NIGERIA

National Biodiversity Strategy and Action Plan

TABLE OF CONTENTS

Page

CHAPTER 4: NATIONAL EFFORTS AT BIODIVERSITY CONSERVATION

CHAPTER 5: STRATEGIES FOR BIODIVERSITY MANAGEMENT IN NIGERIA

CHAPTER 6. SECURING THE FUTURE: PLAN OF ACTION FOR NIGERIAN BIODIVERSITY

CHAPTER 7: MONITORING AND EVALUATION

LIST OF TABLES

PAGE

LIST OF FIGURES

Page

LIST OF BOXES

Page

LIST OF ACRONYMS

ADB	-	African Development Bank
BD	-	Biodiversity
BDCP	-	Bio-resources Development and Conservation Programme
BON	-	Broadcasting Organization of Nigeria
CBD	-	Conservation on Biological Diversity
CBOs	-	Community Based Organizations
CITES	-	Convention on International Trade in Endangered Species
CRIN	-	Cocoa Research Institute of Nigeria
CRNP	-	Cross-River National Park
EMP	-	Environmental Management Programme
FAO	-	Food and Agriculture Organization
FDF	-	Federal Department of Forestry
FEPA	-	Federal Environmental Protection Agency
FHI	-	Federal Herbarium Ibadan
FMANR	-	Federal Ministry of Agriculture and Natural Resources
FMF	-	Federal Ministry of Finance
FME	-	Federal Ministry of Environment
FMI	-	Federal Ministry of Information
FMIA	-	Federal Ministry of Internal Affairs
FMJ	-	Federal Ministry of Justice
FMST	-	Federal Ministry of Science and Technology
FMWH	-	Federal Ministry of Works and Housing
FORMECU	-	Forestry Monitoring Evaluation and Co-ordination Unit
FOS	-	Federal Office of Statistics
FRIN	-	Forestry Research Institute of Nigeria
GMO		Genetically Modified Organism
IAR	-	Institute for Agricultural Research
IART	-	Institute of Agricultural Research and Training
ICRAF	-	International Centre for Research in Agro-forestry
IITA	-	International Institute of Tropical Agriculture
INC	-	Inter-governmental negotiation Committee

IUCN	-	International Union for the Conservation of Nature
MAN	-	Manufacturers Association of Nigeria
NACB	-	Nigerian Agricultural Co-operative Bank
NACCIMA	-	National Association of Chambers of Commerce, Industry, Mines and Agriculture
NCGRAB	-	National Centre for Genetic Resources and Biotechnology
NARP	-	National Agricultural Research Project
NBTE	-	National Board for Technical Education
NCF	-	Nigerian Conservation Foundation
NDIC	-	Nigerian Deposit Insurance Corporation
NEST	-	Nigerian Environment Study/Action Team
NGOs	-	Non-Governmental Organizations
NIFFR	-	Nigerian Institute for Freshwater Fisheries Research
NIFOR	-	Nigerian Institute for Oil Palm Research
NIHORT	-	National Horticultural Research Institute
NIOMR	-	Nigerian Institute for Oceanography and Marine Research
NPAN	-	Newspapers Proprietors Association of Nigeria
NRCC	-	Natural Resources Conservation Council
NSE	-	Nigerian Stock Exchange
NUC	-	National Universities Commission
PMAN	-	Performing Musicians Association of Nigeria
RRIN	-	Rubber Research Institute of Nigeria
SDFs	-	State Departments of Forestry
SEPA's	-	State Environmental Protection Agencies
SMANRs	-	State Ministries of Agriculture and Natural Resources
UNAAB	-	University of Agriculture Abeokuta
UNCED	-	United Nations Conference on Environment and Development
UNDP	-	United Nations Development Programme
UNEP	-	United Nations Environment Programme
UNESCO	-	United Nations Educational Scientific and Cultural Organization
WWF	-	World-Wide Fund (for nature)

AKNOWLEDGEMENT

VISION STATEMENT

A nation that Integrates biodiversity conservation in a truly national programme of sustainable development aimed at substantially reducing poverty, designing a secure future and facilitate the growth of the Nigerian biodiversity for the benefit of the Nigerian community and economy in line with the principles of ecological sustainability and Social Equity.

FOREWORD

EXECUTIVE SUMMARY

Nigeria occupies a unique geographic position in Africa and the variability in climate and geographic features endows her with one of the richest biodiversity in the continent. Its diversity of natural ecosystems ranges from semi-arid savanna to mountain forests, rich seasonal floodplain environments, rainforests, vast freshwater swamp forests and diverse coastal vegetation. Nigeria's Niger delta contains the largest tract of mangrove in Africa.

Information on Nigeria's extremely diverse biological heritage is very limited although the role of biodiversity in national development is generally appreciated even among policy experts. The individual components of biodiversity – genes, species, and ecosystems provide our society with a wide array of goods and services.

A country report published in 1992 by the Federal Environmental Protection Agency (FEPA) indicated that Nigeria possesses more than 5,000-recorded species of plants, 22,090 species of animals, including insects and 889 species of birds, and 1,489 species of microorganisms. It estimated that 0.4% of the plant species are threatened and 8.5 % endangered, with 0.14% of the animals and insects threatened and 0.22% endangered. The country study listed 135 reptilian species, 109 amphibian species and 648 fish species and recognized the forests in Cross River State of Nigeria to be a hotspot for amphibian biodiversity. Nigeria is known as a global hotspot for primate species, with a great diversity found especially in the Gulf of Guinea forests of Cross River State. Some of the endemic species include three monkeys, the white-throated monkey *(Cercopithecus erythrogaster)*, Sclater's guenon *(Cercopithecus sclateri)* and the Niger Delta red colobus *(Procolobus pennantii epieni)* and four bird species, the Anambra waxbill *(Estrilda poliopareia)*, the Ibadan malimbe, *(Malimbus ibadanensis)*, the Jos Plateau indigo-bird *(Vidua maryae)* and the Rock Fire-Finch *Lagonostica sanguinodorsalis*. The most endangered gorilla subspecies on earth, the Cross River gorilla *(Gorilla gorilla diehli)* with an estimated population of less than 250 individuals is found only in a couple of protected areas in Cross-River State, south eastern Nigeria.

The IUCN Red List of Threatened Species (i.e. of globally threatened species) includes 148 animals and 146 plants that are found in Nigeria. Of these, 26 animals and 18 plants are classified as endangered and another three animals and 15 plants are critically endangered worldwide.

Natural and man-made threats, socio-cultural problems as well as direct and indirect consequences of socio-economic development have contributed to the erosion of biodiversity at all levels. Within the last 25 years, it is believed that about 43% of the forest ecosystem has been lost through human activities. Nigeria, with a population of about 120 million people constitutes nearly a quarter of the total population of sub-Saharan Africa. A population growth rate of more than 3 % and increasing poverty (especially in rural areas) has put severe demand on the country's natural resources, the institutional structures and the resources available to manage them. There has been a general institutional weakness and lack of technical capacity to effectively tackle the nation's environmental issues, including threat to biological diversity.

Nigeria is a signatory to several international treaties and conventions for conservation and sustainable use of biodiversity, which demonstrates her commitment to the conservation of natural resources. Consequently, the country took active part in all the negotiation processes leading to the adoption of the Convention on Biological Diversity and was one of the 153 signatories to the Convention at the United Nations Conference on Environment and Development (UNCED),

commonly known as the Earth Summit in Rio de Janeiro, 1992. Subsequently, the country ratified the convention in 1994 and thereafter, started the process of preparing her Biodiversity Strategy and Action Plan. In 1993, "A Country Study Report" prepared by the Federal Environmental Protection Agency (FEPA) documented the status of Nigeria's biological diversity, policies, laws, and conservation programmes.

The current Biodiversity Strategy and Action Plan (NBSAP) is a review of the first draft document, which was one of the products of the World Bank-assisted Environment Management Project in 1998. This review addressed identified gaps in the earlier document through a process of consultations by a Team of Experts with grass roots stakeholders at community level and eco-regional and National Workshops. It addresses the articles and the spirit of the Convention and encompasses the country's vision of sustainable development.

The goal of the Strategy and Action Plan is ***'to develop appropriate framework and programme instruments for the conservation of Nigeria's Biological Diversity and enhance its sustainable use by integrating biodiversity consideration into national planning, policy and decision-making processes.*** The country has since the preparation of the first draft of the NBSAP undertaken surveys and inventories of its biodiversity, which form the bases for setting the National Strategy for Conservation and Sustainable Use of Biodiversity. This strategy would be part of our national commitments under the Convention and a testimony to our responsibilities to our future generations.

