the locations of reintegration activities and how they are undertaken will be critical to the future viability of critical areas for biodiversity conservation and the protection of tropical forests in Africa.

The USAID mission is cognizant of these facts and appears to be doing everything within its power to design and orient activities away from areas deemed important for biodiversity protection. Further, if properly implemented these activities could help take pressure off these areas and actually improve the prognosis of successful long term conservation of these areas. This is due to the fact that many of the current pressures are directly related to military, armed irregulars, and rural militias. It will be critically important that NGOs financed to assist in reintegration activities be aware of the proximity of national parks, reserves and other areas of critical ecological value and contact protected area managers. The environmental record of organizations undertaking humanitarian relief in eastern DRC in response to the genocide in Rwanda and the war in DRC has been mixed. There have been both cases of exemplary coordination as well as those where NGOs have shown a complete disregard for protected areas. It will be important for those undertaking public works activities or offering assistance through more traditional development activities to take the necessary precautions to reduce the negative impacts on biodiversity and tropical forests.

PART 2:

TROPICAL FORESTS AND BIODIVERSITY FAA 118/119 ASSESSMENT

8 EXECUTIVE SUMMARY

See the text of the Executive Summary of Part 1 of this document.

9 BACKGROUND

This section provides a tropical forests and biodiversity analysis as required by Sections 118 and 119 of the Foreign Assistance Act (FAA) Guidelines for US government agencies working abroad. This is prepared as the second part of an Environmental Threats and Opportunities Analysis (ETOA) prepared on behalf of USAID Kinshasa, DRC and USAID Washington. The teams approach is outlined in Part 1 of this document and consisted of an extended stay in DRC by team members each of whom has over a decade of experience working in conservation and development in DRC. As much of the information in this report is covered in Part 1 of this document, repetition is avoided as much as possible and relevant sections are referenced. The two sections are intended to compliment one another; however, the threats analysis takes a decidedly different approach between sections. The first section describes threats in relation to eco-development zones while the second section addresses specific threats to tropical forests and biodiversity.

10 TROPICAL FORESTS IN THE CENTRAL AFRICAN REGION

10.1 DRC Tropical Forest Overview

The Democratic Republic of Congo possesses over 50% of Africa's tropical forests and is second only to Brazil in terms of countries ranked by surface area covered by tropical forest. By virtue of its tremendous biomass, DRC's forest are important in helping to maintain global climatic and chemical cycles in that conversion of its forests to agricultural land will result in an extraordinary increase in atmospheric carbon dioxide (CO₂), dramatically impacting efforts to combat global warming. In addition, DRC's forests help drive both regional and local weather patterns. Indeed as over 50% of the rainfall received in the region results from local cycling of water through evapotranspiration, loss of forest cover will result in both less precipitation and an increase in the severity of droughts. Finally, millions of people make their home in DRC's forests, using it for the construction of shelter, harvesting food stuffs, and as a source of spirituality.

DRC's forests are diverse systems at both the ecosystem and floristic levels (see pp 18-20). While there are a variety of different ways of dividing DRC's forests, it is clear from table 3.1 that there are a number of major divisions. Even within vegetative formations, there are a variety of different forest types and floristic associations. Within a given forest type forests typically contain over 120 species > 10 cm diameter at breast height (dbh) per ha (see e.g., Hart, 2001). DRC's forests are far from homogenous as evidenced by the differential distribution of important timber species. For example, *Wenge* (*Miletia laurenti*) is found in relatively high densities on poorly drained and swamp soils in Bandundu, *Limba* (*Terminalia superba*) is found in high densities in the semi-deciduous forests of the Mayombe in Bas Congo, relatively high concentrations of *Afromosia*

(*Pericosios elata*) are found in the forest northeast of Kisangani in Oriental Province, and Sapele (*Entandrophragma cylindricum*), while occurring throughout the forest in the central Congo basin south of the Congo river is found in relatively high densities in the semi-deciduous forests of northeastern DRC, often in association with both Iroko (*Milicia excelsa*) and the true African mahogany (*Khaya* spp.).

