

CONSERVATION AND MANAGEMENT OF BIODIVERSITY IN WEST AFRICA - CASE STUDY OF GHANA

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Summary

This chapter presents an overview of the situation with respect to biodiversity in West Africa with special reference to Ghana. In spite of significant efforts to halt the alarming rate of biodiversity loss, the 1990s have been characterized by an accelerated destruction of biodiversity. The West African Guinean hot spot ranks first in mammal diversity among the world's 25 hot spots. With an estimated 2,857 species, it is home to half of Africa's known mammalian species. Biodiversity in all its forms and at all levels of organization has come under serious threat in many places. Species loss has assumed dramatic speed and magnitude as more species move into the critically endangered category or go extinct. This has been a major concern to mankind, especially during the last quarter of the 20th century. The indicators of biodiversity continue to point to an accelerating species loss and continuous degradation. Effective management of biodiversity in West Africa can only be achieved when issues such as over exploitation, capacity building, poaching, bushfires and indigenous knowledge systems are properly addressed.

1. Introduction

Issues relating to biodiversity, environment and sustainable development are probably

the three most commonly discussed development paradigms in the world these days (Boon E.K 2002, OECD, 1996). Increasingly, biodiversity loss has been a major concern to mankind, especially during the last quarter of the 20th century (Hens 2004, McNeely, 1998, OECD, 1996). At the dawn of the new millennium, there was increasingly no doubt that the planet was in the midst of a biodiversity crisis. The international community has increasingly been interested in biodiversity, sustainable development and environmental problems worldwide. In 1992 at Rio de Janeiro, Brazil, an international commitment was made at the United Nation Conference on Environment and Development (UNCED) to work towards a sustainable management, conservation and development of all types of forests (UN Agenda 21, 1992). This World Summit reconfirmed that biodiversity, worldwide continued to be degraded at alarming rate (Hens 2005). The Plan of Implementation of the World Summit on Sustainable Development calls for action to significantly reduce the rate of biodiversity loss by 2010 (UNEP, 2004; UNECA, 2001; WCED, 1987). This has demanded the attention of governments, policy makers and non-governmental organizations, especially during the 1980s and 1990s.

The increased awareness has led to the establishment of ministries and organizations dedicated to environmental protection and biodiversity conservation and management in many countries. Many international treaties, agreements, and declarations have been made and ratified at important world summits to facilitate a sustainable conservation and management of biodiversity. In addition a proliferation of non-governmental organizations of major groups such as women, indigenous communities, local authorities, business and industry, and scientists to support, promote and deal with biodiversity issues at local, national, regional and global levels.

2. The Concept of Biodiversity

The term biodiversity is a structured form of the phrase “biological diversity. Biodiversity” refers to variability of life on earth, which explicitly recognizes the incredible interaction of the different ecosystems components. While various biodiversity definitions do exist, the most often cited definition is provided by the “Convention on Biological Diversity” in its *Article 2: biological diversity is the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.* Fascinating complex ecological connections do exist among the different biodiversity levels (species, genes and ecosystem) and as a result provide essential ecosystem services on one hand, and social and recreational opportunities on the other, including being a source of inspiration and cultural identity (Hens and Boon 2003,). The biological diversity found in any one area or country varies in complex ways, depending on the physical size, local climatic conditions, topography, vegetation, and soil type (UNECA, 2001).

2.1. Importance of Biodiversity

Biodiversity provides the basis for the livelihoods of many people, and for growth at both local and national levels. The direct benefits of biodiversity include the provision

of food, medicine, fodder, energy, and timber. Indirect benefits include the provision of essential life support services, such as the recycling of carbon, oxygen, and nitrogen, mitigation of pollution, protection watersheds, and combating soil erosion. Biodiversity is essential for ensuring food security, and its economic value is easily recognized.