The Federal Government of Nigeria has mobilized the scientific community in government departments and non-governmental institutions to contribute to the background studies and the preparation of a draft document that was re-submitted to public debate for revision and approval. The operational approach in the development of this Strategy is the establishment of an adaptive process that institutes national goals, sets priorities, and provides frameworks for addressing: ***Biodiversity conservation; Sustainable use of biological resources; Equitable sharing of benefits; Conservation of agro-biodiversity; Biosafety; and Biodiversity – Industry Interface.***

The process leading up to the preparation of this NBSAP has again involved broad participation from various agencies of the Federal and State governments, academia, non-governmental agencies and local communities through national and regional level consultative workshops to develop and review the draft document. Experts on the various sectors and crosscutting issues prepared a number of background papers for the Strategy. A National Steering Committee and Biodiversity Technical Committee constituted by the Federal Ministry of Environment provided oversight during the drafting of the Strategy.

Participants at the Workshops reached a consensus of opinion that the biggest threat to conservation of Nigeria 's biological diversity is poverty. It was agreed that more than 70% of the Nigerian population reside in rural areas and rely heavily on wild plants and animals for food and also to supplement income. Biodiversity therefore serve as a 'safety net' for the rural population. This Strategy and Action Plan will pursue the sustainable use of biodiversity through addressing the fundamental problem of poverty. It will evolve a programme of engagement of rural communities to which a significant portion of the benefits of conservation will be ploughed back. This Plan has also encouraged a policy shift towards decentralization and local participation in natural resources management as a more viable way to promote conservation-oriented decision-making and biodiversity conservation.

The national workshop identified the major threats to sustainable use of renewable natural resources as unplanned urban development and oil industry operations that compound sound community practices to manage natural resources for their mutual benefit. Arising from the National Workshops is the new understanding that biodiversity conservation is a national concern that involves the entire population, organizations, communities, private companies and the various tiers of government and should not be seen as the exclusive responsibility of the Federal Government alone.

Biodiversity Conservation

The Nigerian government recognizes the need to conserve its biological diversity and has made a commitment to conserve Nigeria's 25% of total forest area. Emphasis will be placed on *in situ* conservation of biodiversity within protected areas such as Forest Reserves, Game Reserves, National Parks and Wildlife Sanctuaries. *In situ* conservation outside protected areas will also be encouraged to complement conservation of biological diversity inside protected areas, to secure Nigeria's biodiversity for future generations.

Priority attention will be placed on conservation of unique ecological characteristics and ecosystems such as mountain, mangrove, wetlands, savanna and rain forests and transit sites for migratory species. The Plan also contains specific priority setting and actions for *ex situ* conservation of various species of plants and animals of economic importance, including re-introduction of locally extinct animals, lost crops, and conservation of threatened or endangered species. The administrative and policy reforms contained in the Plan will provide a vehicle for achieving our biodiversity conservation goals and objectives.

Assessment of the status of biodiversity would proceed hand-in-hand with assessment of the socio-economic factors determining biodiversity use. Appropriate spatial scales have been determined for study: for many purposes, especially at the local village level. However regional and national level analysis is also important for a complete understanding of the exploitation of major resources, such as fisheries and timber. In setting the goals, secondary materials from published sources have been combined with some in-depth analyses and rapid surveys to ensure that appropriate measures are taken to balance use and conservation.

Conservation of agro-biodiversity

Due to the diversity of habitats in Nigeria and the tropical climate, there is great diversity of plant species, including several that have been domesticated. Nigeria's plants include many species with traditional value as food items, medicines and for various domestic uses and a number of these have been catalogued in various specific areas of the country. Nigeria is also an epicenter for diversity of wild varieties of important crop plants, including cowpeas *(Vigna unguiculat*a), West African rice *(Oryza sativ*a), yams *(Dioscorea* spp.), Bambara nuts *(Vigna subterranea*), Kersting's groundnut *(Macrotyloma geocarpu*m), African yam bean *(Sphenostylis stenocarp*a), and winged bean *(Psophocarpus tetragonobus*). A number of these wild crops and their relatives although more adapted to the environment and climate are being replaced with new varieties/cultivars and are therefore threatened with extinction. Improved cultivars therefore constitute a principal cause of genetic erosion and have been responsible for the extinction of most land races. This makes the lines prone to genetic drift and genetic loss within collections and it leads to isolation from on-going

evolutionary processes. Some of the crops going extinct include the native yam, beans, white melon, *Chrysrophyllum albidum*, *Irvingia gradifolia, Balanites spp*, *Vitellaria paradoxa* (shear butter tree), sada, Atili and Borno ex-millet.

The NBSAP has outlined a programme of work to encourage both the *ex situ* and in farm conservation of the country's agricultural biodiversity. Seed banks and germplasm collections will be maintained at various sites in the country.

Other Policy Considerations

Development of baseline information on indigenous food trees, crops, microbes etc, which would be published and disseminated to stakeholders;

Development of Zoological/botanical gardens in the various eco-geographic zones in order to capture the nation's agro-biodiversity;

Composition of an effective committee in order to revive dormant and non-performing local organizations, which facilitate conservation, involving participatory approach to ensure success;

Strengthening Agricultural and Forest Research Institutes to conserve species that fall under their mandate;

Initiation of a programme of bio-pesticides production from indigenous plant derivatives;

Realignment of crop science research to focus on indigenous food crops and plants; and

Adequate equipping of relevant research institutions to conduct research on indigenous plant species.

Sustainable Utilization of Biological Diversity

An integrated and coordinated plan for biological diversity utilization is envisaged in the NBSAP. Government has established a national programme for sustainable utilization of biological resources at the Ministry of Science and Technology, the Forestry Research Institute of Nigeria, as well as the Raw Materials Research and Development Council in order to optimize the contribution of these resources in the national economy. It is also envisaged that an Inter-Ministerial Panel or a full-fledged Biodiversity Institute will be established to coordinate and harmonize the activities of various agencies of Government, bio-industries and the civil society in sustainable utilization of biological resources. The planning process for this strategy initiated the formation of a private sector driven Bio-resources Industry Organization of Nigeria (BIN) to engage the private sector and civil society in monitoring the use of biodiversity for the production of consumer goods.

Policy Perspectives

a. Development of a national policy to regulate the exploitation of biological resources, with emphasis on added local value and broad stakeholder participation instead of export of raw plant materials.

b. Development of a national database of ethno-botanical and ethno-medical information. This should be done with the active collaboration of local communities, traditional healers, ethno-botanists and taxonomists. To achieve this goal, a system of incentives would be created to reward the holders of indigenous knowledge. In this regard, the NBSAP recognized the need for immediate steps to be taken to establish a Clearing House Mechanism (CHM) this will in turn involve:

i. Coordination of biological resources information collection, especially through the establishment of an efficient Clearing House Mechanism (CHM), with full government support. This would include a review of roles and responsibilities of related ministerial and line agencies at federal and state levels to ensure articulation of all relevant information. The information collected should reflect the categories as identified by the World Conservation and Monitoring Centre (WCMC) namely, Conservation, Genetic Resources, Technology, Biotechnology, Environmental Statistics/Economics, Policy, Human Factors, Environmental Law; and

ii. Recognition of a distinct role for the media in biodiversity information management.

c. Initiation of a programme of bio-discovery, with emphasis on the collection of information on microorganisms and their role in bioremediation.

d. Internalization of the process of data collection through education and public awareness, which would include encouragement of indigenous crop studies in secondary schools and university training in plant taxonomy and systematic.

Access and Benefit Sharing

Article 10 of the CBD requires signatories to the convention to develop Fair and Equitable sharing of benefits arising from the utilization of the commercialization of biological diversity. Hitherto local communities have derived minimal benefits from the commercial exploitation of the country's biodiversity. The new plan hopes to address this problem by according recognition to local communities as the custodians of most of the nation's biodiversity. A national policy on intellectual property rights and traditional knowledge will be developed to formulate a *sui generis* system that will reward indigenous knowledge. Access to national parks is regulated through the National Parks Decree of 1999, which gives the Conservator General, on approval from the Honourable Minister for Environment, authority to grant access to the national parks.

Biosafety

Developments in genetic engineering have led to the development of Genetically Modified Organisms (GMO's) and their derived products in crops, food and consumer goods. This evolution from purely research and development endeavour to consumable products has generated serious debate on the benefits and risks associated with altering the genetic material of living organisms. Although genetic modifications of plants and animals through domestication and controlled breeding have gone on with little debate for several thousand years, it was only since 1973 that scientists began to transfer isolated genes from one organism into the DNA of other organisms. The use of this technology has become more widespread and sophisticated such that there is now increased public concern over the safety of genetically modified plants and animals especially in their use for human consumption. The uncertainty over the effects of genetically modified crops

and the consumption of GM foods has also raised concerns in the health profession over the regulation and safety of GM foodstuff. For the purpose of the NBSAP, the immediate concern is on the regulation of the trans-boundary movement of living modified organisms and procedures for risk assessment and safety in the utilization of such organisms in Nigeria.