TABLE 12 AREA COVERED BY PRINCIPAL VEGETATIVE FORMATIONS IN THE DEMOCRATIC REPUBLIC OF CONGO.

VEGETATIVE FORMATION	AREA (Km ²)	% TOTAL FOREST AREA	% NATIONAL TERRITORY
Closed equatorial forest (evergreen and semi-deciduous)	872.251,16	68,14	37,20
Mountain forest			
- Closed mountain forest	38.612,39	3,01	1,65
- Bamboo forest	1.666,72	0,13	0,07
Open equatorial forest			
- Dry forest	51.946,17	4,06	2,22
- Open forest (Miombo)	102.225,61	7,99	4,36
Flooded forest	88.614,08	6,92	3,78
Gallery forest	2.500,05	0,19	0,11
Mangrove forest	555,07	0,04	0,02
Secondary forest	121.670,70	9,54	5,19
TOTAL FOREST	1.280.042,46	100,00	54,59
Forest-savanna mosaic	165.838,83		7,07
Plantations	555,57		0,02
Savannas, grass and wooded	768.358,82		32,77
Water	62.502,24		2,67
Un-interpretable (clouds)	67.502,24		2,88
COUNTRY TOTAL	2.344.800,00		100,00

Source : SPIAF, 1995 ; Synthetic forest map

10.2 Threats to Tropical Forests in DRC

The threats posed to tropical forests in DRC are discussed in Part 1 of this document in the section titled “Threats to Forest Integrity and Biodiversity” (pp 67-73). Specific subheadings include “threats posed by increased forest access”, “threats posed by lack of trained personnel”, and “threats posed by inappropriate management strategies”. Additional threats are addressed in the “Threats” where the subject is treated by eco-development region. Here the topics of deforestation, commercial logging, roads, and management issues and risks are further discussed in view of threats as these threats have been identified by Buzzard (2002) as being particularly important in Central Africa.

10.2.1 Deforestation

Environmentalists, ecologists, and other concerned parties have been calling the attention of the world's population to the problems posed by tropical deforestation for over two decades. While the debate continues in some circles as to whether or not the decrease in return time and increase in severity of El Nino events and droughts as well as concurrent increases in global warming have actually occurred, the fact that there have been highly variable local, regional, and global weather patterns in recent years cannot be denied. Further, the vast tracts of tropical forest that have been lost in Central and South America, Asia, and West Africa have made a substantial contribution to atmospheric increases in CO₂, a major greenhouse gas.

In 1992 FAO found deforestation rates in Central Africa to be on the order of 0.5 percent per year, representing a forest conversion of some 114,000 km² for the decade ending in 1990 (Buzzard, 2002). While the forests of DRC's central basin are relatively sparsely populated (Figure 3, Part 1), at an estimated annual human population growth rate of over 3.3% for the past two decades, eastern DRC's population has exploded. The wave of deforestation caused by this extraordinary growth is visible in satellite images (Figure 8, Part 1) and discussed in relation to the Albertine Rift and Rift Frontier eco-development zones (pages 89-94). One cannot emphasize enough the fact that DRC's forest biodiversity is not distributed equally and that these two eco-development zones - Albertine Rift and the Rift Frontier - happen to be two of the most important regions for biodiversity conservation in Africa, if not the world. Thus the loss in terms forest cover here and its contribution to global warming and climate change is by no means equivalent to the absolutely tragic loss of biodiversity that is presently underway.