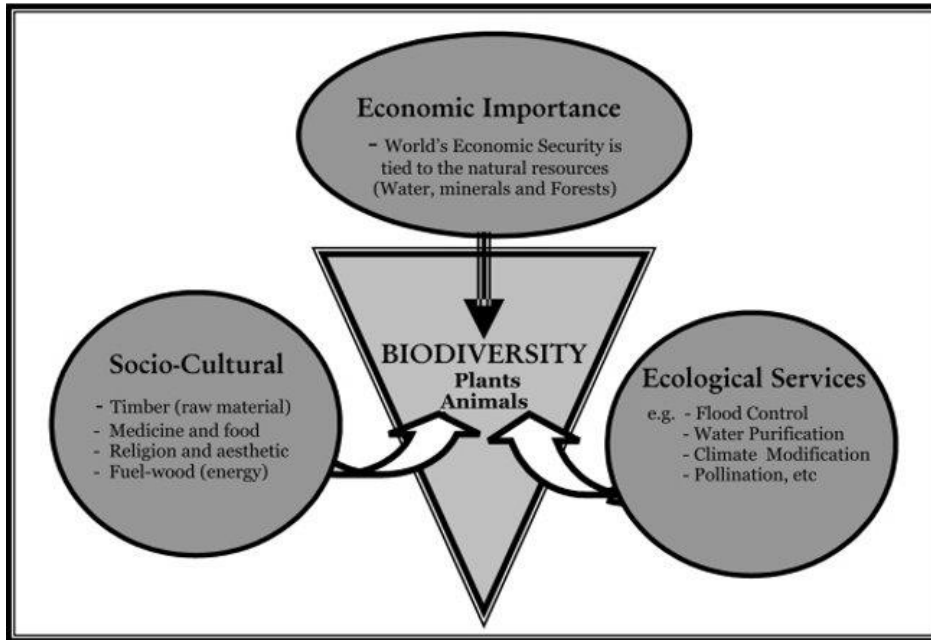


Figure 1: Importance of Biodiversity

Ecologically Diversity	Genetic Diversity	Organization Diversity
Biomes		kingdoms
Bio-regions	populations	phyla
Landscapes	individuals	families
Ecosystems	chromosomes	genera
Habitats	genes	species
Niches	nucleotides	subspecies
Populations		populations
		individuals
Cultural diversity: human interactions at all levels		

Source: Hens and Boon, 2003

Table 1. The composition and levels of biodiversity study.

All over the world's major food crops and livestock depend on new genetic materials from the wild to remain productive and healthy. Modern agriculture is now estimated at a \$3 trillion global business, while nature tourism generates some \$12 billion in annual revenue (UNECA 2001). Biodiversity is also important for human health. About 120 pure chemical substances used in pharmaceutical industry around the world are extracted from some 90 species of higher plants (UNECA 2001). The importance of biodiversity is illustrated in Figure 1. Table 1 outlines the composition and levels of biodiversity study

3. State of Biodiversity in West Africa

One of West Africa's greatest strengths is the richness and diversity of its biological resources. West Africa has a large and diverse heritage of plants, animals, and micro organisms. It is a home to more than 3,000 known species of mammals, 41,500 plants species, 9,667 bird species, 1543 reptile species, 669 amphibians, and 1,169 fish species (2005; UNECA, 2001). In addition to being an essential resource for West African economies, the vast and unique biodiversity on the continent is an invaluable global heritage. The estimate number of mammals, birds, and plants species found in West Africa is presented in Table 2.

West Africa holds one (Guinean hot spot) of the 25 identified biodiversity hot spots in the world. The Guinean hot spot ranks first in mammal diversity among the world's 25 hot spots. With an estimated 2,857 species, it is home to half of Africa's known mammalian species (UNECA 2001). The forests of West Africa are of global importance. The most significant areas include the forest relics at Gola in Sierra Leone, Sapo in Liberia, Tai in Cote d' Ivoire , and the Fouta Djallon, mount Nimba, and Loma at the headwaters of river Niger, Senegal and the Gambia (UNECA 2001).

Country	Mammals		Birds		Plants		Reptiles		Amphibian		Fishes	
	KS	TS	KS	TS	KS	TS	KS	TS	KS	TS	KS	TS
Benin	188	6	485	2	2,500	14	99	1	12	0	84	8
Burkina Faso	147	6	453	2	1,100	2	44	1	11	0	102	11
Cameroon	332	42	936	18	8,260	334	211	1	192	50	138	35
Chad	134	12	532	5	1,600	2	53	1	10	0	1	0
Cote d'Ivoire	230	23	702	11	3,660	105	131	2	54	14	111	11
Gambia	133	3	535	2	974	4	58	1	14	0	102	11
Ghana	249	15	729	8	3,725	117	135	2	72	10	90	8
Guinea	215	18	640	10	3,000	22	95	1	48	5	121	8
G. Bissau	108	5	459	1	1,000	4	47	1	13	0	110	10
Liberia	193	20	581	11	2,200	46	80	2	42	4	86	8
Mali	137	12	624	5	1,741	6	107	1	32	0	2	1
Niger	131	10	493	2	1,460	2	60	0	8	0	2	0
Nigeria	290	25	995	9	4,715	170	155	2	73	13	95	12
Senegal	191	11	612	5	2,086	7	92	6	32	150	18	
Sierra Leone	179	12	626	10	2,090	47	69	3	46	2	99	8
Togo	196	7	565	2	3,085	10	107	2	10	0	8	2
Total	3,053	227	9,967	103	43,196	892	1,543	27	669	248	1169	133

Sources: UNECA 2001, IUCN 2004, World Resources Institute, 2005

Table 2: Table 2. Known and Threatened Species in West Africa (2001-2004) [KS: Known Species TS: Threatened Species]