The expert consultation process on this issue reached the conclusion that this was clearly a policy area where the grafting of foreign solutions based on experiences from outside our region may prove to be catastrophic. The NBSAP provides for multi-sectoral approach in developing legislation and establishing guidelines for the control and monitoring of GMO's. Counter-balancing this need for caution is the equally important national development objective of participating and harvesting the fruits of this technology, which has been widely recognized as being capable of changing the entire agro-pharmaceutical industry. The national strategy advocates increased activities in the non-transgenic biotechnology processes, use of naturally occurring micro-organisms for industrial processes and to improve agricultural productivity and the intensification of traditional plant breeding technologies, while developing adequate guidelines and protocols for field testing and subsequent release of genetically modified organisms For a biodiversity rich country such as Nigeria, unregulated importation and use of living genetically modified organisms may be catastrophic to the environment, human health and sustainable development of the country.

Financial Mechanism

Although the commercial value of biological diversity in Nigeria exceeds the cost of conservation measures by more than $3 billion at 1993 values ($3.75 billion versus $0.37b), biodiversity conservation has not been recognized as feasible investment in Nigeria's economic development and consequently natural resources valuation has not been fully incorporated into the national economic planning. It has been estimated that the ratio of conservation costs to Nigeria was about 3.8 % of GDP while the aggregate contribution of biodiversity to the GDP was about 46% in 2001. In 1990, it was estimated that the monetary value of other benefits realized from conservation was put at well over $6 billion. With the increase in bio prospecting and bio-discovery activities in Nigeria and the growth in biotechnology related industries that utilize indigenous genetic materials as feedstock, the 2002 estimate for the benefits of biodiversity to Nigeria is over $8 billion per annum. The strategic plan therefore provides for a significant increase in the national expenditure on biodiversity conservation in order to ensure the continuous availability of these resources.

Finally, the Action Plan makes concrete provisions for a programme of research, extension and education that will enhance sustainable development of Nigeria's biodiversity, using a combination of policy reforms, new legal instruments, institutional collaboration and a responsive financial mechanism targeted at areas of greatest need. It has also established a framework for continuous assessment and monitoring of biodiversity and a system of measurement of the stated targets.

CHAPTER1: INTRODUCTION

1. 1. Background

What is Biodiversity (BD)?

Biological Diversity or Biodiversity refers to the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. It encompasses the variety of all forms of life on earth, which provides the building blocks for human existence and our ability to adapt to environmental changes in the future.

Biological diversity involves genetic, species and ecosystem diversity. Genetic diversity denotes the variation within species in the functional units of heredity present in any plant or animal, microbial or other origin of living things. Species diversity encompasses the variety of species - whether wild or domesticated, within a geographical area. Estimates of the total number of species (defined as a population of organisms which are able to interbreed freely under natural conditions) range from 5 million to 100 million globally; though less than 1.7 million have actually been described. In terms of species number alone, life on earth would appear to consist essentially of insects and microorganisms. Species diversity remains central to the evaluation of diversity at other levels, and is a constant point of reference in biodiversity conservation. Ecosystem diversity refers to the variety of life forms in a given territory or area and the ecological processes that make them function. Ecosystem diversity is often evaluated through measures of the diversity of the component species, the relative abundance of different species as well as consideration of the types of species.

Biodiversity is critical to the maintenance of a healthy environment. Its role in meeting human needs directly while maintaining the ecological process upon which our survival depends is enormous. Biodiversity not only provides direct benefits such as food, medicines, and energy; it also affords us a "life support system." Biodiversity is required for the recycling of essential elements, such as carbon, oxygen, and nitrogen. It is also responsible for mitigating pollution, protecting watersheds, and combating soil erosion. Because biodiversity acts as a buffer against excessive variations in weather and climate, it protects us from catastrophic events beyond human control. In a fundamental sense, experiencing and increasing our knowledge about biodiversity transforms our values and beliefs. Knowledge about biodiversity is valuable in stimulating technological innovation and providing the framework for sustainable development.

The immense economic value of biodiversity is well established. Many people visit forests, beaches, mountains, grasslands, lakes, ponds, estuaries and streams for extended vacations or short periods of relaxation. Around the world, the number of eco-tourists, people travelling to enjoy nature and various cultures, is increasing. All of these bring in large amounts of money each year. For example, medicine from wild products generates some $40 billion each year while nature tourism generates some $12 billion worldwide in annual revenues. Exports of agricultural products represent a very high proportion of foreign exchange earnings in many countries in sub-Saharan Africa. Examples include cotton, livestock, gum Arabic, and groundnuts in Chad; coffee, cotton, tea, and sisal in Tanzania: shrimp, cashew nuts, cotton, sugar, copra, and citrus in Mozambique; and cocoa, coffee, timber, bananas, and cotton in Côte d'Ivoire. Besides, before the discovery of petroleum in Nigeria, the national economy was largely dependent on three agricultural crops, namely: cocoa, oil palm and groundnuts. In addition, modern crop and animal improvement practices depend on genetic stock from natural ecological systems. Breeders and farmers rely on the genetic diversity of crops and livestock to increase yields and to respond to changes in environmental conditions. For example, genetic material for the improvement of the world's major food crops, such as corn, wheat, and soybeans, are sourced from the wild.

However, despite the importance of biodiversity to the survival of the present and future generations of Nigerians, the country is experiencing a high rate of biodiversity loss. Some of the issues that pose a collective threat to biodiversity protection in Nigeria include:

i. Exponential increase in population accompanied by intensified industrial activities for economic development;

ii. Dependency of the rural population (about 70% of the total population) on biodiversity resources

iii. Lack of clear and consistent national policy on biodiversity conservation;

iv. Poor coordination among relevant institutions; and

v. Insufficient funding of institutions, programmes and activities that contribute to biodiversity conservation.

In line with article vi of the Convention on Biodiversity, the Federal Ministry of Environment initiated the Strategy and Action Planning process in order to guarantee the conservation of Nigeria's biological diversity.

1.2. Nigeria and the Convention on Biological Diversity

Nigeria was among the 153 countries that signed the Convention on Biological Diversity (CBD) at the United Nations Earth Summit in June 1992. The Convention is probably the most all-encompassing international agreement on biodiversity ever adopted. The five main aims are:

- Conserving biodiversity at all levels: genetic, population, species, habitat, and ecosystem;
- Sustainable development of biodiversity: to ensure that this diversity continues to maintain the life support systems of the biosphere;
- Fair and equitable sharing of benefits from biodiversity: to recognize that social and economic goals for the use of biological resources and benefits derived from genetic resources is central to the process of sustainable development, and that this in turn will support conservation;
- Sharing of relevant technology for sustainable development; and
- Establishment of global financial mechanism for the conservation of biodiversity

The Convention calls for partnership between nations and among government organisations, NGOs and the Private Sector. It calls for articulate planning strategies and programmes, with considerations for legislation, regulation, law enforcement, use of appropriate administrative mechanisms, research (data generation) and budgeting.

A related document, the Agenda 21 envisions a world with new development paradigm that recognizes the interdependency of humanity. Its opening paragraph captures both the frustration of our present situation and the hope for a better future for all mankind.

"Humanity stands at a defining moment in history. We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being. However, integration of environment and development concerns and greater attention to them will lead to the fulfillment of basic needs, improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future. No nations can achieve this on her own; but together we can – in a global partnership for sustainable development." - Agenda 21: Earth's Action Plan, Chapter 1".

The declaration stressed the need for inclusiveness, mutual respect and a more open society that accommodates the interests and contributions of all sectors of the society.

"One of the major challenges facing the world community as it seeks to replace unsustainable development patterns with environmentally sound and sustainable development is the need to activate a sense of common purpose on behalf of all sectors of society. The chances of forging such a sense of purpose will depend on the willingness of all sectors to participate in genuine social partnership and dialogue, while recognizing the independent roles, responsibilities and special capacities of each."-Agenda 21: Earth's Action Plan, Chapter 27

Box 1.1:United Nations Millennium Declaration Goals that are Relevant to Biodiversity Conservation

GOAL 7: ENSURE ENVIRONMENTAL SUSTAINABILITY

Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources.

Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water.

Target 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers.

GOAL 8: DEVELOP A GLOBAL PARTNERSHIP FOR DEVELOPMENT (Selected Targets)

Target 12: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system. *Includes a commitment to good governance, development, and poverty reduction—both nationally and internationally.*

Target 13: Address the special needs of the Least Developed Countries. *Includes: tariff and quota free access for List Developed Countries (LDC) exports; enhanced programme of debt relief for Highlu Indebted Poor Countries (H IPC) and cancellation of official bilateral debt; and more generous Official Development Assistance(ODA) for countries committed to poverty reduction*

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Target 15: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term.

Target 16: In cooperation with developing countries, develop and implement strategies for decent and productive work for youth.

Target 18: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications.

source of livelihood for improving the living standards of the world's poor and for achieving some of the major targets of the Millennium Development Goals (MDGs). See Box 1.1.