It must be emphasized that it is the rate of change that is the most alarming in DRC. As the human population of DRC has gone from approximately 40 million in 1990 to somewhere on the order of 60 million people today, it is expected to roughly double in the next 20 years and become on the order of 120 million people (USAID DRC 2002). Given the agrarian lifestyle of eastern DRC's population as well as its reliance on fuel wood and charcoal for cooking, one should expect analogous rates of forest loss here. As discussed in Part 1 of this document (Box 5.3, p68 and "Threats to Tropical Forest and Biodiversity" pages 88-98), the ability to manage population growth and agricultural expansion will be essential to minimizing loss of biodiversity and forest cover.

10.2.2 Commercial Logging

More than anything else, geography has thus far spared most of DRC's forests from bearing the brunt of commercial logging. The approximately 200 km of waterfalls and rapids between Stanley Pool and the port of Matadi make it impossible to float logs down the river to the port and thus require increased transportation costs imposed by transferring timber to road and rail. Similarly transportation costs to ship wood from eastern DRC's forests 1000 km or more to the port of Mombasa, Kenya make it an expensive proposition to export timber (see Part 1, "Obstacles to Increasing Future Timber Production" section, pages 64-67). While table 10 depicts a dramatic reduction in timber production as the result of war and political instability, it is worth noting that even in 1992, DRC reported timber export volumes of only 330,300 m³ of wood. This pales in comparison with export volumes on the order of 2 million m³ of wood for each of the Republic of Congo and Gabon (FAO 2000). The fact that these neighbors that only possess a fraction of DRC's forest each exported well over \$100 million worth of timber (Gabon exported over \$300 million) as

compared to DRC’s \$11 million in 2000 is a dramatic indication of the lack of development of this important economic sector.

TABLE 13 CHANGE IN NUMBER OF TIMBER COMPANIES AND DECLARED VOLUMES FOR THE PERIOD BETWEEN 1992-2002.

YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Number of companies	28	28	25	22	25	18	16	16	12	13	11
Declared volume (m ³ x1000)	330	287	272	225	308	257	262	34	62	38	44

Direction de la Gestion Forestière (2003)

As stated in Part 1 of this document (“Forests and Timber Exploitation” pages 61-67), the GDRC is well aware of the potential economic potential of the forest sector and, in consultation with a number of donors, is undertaking efforts to increase timber production. In order to move towards sustainable development in this sector, the GDRC has reformed its forestry code and is developing plans for pilot zoning projects that would work with stakeholders to determine production forest zones in areas of high timber production and/or high human population growth. Concurrent with development of the forestry sector are plans for buttressing the protected areas network (see Part 1, “Summary of Current Donor Activities in the Environment Sector”, pages 99-104)

10.2.3 Roads

Buzzard (2002) discusses the threat of roads to tropical forest conservation in view of an analysis of the importance of logging roads in Cameroon undertaken by Minnemeyer et al. (2002). The thesis apparently is that many areas believed to be “low access” or roadless may in fact be accessible by logging roads. Indeed the threats posed by logging roads with respect to facilitating immigration, forest fragmentation, and commercialization of the bushmeat trade are much discussed in conservation circles and addressed in Part 1 (“Forests and Timber Exploitation”, pages 61-73; and “Threats to Biodiversity and Tropical Forests”, pages 88-98) and Part 2 below.

Part of the legacy of the Mobutu era in DRC is a complete neglect of all but the most important roads. This is generally believed to have been a strategic decision by the former dictator to make it difficult for potential aggressors (be it rebellious populations or invading armies) to advance on his strongholds and take over the country. As there was a relatively well developed road network at independence²⁹ (that continues to be represented on maps), studies undertaken to depict wilderness areas in Central Africa based on road networks have understated the importance of DRC. In contrast, river transportation has been the major mode of access to remote forests here. River boats have long been transporters of bushmeat from the forest to important urban areas and threats posed by bushmeat trade are treated elsewhere in this document (Part 1, “Threats to Biodiversity and Tropical Forests” pages 88-98; Part 2, “Biodiversity in the DRC” pages 117-119).

²⁹ The word “relative” is important here as the transportation network of the former Belgian Congo is considered to have been poorly developed and only established to the extent that it could facilitate extractive activities. The network nevertheless deteriorated after independence.