4. Threat to Biodiversity in West Africa

In spite of significant efforts to halt the alarming rate of biodiversity loss, the 1990s has been characterized by an accelerated destruction of biodiversity and the conversion of

natural land to meet the demands of a globally growing population (Hens and Nath, 2003). West Africa presents no exception. Rapid population growth, development of commercial agriculture, logging, fishing, and urbanization are causing large-scale losses of West Africa's biological diversity (Hens and Boon E.K 2000; UNECA 2001; Conservation International, 2005). Species loss has assumed dramatic speed and magnitude as more species move into the critically endangered category or go extinct. It is estimated that at least 11,000 species are threatened with extinction, according to IUCN's Species Survival Commission due to major human induced threats to ecosystems and biodiversity through unsustainable exploitation, habitat change, pollution, invasion by exotic species, and global climate change (UNECA; 2001).

The indicators of biodiversity continue to point to an accelerating species loss and continuous degradation. The earth's forests have been disappearing at a rate of 14.6m hectares annually, while the proportion of coral reefs loss due to human activities has increased from 10 percent in 1992 to 27 percent in 2000 (Hens and Nath, 2003). More than 1.6 billion people depend on forest for their livelihood, while wood is the main household energy source for heating and cooking of many of the world's poorest communities (Hens, 2004). The level of biodiversity loss in an ecosystem determines by its capacity and resilience to respond to external shocks and the link between the species and the functions of the system. Whether the deletion of some species affects a given function depends on the number of alternative species that can support the function if the ecosystem is perturbed (Schindler, 1990, Holling et al 1995).

At the ecosystem level, fragmentation, reduction in size, isolation of ecosystems have affected the capacity to adapt to changes, exchange ecosystem types as well as to maintain viable species populations (above their minimum critical size to remain genetically healthy). Any changes in species composition in an ecosystem affect invariably certain ecological equilibrium and processes e.g. extinction of sea otters can disrupt entire coastal marine causing collapse of fisheries (Reid and Miller 1989). More than 99 percent of all species that ever existed have become extinct over a period of more than 3.5 billion years, and ecosystems have expanded or receded in the wake of climate changes and natural disturbances (WWF, 2005). The Changes in numbers of species in the threatened categories (CR, EN, VU) in the world from 2000 to 2004 are presented in Table 3.

Group	CR				EN				VU			
	2000	2002	2003	2004	2000	2002	2003	2004	2000	2002	2003	2004
Mammals	180	181	184	162	340	339	337	352	610	617	609	587
Birds	182	182	182	179	321	326	331	345	680	684	681	688
Reptiles	56	55	57	64	74	79	78	79	161	159	158	161
Amphibians	25	30	30	413	38	37	37	729	83	90	90	628
Fishes	156	157	162	171	144	143	144	160	452	442	444	470
Insects	45	46	46	47	118	118	118	120	392	393	389	392
Molluscs	222	222	250	265	237	236	243	221	479	481	474	488
Plants	1,014	1,046	1,276	1,490	1,266	1,291	1,634	2,239	3,331	3,377	3,864	4,592

Source: IUCN Red List, 2004

Table 3: Changes in numbers of species in the threatened categories (CR, EN, VU) in the world from 2000 to 2004 (Source: IUCN Red List, 2004)

4.1. Causes of Biodiversity Loss

The causes of this continuing loss of species, genes and ecosystems are multiple and complex (Hens and Boon, 2003, OECD, 1996). However, one of the traditionally important ones was the unique focus on the biological reasons of biodiversity loss (Box 1 lists the common biological causes of biodiversity loss). The effects of this decline are multifaceted and mostly depend on a species functional role in an ecosystem.

Extinction of species is part of an evolutionary process. However, during recent times, extinction rates are ten to hundred times higher than during pre-human times (Sinclair, 2000a). The main biological causes for this loss of biodiversity are:

- a) **The loss of habitats.** On human disturbance of habitats on a worldwide scale data show the significant impact of human activity on world ecosystems; For example, in Europe only 15% of the continent is classified as “undisturbed”, which is the lowest percentage worldwide. loss of tropical forest is the most highly published aspect of this (Sinclair, 2000b). Elsewhere, rivers are impounded, coral reefs destroyed by dynamite, and natural grasslands are ploughed.
- b) **The introduction of exotic species.** Many are accidental, as with noxious weeds and insect pests. Others are deliberate. Foxes, rabbits and cats, which came to Australia aboard of European ships, have decimated Australia’s indigenous wildlife. In freshwater, the stocking of exotic fish for sport, or (rarely) for food, has caused at least 18 extinctions of fish species in North American rivers. Catastrophic changes in the fish biodiversity of Lake Victoria (East Africa) resulted from the introduction of Nile perch, Eucalyptus, which is indigenous in Australia, has been introduced in many tropical and subtropical regions in the world, where the tree merely behaves as a pest.
- c) **Over-harvesting** by (illegal) hunting, and the systematic cutting of wood for heating purposes, or charcoal production, are other reasons for biodiversity loss. The use of medicinal plants might illustrate this point. In the semi-arid rural area of Southern Cochabamba (Bolivia) it was shown that out of 132 inventoried plants the local people use for traditional medicinal purpose, 10 were threatened because of their intensive collection (Urena Hinojosa, 2001).
- d) **Lesser known causes are due to “knock-on” effects.** Species that are co-evolved with another, such as plants with specialized insect pollinators, will go extinct if one of the pair goes extinct; When the last passenger pigeon (*Ectopistes migratorius*) died in the early 1990s, so also did two of its obligate parasites, two louse species. Moabi (*Baillonella toxisperma*) used to be a common tree in West Africa. The fruits are eaten, cooking oil is extracted from the seeds (Karite) and the bark is used for medicinal purposes. For its reproduction the plant depends on the elephants. Only these animals swallow and disperse the moabi seeds. The impressive reduction of elephants in countries as Ivory Coast, Ghana and Benin has an important impact on the distribution of the tree.
- e) **Homogenization in agriculture and forestry.** Although an estimated 7000 plant species have been collected and cultivated for food, only 30 contribute over 90% of the entire global population energy needs. The case of the banana (*Musa* spp.) is illustrative. Bananas are the fourth most important food source in the tropics after rice wheat and corn. They are cultivated in nearly 120 countries. Farmers use only about 25 edible sterile banana varieties. The number of varieties is diminishing due to the

spread of pests and diseases and the deterioration of the resource.

- f) Pollution and global environmental change also threaten the world's biodiversity.

All these causes have one element in common: they are induced by human activity. This makes human activity the most important source of the current decline in biodiversity. Therefore, understanding the many aspects of human influences on biodiversity, and their underlying driving forces, is of crucial importance for setting priorities and counteracting the current negative trends.

Source: Hens, 2005

Box 1. Biological causes of biodiversity loss

5. Conservation and Management of Biodiversity in Ghana

5.1. Geographical and Ecological Zone of Ghana

Ghana is located on the west coast of Africa, about 750 km north of the equator between the latitudes of 4 and 11.5° north and longitude 3.11° West and 1.11° East. It is bounded on the north by Burkina Faso, on the west by La Cote d'Ivoire, on the east by Togo and on the south by the Gulf of Guinea (Atlantic Ocean). Ghana has a total land area of 238,537 km² (92,100 sq. miles) stretching 672 km north to south and 357 km east to west. Its physical size makes it about the same size as Great Britain. Out of a total land area of 23 million hectares, 13 million hectares (57%) is suitable for agricultural production, and 5.3 million hectares (39%) of this is under cultivation.

Ghana has a tropical climate. The temperature is generally between 21-32°C (70-90°F). There are two rainy seasons, from March to July and from September to October, separated by a short cool dry season in August and a relatively long dry season in the south from mid-October to March. The north, also with tropical climate, is dry and falls partly within the Sahelian zone. Annual rainfall in the south averages 2,030 mm, but varies greatly throughout the country, with the heaviest rainfall in the south-western part.

Ghana is not a mountainous country, but has some highlands and some steep escarpments in the middle portions and isolated places in the northern parts. The land is relatively flat and the altitude is generally below 500m, with more than half of the country below 200m. The Volta River basin dominates the country's river system and includes the 8,480km² Lake Volta (the largest artificial lake in the world), formed behind the Akosombo hydroelectric dam. The coastal area consists of plains and numerous lagoons near the estuaries of rivers.

In terms of vegetation, the north is predominantly savannah and the middle section (extending to the south-western part) is typical rainforest, while the coastal section has thicket interspersed with savannah. Ghana's forest zone covers 34% of the country and contains 3725 plant species and many rare animals. More than 90% of Ghana's high forests have been logged since the late 1940's. It is estimated that 1.7% of the forest area is depleted annually. Of the remaining forests, only about 1% lies within protected

areas (i.e., national parks, wildlife sanctuaries, and game production reserves). 13 out of 223 different species of mammals and 8 out of 529 species of birds are threatened annually. Currently, 103 of the 3725 plants species in Ghana are also threatened (FC, 2004).

Rich mineral resources such as gold, diamonds, manganese, limestone, bauxite, iron ore as well as various clays and granite deposits. Ghana has extensive forests, which are arguably the best managed in West Africa (with 252 permanent forest reserves in the rain forest zone alone. In total about 11% of Ghana is defined as forest.). Ghana is the second largest producer of cocoa in the world. It is also the third largest producer of timber and the second largest exporter of wood and wood products in Africa; beautiful landscape, inviting sunshine, pristine beaches, exotic wildlife and exciting national parks and game reserves; rich culture and tradition and a world acclaimed warmth and hospitality of its people.

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