For Nigeria, the NBSAP process presents a good opportunity for planned economic development based on the framework of the Earth Charter and Agenda 21. It offers a solid framework for utilizing our natural resources as a tool and the foundation for sustainable development based on social equity. It also affords the opportunity for Nigeria to join the rest of the world in pursuing the United Nations Millennium Declaration in relation to biodiversity conservation (Box 1.12).

Box 1.2 Key Issues at the Zonal and National Workshops

- Conversion of natural landscapes (e.g. forest to agriculture or housing).
- Decline in commercially valuable species (e.g. timber trees, wild foods and medicines)

1.3. The NBSAP Process

The process leading up to the preparation of this NBSAP involved broad participation from various agencies of the Federal and State governments, academia, nongovernmental agencies, local communities and the civil society through national and regional-level consultative workshops to develop and review the draft document. The activities involved are summarized henceforth:

i. Establishment of a National Biodiversity Technical Committee, to consider the preliminary activities preparatory to the formulation of an Action Plan - February 1995;

ii. Formation of an Expert Consultation Team of 6 to organise the consensus - building modality for the preparation of Nigeria's Biodiversity Strategy and Action Plan - November 1995;

iii. The Expert Consultation Team undertook fieldwork and desk studies to fill identified gaps, and prepared draft documentation for consensus building - January 1996;

iv. Eco-Regional Workshops conducted by the Expert Consultation Team to consider inputs from four geo-ecological zones of the country (Ibadan, South-West Zone; Kaduna, Central Zone; Calabar, South-East Zone and Bauchi, Northern Zone) - January 1996 - April 1997;

v. The Expert Consultation Team collated inputs arising from the Eco-Regional Workshops, and prepared a Draft Biodiversity Strategy and Action Plan, May - September 1997.

vi. A Draft Biodiversity Strategy and Action Plan was considered by a National Stakeholders Workshop - February 1998

vii) Subsequent expert review of Nigeria's NBSAP identified gaps in the plan and commissioned consultants to among other things:

a. Incorporate the views of a wider section of the Nigerian population in the deliberation and development of the Strategy, to specifically ascertain the views of the local population and incorporate their perception and experiences in the revised Plan.

b. Engage the private sector in the development of the revised Plan in order to examine and highlight the opportunities in sustainable development of biological diversity and the impact of bio-business on the conservation of biodiversity.

c. Within the context of the advances in biotechnology, review the action plan as it relates to biosafety protocols and regulations.

d. Include in the strategic focus, a clearly outlined plan to decentralize the implementation of the conservation activities in order to enhance efficiency and broaden participation of all stakeholders in the important issue of biodiversity conservation.

viii. Zonal and national workshops aimed at seeking the views of all stakeholders and consensus building on the NBSAP (Box 1.2).

In addition, experts on sectoral and crosscutting issues prepared a number of background papers incorporated into the NBSAP. The National Biodiversity Technical Committee constituted by the Federal Ministry of Environment provided Periodic oversight during the development of the NBSAP.

National Environmental Action Plan (1990)
The main focus of the National Environmental Action Plan (NEAP and the follow-up State Environmental Action Plans was expressly on the linkages between environment concerns and economic issues with strong emphasis on institutional and capacity building aspects. T he NEAP process was led by the World Bank although the National Planning Commission and the Ministry of Finance were involved in the development. NEAP was fully integrated into the national rolling plans and annual budgetary provisions
Implementation of NEAP involved 6 sectoral agencies with the Federal Ministry of finance co-ordinating. Implementation led to the development of SEAPs and undertaking baseline studies, capacity building and setting up of Environmental Management Information system. SEAPs have remained un-implemented due to the top-down approach in their preparation. Participation in both the preparation and implementation of NEAP was limited to Governmental bodies. Monitoring Assessment mechanisms are generally inadequate. No set of indicators for monitoring.

National Biodiversity Strategy and Action Plan (1997-2002)

The purpose of the National Biodiversity Strategy and Action Plan (NBSAP) is to identify relevant actions and needed investments to address the objectives of biodiversity conservation. Emphasis is placed on *in-situ* conservation. The administrative and policy reforms contained in the plan provide a vehicle for achieving the conservation goal and objectives. It makes provision for a programme of research, extension and education The objective on paper is to integrate biodiversity planning considerations into national policy and decision making. This has been largely attained in the National Rolling Plan except for poor funding. Poor funding is a major constraint to programme mplementation. However, significant impact is being made in the protection of national parks and promotion of ecotourism. The plan is a result of a series of consultation with stakeholders at 4 eco-regional workshops and one national workshop. The NBSAP is devoid of indicators for monitoring progress. This is being addressed in the on-going revision exercise.

Vision 2010 Report (1997)
The vision 2010 Report aims at achieving for Nigeria "a united, industrious, caring and Godfearing democratic society, committed to making the basic needs of life affordable for everyone and creating Africa's leading economy". The report covers various areas and issues including Education, Health, Environment, ndustry, Petroleum, Solid Minerals, Agriculture, Poverty Alleviation, Infrastructure, Gender, Good Governance, Anti-Corruption etc. The Vision recognizes the roles of, and the need for, adherence to plans and budgets in effective management systems. It provides focus and inspiration for all future plans in public and private sectors. It canvases that, the perspective plan, the rolling Plan, Annual Budgets, and Private and NGO Plans should be based on the Vision.
Implementation of the plan had not started before the demise of the Military regime under which it was prepared and the Vision died with that regime. The Vision is the outcome of 12 plenary meetings, 57 workshops, 53 sub-committee meetings, field studies and thousands of public memoranda. A National Council on Nigeria Vision has the overall responsibility for Monitoring and Evaluation. It involves the Government, NGOs and the private sector. It sets specific targets over short, medium and long-term and identifies some indicators for measuring performance.

National Action Programme (NAP) to Combat Desertification and Mitigate the Effects of Drought (2000)
NAP has been developed by the Nigerian Government in line with Article 10 of the UN Convention to Combat Desertification as a key operational tool for the implementation of the Convention. The document spells out long-term integrated strategies that focus simultaneously on improved productivity of land, and the rehabilitation resources in dry sub-humid, semi and arid areas of Nigeria. It also spells out critical priority activities

to be undertaken in achieving the objectives. Programmes designed to tackle desertification problems have always been included in the country's development plans although the problems of coordination among the various implementing agencies has largely remained. NAP has not indicated an estimated implementation cost although new funding sources have been identified. Implementation of NAP has just commenced through the Ministry of Environment, the Ministry of Water Resources, the Task Force on Afforestation and the Ecological Funds Office. The Development of NAP was facilitated by the National Coordinating Committee or Desertification Control involving government, Academic, NGOs and International bodies. A set of indicators have been developed for monitoring and evaluation of programme implementation.

National Forestry Action Programme (1996)
The National Forestry Action Programme (NFAP) is geared towards ensuring sustainable forest management, promoting participatory process of development, facilitating private sector – forestry development and adopting an integrated approach to forestry development. It comprises of 3 sub-programmes viz: forest management, social forestry and forest industries. The programme is integrated into the National Rolling Plan although it is under-funded by Government. International donors were to provide financial support for implementation after a donors' oundtable which has not held. Implementation of some components of NFAP is just about to commence with the funding of the Forestry Development Programme by Government Participation of all relevant stakeholders through such bodies as the National Advisory Council, National Technical committee and State Committees No specific M & E arrangements in the programme document.

National Conservation Strategy (1988)
The National Conservation Strategy (NCS) focuses on conservation of Nigeria's renewable resources, including vegetation, forage, water, fisheries and other marine resources, wild animals and soil. The overall objective of the NCS is to provide development planning with a long-term, strategic approach to the management of natural resources and their uses. The NCS attempts to commit agencies at different levels to integrate conservation and development plan and for ecological impact studies at the conceptual stage of development project. The National Planning Commission was not however included significantly in preparing the NCS document which was essentially done in parallel to the development planning process. A major step in the implementation of the NCS was the establishment of the Natural Resources Conservation Council in 1989, mandated to oversee the implementation of the NCS. This body had since been subsumed under FEPA which was later merged with the Ministry of Environment, thus truncating the NCS implementation process NCS involved limited participation of Civil Society Organizations and other stakeholders due to strong government dominance. The strategy evolved under a military regime. Monitoring and Assessment mechanisms are generally inadequate. No set of indicators for monitoring.

Type, Scope and Objective of Strategy
Relationship to Development Planning
Implementation and Results
Participation
Monitoring of Outcome

CHAPTER 2 SOCIO-ECONOMIC AND BIOPHYSICAL ENDOWMENT

2.1. Locations and Size

Situated in West Africa, Nigeria covers an area of 923,768 km2. It lies between latitudes 4o and 14oN and longitudes 3o and 15oE. It shares its 4,047-km international border in the east with Cameroon Republic, in the north with Niger Republic and Chad, and part of the western boundary with Benin Republic. In the south, the country is bounded by the Atlantic Ocean's Gulf of Guinea (Fig.2.2).