10.2.4 Management issues and risks

Risks associated with forest management are discussed extensively in Part 1, in the section titled “Forests and Timber Exploitation” (pages 61-73).

10.3 Analysis of Actions necessary to Achieve Conservation and Sustainable Management of Tropical Forests in DRC

In a FAA 118/119 Analysis of the Central African Program for the Environment, Buzzard (2002) puts forth 9 areas within which actions should be taken to work towards conservation and sustainable management of forests within the Congo Basin. Her analysis serves as a useful framework to discuss the same subject with respect to DRC.

- *Strengthen policy and institutions:* The fact that political and institutional factors play a critical part in the management of forest resources has been recognized by both the GDRC and donors. The World Bank is developing a loan package aimed at reforming relevant forestry laws in DRC (e.g., forestry code) and to help create a coordination office within the Ministry of Environment (along with help from FAO), in order to work with other Ministries on issues related to forest policy as well as travel throughout the country to meet with stakeholders. Nonetheless, some actors are apparently working against such reforms such that donors must remain vigilant.
- *Assist parties to honor legal/management commitments:* Buzzard (2002) points out that it has been noted that forest degradation would be significantly slowed around the world if governments and industry were to actually implement commitments they have made – locally, nationally and internationally -- to manage and protect their forests (Global Forest Watch 2002). While many countries have taken great strides in enacting laws to protect their forests, in many places regulations are simply not enforced. These points are pertinent to the DRC.
- *Combat illegal logging:* Measures to combat illegal logging include improved monitoring, improving governance and accountability and involving communities. In the DRC, even the government documents refer to timber production figures as “reported” data with the implication that significant production goes unreported (Batunyi and Mbala, 2003). As the GDRC moves to increase timber production, the International Tropical Timber Organization (ITTO) recommendations cited by Buzzard (2002) are worth recalling:
 1. Develop and implement effective monitoring systems that include the use of log-tracking, remote sensing and field investigations
 2. Provide capacity building and training to communities, non-government groups and law enforcement agencies in various monitoring approaches and tools
 3. Develop regional data sharing programs to help identify problem areas that need to be targeted for enforcement
 4. Support and undertake research on the nature, extent, causes and impacts of illegal logging and on potential solutions.

- *Promote community participation:* Community participation and the involvement of civil society are key elements to achieving conservation and sustainable management of tropical forests. These have often been overlooked. The new forestry code in the DRC makes specific reference to the need to work with local communities to determine areas suitable for timber production zoning as well as to assure both secure tax revenue for these communities and require timber companies to undertake locally agreed upon actions to improve the livelihood of local communities (e.g., construct schools and health centers). Donors could facilitate this process through governance activities.
- *Land Use Planning:* Land use plans, and/or appropriate land use policy development can provide for a more integrated land use for forests and adjacent lands. Communities should be involved in this process as stakeholders. The new forestry code requires zoning activities to be undertaken with local communities prior to issuing new timber concessions. The World Bank is currently working with government to choose areas for pilot studies and early indications suggest that CBFP landscapes could make ideal sites for such activities.
- *Improved monitoring and data analysis:* Improved data and capacity are necessary to improve understanding of economic and ecological alternatives with regard to forest management and utilization. Steps must be taken to improve decision-making, based on sound data, and in the absence of corruption. A multi-donor program “SYGIAP” is currently underway to improve geographic information systems (GIS) capacity in the ICCN and partner organizations, including SPIAF (the forest inventory branch of the Ministry of the Environment). The fact that ICCN is part of the coordination office in the Ministry of the Environment should theoretically facilitate information exchange. However, it is important that efforts to improve data analysis and information exchange continue and that crucial Ministries (e.g. Mines) be included in the process.
- *Reform forest concession systems and management:* Buzzard (2002) points out the need to reform systems for awarding forest concessions. The new forestry code has gone a long way to addressing concerns with the granting of timber concessions (Part 1, “Forests and Timber Exploitation” pages 61-73). However, it is apparent and not surprising that some individuals are not happy with these reforms and may be working against them. It is imperative that legislative reforms be implemented (the rules and regulations implementing the forestry code need to be promulgated) and monitored.
- *Halt forest corruption:* Steps must be taken to halt corruption in the forestry sector, and help to curb its associated environmental effects.
- *Adopt a transboundary watershed approach to planning and management:* Buzzard (2002) suggests that in order to protect and sustainably manage tropical forests in the Congo Basin, it is important to recognize the Congo River Basin as a unique watershed that requires integrated management cross-sectorally and at many levels. It is indeed important to have transboundary collaboration on a variety of issues but given the political realities a pragmatic approach will be required.