2.2. Political and Administrative Structure

Nigeria operates a federal system of government. There is a central government with its headquarters at Abuja. There are 36 states and the Federal Capital Territory (FCT) with 774 Local Government Areas that constitute the third tier of government. It is now common for reasons of coordination and for representation in national affairs to group the 36 states into six geopolitical zones as follows indicated Table 2.1.

Table 2.1: Nigeria's Geopolitical Zones

Zone	Constituent States
North West	Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto, Zamfara
North East	Adamawa, Bauchi, Borno, Gombe, Taraba, Yobe
North Central	Benue, Kogi, Kwara, Nassarawa, Niger, Plateau
South West	Ekiti, Lagos, Ogun, Ondo, Osun, Oyo
South East	Abia, Anambra, Ebonyi, Enugu, Imo
South South	Akwa-Ibom, Bayelsa, Cross-River, Delta, Edo, Rivers
Federal Capital	The Federal Capital Territory (FCT)

The current constitution was adopted in 1999 and the present government represents the first democratically elected government in about twenty years. The executive arm is headed by a President, Commander-in-Chief of the Armed Forces, elected by popular vote for no more than two four-year terms. The Federal Executive Council, an appointed body, functions as a cabinet within the executive arm. The legislature is bicameral consisting of the Senate elected by popular vote to serve four-year terms, and a House of Representatives, also elected by popular vote to serve four-year terms.

The judiciary constitutes the third arm of government and is made up of the Supreme Court and the Federal Courts of Appeal with judges appointed by the federal government on the advice of an Advisory Judicial Committee.

A Governor who appoints Commissioners to oversee various state ministries heads the state. It is noteworthy that state ministry structure varies between states and does not necessarily follow the federal model. Local government administrations (LGA's) function as the main supporting bodies for activities within each state and are administered by elected Chairpersons.

2.3. Population and Settlements

The country is the most populous nation in Africa. Based on the 1991 census figure of 88.9 million, and an assumed growth rate of 2.8 percent per annum, Nigeria's current population has been estimated at about 120 million. About 30% of the population lives in urban areas, such as Lagos, Ibadan, Warri, Enugu, Onitsha, Owerri, Benin City and Port Harcourt, Kano, Kaduna and Jos. The population exhibits a strong rural to urban migration which has increased since the creation of more states.

Nigeria's population exhibits a high ethnic and cultural diversity, composed of more than 250 ethnic groups, with Hausa, Fulani, Yoruba, Igbo, Ijaw, Kanuri, Ibibio, Edo and Tiv as the major ethnic groups.

The population density in the country was put at 96 persons per km^2 in 1991, although regional differences occur, with the southeastern region having the highest density of 247 persons per km^2, while the lowest density occurs in the west central with 43 persons per km2. In the northwest the density was estimated at 76 persons per km^2 while that of the southwest was estimated at 194 persons per km^2. The 1991 census revealed that 64 percent of the population lives in rural areas but the urban population has been growing rapidly at an annual rate of 4.5 percent. Today, about 70 percent of the Nigerian population consists of rural dwellers, an indication of the importance of agriculture in the economy. Furthermore, as much as 1,000 persons per km2 density has been attained in a number of LGA's of Abia, Imo, and Akwa Ibom states in the south-eastern part of the country; Lagos and Ibadan in the southwest, and Kano in the north.

Figure 2.1. The States and Federal Capital Territory of Nigeria

The escalating growth in population implies an increasing demand for biological resources. This in turn translates into increasing demand for arable land resulting in deforestation, shortened fallow period, soil deterioration, and increasing application of inorganic fertilizers, pesticides and herbicides for agriculture. Thus, the increasing population growth has become very crucial among the set of factors that degrade the environment and threaten biodiversity.

2.4. Climate

In Nigeria, as in other parts of the tropics, moisture plays a critical role in the determination of the abundance of natural life. Two distinct seasons occur in Nigeria; the wet and dry seasons, with the highest rainfall occurring in the coastal regions of the southeast, where the mean annual rainfall is in excess of 2,000mm distributed throughout the year. As one moves from the coast towards the interior, the total amount of rainfall and length of the wet season decreases.

The monthly temperature for most locations in the south ranges between 22^oC and 32^oC and 8^0C to over 40^oC in the north. The highland areas of Obudu, Mambilla and Jos Plateaus have cooler climates than the rest of the country. During the dry season, usually from October - April, the relative humidity at 6.00 a.m. averages about 30 percent while relative humidity at noon is less than 10 percent.

2.5. Drainage system

Nigeria is drained by two major river systems that play major role in the climate and vegetation of the country. The Komadougou-Yobe in the North with headwaters formed by the Hadejia, Jama'are and Misau Rivers flows northeast from the north-central portion of the country, eventually forming the border with Niger Republic before emptying into Lake Chad in the extreme northeast corner. The Hadejia-Nguru Wetland, an important freshwater habitat for wildlife, is part of this system. The Niger-Benue system consists of the Niger flowing into the country across its western border with Benin and Niger Republics and southeasterly to the central part of the country. There it is joined by its major tributary, the River Benue, which flows southwesterly from its headwaters in the mountainous border with Cameroon. From the confluence at Lokoja, it flows southwards emptying into the Atlantic through the Niger Delta. The River Niger is the third largest in Africa and sixth largest in the world. Other important river systems include Ogun-Oshun, Benin-Owena, Anambra–Imo, and Cross-River.

Figure 2.2. Nigeria – Showing Geographical Position in West Africa

2.6. Soils

The soil pattern in the country is determined mainly by its geology and the climate. Four main soil groups occur in a zonal pattern from the coast to the northern boundary.

* Hydromorphic and Organic Soils

These are derived from alluvial, marine and fluvio-marine deposits of variable texture. They occur extensively in the Niger Delta and in the coastal zone west and east of the Delta. They also occur intrazonally along the major rivers throughout the country.

* Ferallitic Soils

These are found in the rainforest mainly on sedimentary rocks. The soils are very old, deeply weathered and red to yellow in colour. They are predominantly clayed in texture and exhibit largely undifferentiated horizons.

* Ferruginous Tropical Soils

These are found at the drier margins of the forest zone but more extensively in areas of savannah vegetation. They occur mainly as derivatives of crystalline rocks although they are also found on other rocks rich in ferromagnesium minerals, sandy deposits and old halomorphic soils. The soils are invariably red or reddish in colour, rich in iron, often low in organic matter to the ferrallitic soils except that they are more often less permeable, more susceptible to erosion and more fertile.

* Arid and Semi-Arid Soils

These soil types are typical of the northernmost regions with low rainfall. In Nigeria, they are recognised as regosols or brown soils. They have been developed on drift and continental sedimentary deposits and are mainly found in the Lake Chad Basin area.

2.7. Ecology and Ecosystem Diversity

Nigeria has a variety of ecosystems ranging from forests in the south through moist savannas in the central part of the country to dry arid savannas in the extreme north. Freshwater, brackish and marine ecosystems also occur, and elements of montane vegetation occur at high altitudes in the eastern borderlands.

The coastal fringe of the country is characterized by a mix of mangrove *Rhizophora* swamps and freshwater swamp forests on barrier islands, as well as stretches of sandy beaches. The Nigerian mangrove ecosystem is the largest in Africa. The water in this ecosystem is typically brackish, especially at estuaries. The mangrove forests are increasingly coming under the threat of Nipa (*Nypa fructicans),* an alien invasive, which establishes at disturbed sites and spreads into the mangrove vegetation. The spread of Nipa palm is affecting the fishery of the area.

Following the swamp forests is a belt of lowland rainforest. About 20% of the country, was formerly covered in this Guineo-Congolian lowland rainforests, but over 90% of these forests are, mainly as a result of anthropogenic activities, that became degraded or lost. Nigeria's lowland rainforests are characterized by a great variety of plant species arranged in a complex vertical structure of forest canopies. Some economically important rainforest trees include Mahogany (*Khaya* species), Iroko (*Milicia excelsa)*, African walnut *(Lovoa trichilioides)* and Mansonia (*Mansonia altissima)*. A number of tree species in this ecosystem are increasingly becoming threatened by illegal and legal logging activities. It is also the area sometimes referred to as the Palm belt because of the ubiquity of the oil palm *(Elaeis guineensis)* a principal economic tree crop of that ecosystem. Many Non-Timber Forest Products are extracted from these forests. They have important values as spices, food items, and medicines.

Above the lowland rainforest belt is a band of derived savanna, which is a previously forested area that has been transformed to become a distinct vegetation type. The derived savanna is a mosaic of disturbed forest and savanna, maintained in a predominantly savanna-like form by human activities.

North of the derived savanna biome is a band of Guinea savanna vegetation. Typical tree species of this zone include Doka (*Isoberlinia spp)* and Cassia (*Cassia spp*). Stream and riverbanks in this ecological zone often support riparian forests that show some floristic relationships with more southerly forests. A characteristic feature of the Guinea savanna is presence of numerous inselbergs – huge granitic outcrop that punctuate the landscape ecological zone. Inselbergs have their own peculiar flora and fauna that makes them distinctive from the surrounding habitats.

The northern fringe of the Guinea savanna slowly changes into the drier Sudan savanna. Typical trees include the Baobab (*Adansonia digitata)* and Dum Palm (*Hyphaene thebaica)*. Elements of *Acacia* are also present. Along the drier northern fringes of the Sudan savanna, the effects of deforestation and periodic drought have changed the structure and composition of the vegetation such that Sahelian elements have penetrated further south.

A narrow band of true Sahelian vegetation, covering less than 10% of the country runs across the northeastern corner. The vegetation is typically thorn scrub and common trees include many *Acacia* species. In parts of this Sahel where the vegetation cover has been seriously disturbed

(e.g., the Manga grasslands area north of Nguru in Yobe State), conditions that approximate true deserts may be found.

The highland areas of the Obudu and Mambilla Plateaus hold patches of montane forests and grasslands at altitudes above 1,200 m. The presence of tree ferns (*Cyathea manniana),* and the profusion of epiphytes are characteristic of montane forests in this ecosystem. The Jos Plateau also has its own distinctive vegetation type.

The extent these principal Nigerian ecosystems are shown in Table 2.2 and Figures 2.3, 2.4 and 2.5 further illustrate the southward advancement of drier more northerly vegetation types since 1953, probably as a result of alterations by humans. The extent of tree crop plantations and farmlands signifies the magnitude of the ecosystem modifications that have taken place in the country.

Table 2.2: Extent of Principal Nigerian Ecosystems

Ecosystems	Total Area (ha)	% of Total Area
Rain forest	8,874,225	9.61
Mangrove swamps and Other coastal wetlands	927,314	1.05
Freshwater and Inland wetlands.	18,641,000	20.18
Savanna:	44,883,510	48.53
Derived		
Guinea		
Sudan		
Sahel		
Tree Crop Plantations	276,500	0.30
Fallow Vegetation (farmland)	18,779,251	20.33
Total	92,381,800	100.0
Coastal-land & Marine Exclusive Economic Zone (EEZ)	41,090,000	

Source: Biological Diversity in Nigeria: A Country Study, 1991-92.FEPA, Abuja.

2.8. The Economy

The Nigerian economy has been described as monoculture in that crude oil accounts for about 95% of national export earnings, instead of agricultural produce, which was dominant in the 60s and 70s. An existing policy to diversify the economy has made very little impact. According to the Vision 2020 Committee report, the GDP attained a growth rate of 3.3% in 1996, from less than 2.2% in 1994. Inflation fell to 30%, balance of payments deficit declined to $800 million, and external reserves increased to $4 billion by the same year. Table 2.3 shows trends in the GDP.

Linkages between various sectors of the economy are weak and unemployment is high, increasing and a critical problem.

Table 2.3: Percentage Distribution of Real GDP by Sectoral Groups, 1995-1999

Sectoral Group	Year				
	1995	1996	1997	1998	1999
Primary Sector (Agriculture)		38.75	39.00	39.40	40.07	40.99
Primary Sector (Mining)	12.93	13.35	13.14	12.25	11.06	
Total Primary Sectors	51.67	52.35	52.54	52.32	52.05	
Secondary		9.23	9.02	8.89	8.55	8.60
Tertiary	39.10	38.62	38.57	39.13	39.45	
Total Value added		100.00	100.00	100.00	100.00	100.00
Diversification Index		1.34	1.34	1.35	1.36	1.36

(Source: Federal Office of Statistics)

The majority of the population is engaged in and derives sustenance from agricultural production. The largely subsistence agriculture sector has not kept pace with the country's rapid population growth. As a result, Nigeria is now a food importer, whereas it was once a net exporter to other countries in the region. According to the World Bank (2001), agriculture's share of the GDP has declined from 33% in 1990 to less than 28% in 2003.

Major agricultural products include cocoa, peanuts, palm oil, corn, rice, sorghum, millet, cassava, yams, rubber, cattle, sheep, goats, pigs and timber. Different ecological zones support different crops. For example, the forest region supports tree crops such as oil palm (*Elaeis guineensis)*, rubber, cocoa, citrus, and kola, as well as food crops such as yam, cassava, maize and plantain. In the drier Sudan and Sahel savanna zones, grain crops such as millet, sorghum, cowpea and groundnut are dominant. The moister Derived and Guinea savannas combine the root crops of the forest belt with the grain crops of the drier savannas.

In addition to petroleum and agriculture, other industries produce coal, tin, textiles, cement, footwear, chemicals, fertilizers and ceramics. The country also produces the following solid minerals: kaolin, gypsum, columbite, gold, gemstones, barites, graphite, marble, tantalite, uranium, salt, soda, and sulphur.

Fig. 2.3

Fig. 2.4

CHAPTER 3 THE STATUS OF NIGERIAN BIODIVERSITY

Generally speaking, all life support systems in the air, water and on land, as well as all the materials required for fulfilling the developmental aspirations of a people, should be provided by their environment. The status of the Nigerian biodiversity will now be considered in terms of the major life forms.

3.1 Flora

About 4,614 vascular plants have been recorded in Nigeria. According to Hutchinson and Dalziel (1927-36), these include 38 endemic species of the defunct Western and Mid-western area, 39 endemic species from what used to be the Northern region, and 128 from the former Eastern region. Of these, Gbile *et al.* (1978) found 490 plant species in 112 families to be threatened. The distribution of these threatened plant species among the families is given in Table 3.1 below. It is widely believed by experts that the number of plants that are currently threatened far exceeds what is contained in table 3.1. Appendix 1 further lists some plant species currently considered by experts as noticeably threatened.

Table 3.1: Distribution of Threatened Plant Species Within Families

Family	Number of Threatened Plant spp.	Family	Number of Threatened Plant spp.
Acanthaceae	26	Loranthaceae	1
Adiantaceae	5	Lycopodiaceae	1
Agavaceae	2	Malvaceae	1
Amarantaceae	1	Marantaceae	1
Anacardiaceae	7	Melastomataceae	8
Annonaceae	15	Meliaceae	2
Apocynaceae	19	Menispernaceae	2
Araceae	3	Mimosaceae	3
Araliaceae	1	Monimiaceae	2
Aristolochiaceae	3	Moraceae	9
Asclepiadaceae	2	Myriticaceae	2
Aspidiaceae	7	Myrtaceae	1
Aspleniaceae	6	Najadaceae	1
Athyriaceae	2	Orchnaceae	1
Balsaminaceae	1	Octoknemataceae	1
Begoniaceae	2	Olacaceae	1
Boraginacea	4	Olaceae	1
Burseraceae	1	Onagraceae	1
Butomaceae	1	Opiliaceae	2
Caesalpiniaceae	13	Orchidaceae	23
Capparidaceae	2	Orobanchaceae	1

Caryophylaceae	2	Oxalidaceae	2
Celastraceae	6	Papilionaceae	8
Combretaceae	9	Pedaliaceae	1
Commelinaceae	3	Pittosporaceae	2
Compositae	36	Plantaginaceae	1
Connaraceae	6	Podostemaceae	2
Convolvulaceae	3	Protacae	1
Cruciferae	1	Ranunculaceae	2
Cucurbitacea	6	Rosaceae	3
Cytheaceae	1	Rubiaceae	16
Cyperaceae	21	Rutaceae	3
Dennstaedtiaceae	1	Salvadoraceae	1
Dichapetalaceae	11	Santalaceae	1
Ebenaceae	7	Sapindaceae	8
Ericaceae	2	Sapotaceae	2
Eriocaulaceae	3	Scrophulariaceae	2
Euphorbiaceae	31	Scytopetalaceae	2
Flacourtaceae	7	Selaginellaceae	1
Gentinaceae	2	Simaroubaceae	2
Geraniaceae	1	Solanaceae	1
Gnetaceae	1	Sterculiaceae	4
Goodeniaceae	1	Thelypteridaceae	2
Graminae	19	Thymelaeaceae	3
Guttiferae	4	Tiliaceae	2
Hymenophylacelae	4	Ulmaceae	1
Hypericaceae	3	Umbelliferae	3
Icacinaceae	2	Urticaceae	2
Iridaceae	1	Verbenaceae	2
Labiatae	6	Violaceae	2
Lauraceae	2	Vittariaceae	1
Lecythidaceae	2	Vochysiaceae	1
Lemnaceae	1	Xyridaceae	1
Lentibulariaceae	1	Zingiberaceae	2
Liliaceae	2		
Lobeliaceae	3		
Loganiaceae	4		
Lomariopsidaceae	2		

Source: Gbile et al. (1978)

3.2 Fauna

Nigeria has a very rich fauna as a result of her diverse vegetation types. Table 3.2 lists the estimated species diversity of major faunal taxa in Nigeria. Detailed surveys will likely add to the list of species already confirmed present in the country. With 18 species, the Okwangwo Division of Cross River National Park has the highest diversity of primates recorded at any single site in Africa, including the endangered Cross River Gorilla *Gorilla gorilla diehli*. Globally and locally threatened species of Nigerian fauna and some known endemics are listed in Appendix 1.