11 BIODIVERSITY IN THE DRC

11.1 Biodiversity Overview

An overview of biodiversity threats and opportunities in the Democratic Republic of Congo is given in Part I (pages 88-98, where the threats are presented relative to geographic eco-regions and specific development activities. The following section explains these threats in terms of their impact and is followed by an analysis of what actions are necessary to reduce them.

11.2 Threats to Biodiversity in the DRC

11.2.1 Agriculture in previously remote areas

The tropical forests in the Democratic Republic of Congo are at risk with the greatest threats being in areas of high population density. It is likely that these threats will soon be compounded in some areas by intense development and international investment. The latter will bring improved roads and other communication and transportation networks opening up areas that were previously nearly inaccessible. The human population is increasing at greater than 3% per year with some of the greatest growth and density being in forest frontier areas. Overall 70% of DRC's population is rural and surviving on extensive, land demanding, agricultural techniques such as slash and burn agriculture. The demand for agricultural land is therefore increasing. Poor transportation networks make delivery of agricultural produce difficult so that wherever populations move agriculture also moves, with the result that halos of new cultivation radiate out from remote illegal mining camps, camps of displaced persons, military camps and also from the camps of militias of numerous affiliations that are scattered through the forest of eastern DRC. Extensive conversion of the forest to non-forest land cover occurs, therefore, not only as a steady eating in from the edges but also as multiple interior disintegration.

Human movements and anarchistic distribution of farmland is partly a result of unclear land tenure. This problem must be tackled through zoning and the zoning should be grass roots in its approach. Different zoned units should have management plans such that protected areas, forest concessions, and community farming zones all have plans for land management.

Simultaneously, it is critical to explore livelihood alternatives for rural populations, and empower them to develop new enterprises and activities that incorporate sustainable natural resources management. The rate of increase of rural populations is lower than that of urban areas, but the actual numbers of people in rural areas is increasing. The geographic position of livelihood activities is crucial such that they serve to pull people away from areas zoned for protection rather than attract immigrant populations towards protected areas.

11.2.2 Mining

The separation between the Mining Ministry and the Environment Ministry has allowed for a disturbing distribution of mining concessions. In eastern DRC these completely ignore the

distribution of protected areas such as the Okapi Faunal Reserve that, on paper, has been entirely covered by “legal” concessions. DRC’s mineral wealth is itself a threat if, in the rush to develop it, environmental concerns are not taken into account. During the war years when the government could not control the exploitation of its mineral rich eastern provinces, many of the parks (Okapi, Kahuzi-Biega, and Maiko in particular) were over-run by small scale extractive operations. It would be a failure if the post-war mining development only increased the size of mining operations without any increase in their environmental accountability. Environmental considerations should include not only the methods of extraction but also the location, protected areas must indeed be protected.