Table 3.2: Estimated Species Diversity of Fauna Groups

GROUPS	Major subdivisions	Common English Name	Estimated Number of Species
Phylum			
PROTOZOA	Protozoans:		
Mastigophora	Sarcomastigophorans		>2
Ciliata	Cilliates		>10
Sporozoa			>6
Sarcodina	Amoeba		>15
INVERTEBRATA			
Rotifera	Sponges		20
Cnidaria (Zooplankton)	Plankton		>134
Ctenophora	Jellyfish, corals		
Comb jellies			
Platyhelminthes	Flatworms		500
Nematoda	Nematodes		
(Round worms)	600		
Annelida	Annelids		10
Mollusea	Molluscs (snails etc)		>77
Echinodermata	Echinoderms		5
Arthropoda	Arthropods		>20,000
Minor invertebrates	Tunicata		640
CHORDATA			
Chrondrichthyes	Sharks		
Osteichthyes	Bony fishes		ca.247 (excluding marine fishes)
Amphibia	Amphibians		>109
Reptilia	Reptiles		>135
Aves	Birds		c. 906
Mammalia	Mammals		c. 247

3.3. Other Life Forms

Nigeria is also rich in forms of life other than those usually grouped as plants or animals. Table 3.3 below lists some of the known groups.

Table 3.3. Estimated Species of Other Forms of Life

GROUPS	Major subdivisions	Common English Name	Estimated Number of Species
Viruses		Viruses	More than 500
Monera	Bacteria	Bacteria	ca.55.
Myxoplasma			K
Fungi	Zygomycota	Zygomycetes	ca.3,423
Ascomycota	Ascomycetes		K
Basidiomycota	Basidiomycetes		K
Oomycota	Water molds		K
Chytridiomycota	Chytrids		K
Acrasiomycota	Cellular slime molds		K
Myxomycota	Plamodial slime molds		K
Algae	Chlorophyta	Green algae	More than 292
Phacophyta	Brown algae		More than 8
Rhodophyta	Red algae		More than 25
Chrysophyta	Chrysophyte algae		K
Pyrrophyta	Dinoflagellates		ca.36
Euglenophyta	Euglenoids		ca.31
Bacillariophyceae	Diatoms		ca. 245

3.4. Genetic Diversity

Currently, there are wide gaps in our knowledge of the genetic diversity of our wild plants, animals and other life forms.

3.5. Conservation Areas

Studies in conservation biology have shown that the most productive approach, that a country may adopt, in the conservation of its biodiversity, is to establish and maintain *in situ,* viable populations of wild flora and fauna, in all the land and waterscapes represented in that country. According to Ezealor (2001, 2002) and Aminu-Kano and Marguba (2002), protection of habitats and species has long been practiced by various cultures in Nigeria, through their preservation of groves and other distinctive habitats for religious, ceremonial and or hunting purposes. Aminu-Kano and Marguba (2002) further reported that Nigeria's first modern Forest Reserve was created in 1889. By 1950, Forest Reserves covered about 8% of the country's land area, and gradually rose to 11% by 1980. Thereafter, an apparent inability to formulat policies to establish more reserves prevailed, leading to the current situation whereby even protected areas are being de-reserved. A summary of

Nigeria's main conservation areas is given in Table 3.4 while the conservation infrastructure and protected-area system described by Ezealor (2002) is reproduced in Box 3.1.

Table 3.4. Major Conservation Areas in Nigeria

Protected Area	State	Legal Status		Area (km^2)	Location	
Game Reserves						
Alawa	Niger	Gazetted	1971	296.2	10o20´N	06o30´E
Dagida	Niger	Gazetted	1971	294.2	09o20´N	50o31´E
Gilli-Gilli	Edo	Gazetted	1960	363	06o05´N	05o20´E
Kwiambana	Sokoto	Gazetted	1970	2,614	10o50´N	06o00´E
Opara	Oyo	Gazetted	1971	2,486	08o09´N	02o50´E
Orle River	Edo	Gazetted	1960	1,100	06o49´N	06o50´E
Pai River	Plateau	Gazetted	1971	2,486	08o09´N	02o50´E
Pandam Wildlife Park	Plateau	Gazetted	1972	224	08o31´N	09o00´E
Wase Rock Sanctuary	"	Gazetted	1972	2,800	09o40´N	10o00´E
Falgore	Kano	Gazetted	1969	920	11o00´N	08o45´E
Lame Burra	Bauchi	Gazetted	1972	2,058	10o27´N	09o15´E
Sambisa	Borno	Gazetted	1978	686	11o00´N	14o30´E
Hadejia-Baturiya Wet-and/Game Reserve	Jigawa	Gazetted	1976	297	12o27´N	10o13´E
Biosphere Reserve						
Omo	Ogun	Forest Reserve		1,350.5	06o30´N	4o15´E
National Parks						
Kainji Lake	Niger	NP Decree	1975	5,309	09o40´N	03o30E´
Yankari	Bauchi	NP Decree	1993	2,240	09o30´N	10o00´E
Old Oyo	Oyo	Gazetted	1991	2,529	08o44´N	03o44´E
Gashaka-Gumti NP	Taraba	Gazetted	1975	6,363	06o40´N	11o10´E
CRNP	Cross River	Gazetted	1991	4463km^2	$06^0$20'N	09^0 15'E
Oban	C/River	Gazetted	1991	4,463	06o20'N	09o15´E
Okwangwo	C/River	Gazetted	1991	1920	06o17´N	09o14´E
Chad Basin	Borno	Gazetted	1978	2,280	13o20´N	14o00´E
Okomu	Edo	Gazetted	1985	1,100	06o21´N	10o11´E
Kamuku	Kaduna	Gazetted	1999	1,127	10o45´N	06o30´E

Box 3.1. CONSERVATION INFRASTRUCTURE AND PROTECTED-AREA SYSTEM

There are Five categories of protected areas recognized in Nigeria, namely.:

National Parks

These are ecologically and culturally important areas where human habitation is largely disallowed and tourism is encouraged. There are currently eight national parks in different biogeographic zones of the country. Hunting and other human activities that affect biodiversiy are completely forbidden in all the parks. Together the national parks cover about 22,592 km2, about 2.5% of the country. National Parks are assets of the Federal Government and the agency responsible for their mangement is the National Parks Service, an agency of the Federal Ministry of Environment.

Game Reserves

These are areas set aside by state governments for the protection of wildlife. Included here are Wildlife Parks and Wildlife Sanctuaries. Poaching is often widespread despite state edicts prohibiting illegal offtakes from the reserves. Game Reserves are often very poorly managed because of inadequate staffing, poor funding, and lack of equipment and poor remuneration of staff. Many states in the south, where human population densities are high, do not have game reserves. State Ministries of Agriculture and Natural Resources often manage game Reserves. Well-managed Game Reserves may be considered for upgrading to national park status. There are presently about 14 Game Reserves in the country.

Forest Reserves

These are areas set aside by state governments for the protection of timber, fuelwood and other forest resources in their domains. Some Forest Reserves in the northern parts of the country, double as livestock grazing areas. Natural vegetation has been replaced in some reserves with monocultures of exotic tree species. Harvesting of resources is usually allowed under permit or as special concessions to local people. Poor management often results, however, in a lack of control of resource utilization and conflicts among resource users. Only a few Forest Reserves, located in remote, difficult to access or sparsely populated areas, are still in a good undisturbed condition. Each of the 36 states has at least one forest reserve, managed by state Ministry of Agriculture and Natural Resources.

Biosphere Reserves and SNR

Are specially designated areas within forest reserve for scientific and educational purposes? And all human activities including hunting and fueling include fuelwood gathering are prohibited.

Special Ecosystems and Habitats

These include sacred groves, streams and lakes or other sites that are revered by local communities for their spiritual, recreational and other socioeconomic values. The commonest of these unique sites are sacred groves; small forest blocks, usually no more than a few hectares, set aside by some rural communities, mostly 43 in the south, as homes of local deities, e.g., the Oshogbo Shrine in Oshun State. With increasing urbanization and the spread of modern religions, sacred forests and other distinctive habitats are fast disappearing. Conservation of the biological resources of these in these small ecological islands is usually through traditional belief systems of superstitions and taboos.

A major shortcoming in Nigeria's protected area system is the non-inclusion of any part of the country's coastal area into the protected area system. Portions of some key ecosystems such as the Niger Delta are also not part of the country's protected area network. These need to be urgently addressed. Another problem of Nigeria's conservation areas is the absence of buffer zones between the core conservation areas and human settlements. This has made it difficult for the lands surrounding the conservation areas to be managed in a manner that is compatible with key objective of biodiversity conservation in the protected areas. A need to create these buffer zones therefore exists.