11.2.3 Hunting and bushmeat trade

Whereas the armed conflict and ensuing anarchy in eastern DRC reduced development dependent on infrastructure, bushmeat hunting increased. Whole villages forced to abandon gardens depended almost solely on bushmeat. This was the case during several gardening cycles in the Ituri forest and in areas of southern Kivu. Furthermore, large military camps in the Ituri forest fed themselves on bushmeat and sold bushmeat in nearby markets as an immediate source of cash. The increase in arms and munitions has filtered throughout the population with local hunters working for the military. Unlike agricultural produce, smoked meat can be transported in large quantities and over long distances on foot or by bicycle, regardless of the conditions of the roads, and this is what occurred during the recent conflict.

Even as peace is established, the increase in arms and the lack of alternate livelihoods is likely to maintain the importance of bushmeat. Around the forest town of Beni in a radius of about 50 kilometers there is no longer any game meat except that of the smallest animals (porcupines and squirrels- Mapilanga unpublished report). In the remote Okapi Faunal Reserve pygmies are having to hunt at greater and greater distances from the road in order to assure a catch (Tshikaya, unpublished report). Despite the increase in bushmeat dependence in the east, associated with anarchy, the phenomenon is not limited to the war zones. Bushmeat is favored and continues to be brought into the metropolis of Kinshasa. In order to feed Kinshasa’s markets, enterprising traders (often women) purchase game from hunters using the Salonga National Park (Ilambu, personal communication), a park mainly in the Equateur Province.

Any road system that penetrates into previously un hunted areas will open up new source areas for the bushmeat trade. At a commercial scale bushmeat hunting has nowhere been shown to be sustainable (Bennett, personal communication)

11.2.4 Habitat loss

Although mining and bushmeat hunting are likely to lead to empty forests, it is the first threat, agriculture, which will lead to forest conversion. Some of DRC’s better known animals depend on large areas of forest: elephant, okapi, Grauer’s gorilla, bonobo. Beyond these highly visible large mammals, the IUCN Red List of threatened species lists over 300 species³⁰ (Table 3, page 80).

³⁰ This list is almost certainly incomplete since good quantitative data on status, distribution, and trends have never been collected for most plant and animal species in DRC.

This means that many species are likely to disappear from areas as the forest gets broken and divided into smaller remnants. This is already the case around populated forest borders.

Any activity that facilitates the movement of people and establishment of agriculture will lead to habitat loss. Road building will certainly dictate the geographic direction of major habitat loss.

The effects can be diminished if prior to road building, there are environmental impact statements and, where a choice of location is possible, that the choice least likely to pull people to unpopulated zones is chosen.

11.3 Analysis of Actions necessary to Conserve Biodiversity in the DRC

The actions necessary to conserve biodiversity in DRC include:

- Inventory and protect key areas of biodiversity that are not now protected. Take steps to integrate protected areas with other surrounding land uses.
- Inventory protected areas affected by the war and take steps to increase their protection.
- Develop multiple use areas as buffer zones around protected areas and include the local populations in the management of these buffer zones.
- Produce management plans for all protected areas based on good biological and socio-economic information and implement them.
- Curb illegal bushmeat hunting – through both protection and incentives.
- Produce zoning and management plans throughout the Congolese landscape.
- Assure that development activities, including road building, are accompanied by environmental assessments.

- Assure the inclusion of environmental concerns in the Poverty Reduction Strategy Paper.
- Expand community conservation programs: Involve communities – and empower them to manage in a sustainable manner.
- Strengthen institutions and public-private-community linkages.
- Improve laws, policies and governance pertaining to the environment

12 CURRENT CONSERVATION EFFORTS IN THE DRC

See text of Part 1, the section titled “Status of Current Donors and NGOs” (pages 99-104) for a summary of current conservation efforts in the DRC.

13 CONCLUDING REMARKS: RECOMMENDATIONS TO USAID DRC

Recommendations as to how USAID DRC can make improvements in their proposed strategic objectives (SOs) are included in Part 1, under the section titled “Review of USAID Strategic Objectives in View of Threats to Biodiversity and Tropical Forests” (pages 104-109). Suggestions are made by reviewing each SO in terms of threats and opportunities.

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