3.6. *Ex-situ* Conservation

Many rare and threatened species in Nigeria that require *ex situ* conservation are receiving very little attention. For example none of our zoological gardens is engaged in a breeding programme for any of our endangered animals. Chapter 4 outlines the activities of some national agencies that are concerned with both *in-* and *ex situ* conservation of biodiversity in the country.

3.7. Dynamics of Biodiversity Exploitation in Nigeria

The impact of human exploitation of biodiversity in Nigeria is enormous. Of all the anthropogenic impacts on biodiversity in Nigeria, the greatest is the degradation of the various biomes in the country. The diagram below summarizes the dynamics of biodiversity use in Nigeria.

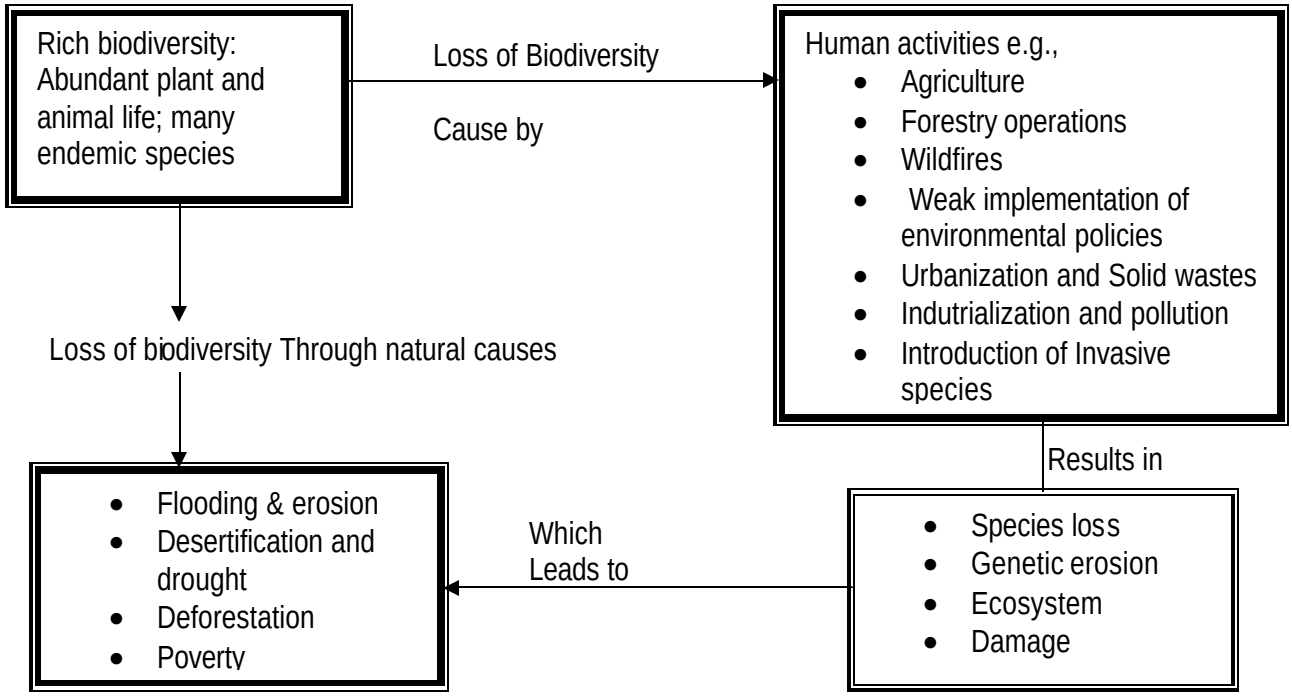

Figure 3.1. Conceptual framework of the dynamics of Biodiversity exploitation in Nigeria

3.8.1. Managing Biodiversity in Forestry

Traditional practices in community forestry encompass a wide range of forms including agro-forestry, sacred groves, forest gardens, collection of non-timber forest products and highly selected timber felling, among others.
Traditional forest management practices still remain important measures for maintaining and sustainably using biodiversity. Agroforestry, combing trees that provide food, fibre, fodder, medicine and building materials, with annual and perennial crops and livestock is at the center of most traditional forest management systems.

3.8.2. Indigenous Knowledge

For centuries, rural people have encouraged and relied upon biodiversity for their livelihoods. Farmers have managed genetic resources, for as long as they have cultivated crops. For centuries, they have selected varieties of crops and livestock breeds to meet environmental conditions and diverse nutritional and social needs. The immense genetic diversity of traditional farming systems is the product of human innovation and experimentation both historic and ongoing.

For many communities in Nigeria, self-reliance in food production will depend on improving low-input agriculture in difficult environmental conditions, which are now prevailing in most parts of the country. The raw materials for these improvements are the biological resources available and sustained in forests, rangelands, fields, farms and homesteads. The accumulated knowledge of farmers coupled with access to modern technologies provides the keys to developing sustainable agricultural systems, necessary for biodiversity conservation and development. There is increasing awareness that conservation and use of biodiversity must be concerned not only with genes, genotypes, species and ecosystems, but also with the traditional knowledge that has helped to produce and maintain this diversity.

An estimated three quarters of prescription drugs derived from plants were discovered because of their prior use in indigenous medicine. Most Nigerian rural and forest communities employ many species for medicine and related purposes.

Similarly, for generations of subsistence farmers have been producing or gathering plants in the wild or semi-wild that have long been accepted as desirable sources of food. Such traditional plants satisfy their needs and are essential to the diets of rural subsistence households, providing sources of energy, vitamins and animals.

Unfortunately, these indigenous species of plants face the threat of extinction. It is believed that some of these species are now in fact extinct . Several factors have been advanced for the loss of these species. Modern agricultural practices have also encouraged monoculture of selected varieties with higher productivities. Most indigenous species have not received research attention with the view to improving them. Many have thus been neglected, over-exploited or under-utilized because of lack of information on their potentials. Many indigenous species were very restricted in respect of use and may become endemic over centuries in isolated areas because of lack of communication or documentation about their potential.

Biodiversity and humanity have become inextricably linked. Human cultures have adapted to many diverse habitats. They have used altered and nurtured biological resources to meet countless needs. As a result of plant and animal domestication and resource harvesting a tremendous interdependence has evolved between "natural" and "human induced" biodiversity. There is an urgent need to appreciate the benefits from biodiversity with regard to indigenous knowledge. There is also the need to promote genetic improvements in traditional plants development of technologies for preparing foods based on these plants that are acceptable in urban markets.

BOX 4.1: Natural Resource Valuation Project

With the assistance of the John D. and Catherine T. MacArthur Foundation, the **Bioresources Development and Conservation Programme** and the **Environmental Law Institute, Washington, D.C.** have initiated a two-phased project to promote the development of a legal regime for the valuation of natural resources in Nigeria that accurately accounts for the value of damage to non-timber forest products and other goods lying outside of modern channels of commerce.

The first objective is to establish the full economic value of one or two sample species in the

3.8.3. Natural Resource Valuation

The vital role which the natural resources of the country plays in the economic life of the citizens has been generally overlooked by economists and decision-makers, especially in the extent to which its use provides a buffer against poverty and opportunities for selfemployment in the informal sector. This has led to a situation where the authorities are unwilling or have been unable to make the requisite investment in natural resource management and conservation. An additional factor hindering sustainable use and development of the country's natural resources is the failure of conventional measures of national income to recognize the unsustainable depletion of biological and other resources as a loss to the country's wealth. "Perverse incentives", such as subsidies for environmentally damaging activities, often discourage sustainable use, and there is considerable scope for improving national accounting methods to reflect the true value of natural resources.

Local communities in Nigeria have historically benefited from natural ecosystems through the use of non-timber forest products (NTFPs) for food, herbal medicines, fibre, and other uses. Although NTFPs typically lie outside of statistics on official commerce, they provide a wide range of raw materials and inputs for a diverse array of rural enterprises.

Despite the central role of NTFPs in the lives of most Nigerians, economic valuation of natural resources has been skewed in favour of resources such as oil and timber, to the detriment of NTFPs and other off-farm income-generating activities. Valuations typically emphasize the commercial significance of forest products and focus on their role in international trade. Little attempt has been made to assess the value of forests to local people over and above the commercial timber value. Existing laws do not set forth natural resource valuation methodologies or even require the use of professionals to perform economic valuation and damage assessments.

Instead, the responsibility for determining the economic value of natural resources typically rests with the industries that cause the damage.

The resulting imbalance in the law and practice of environmental valuation is central to the crises that the communities and ecosystems of the Niger Delta now face, as well as in the greater Nigerian environment. Recognition of the value of NTFPs could lead to their increased use as a tool in social and economic development, as well as to the development of a more complete understanding of the Nigerian environment. Additionally, more effective valuation practices could reduce conflict and civil strife due to inadequate compensation for damage wrought to the sources of food, water, and livelihoods of communities throughout the Niger Delta, as well as elsewhere in Nigeria.

3.8.4. Bio-resources as a Platform for Economic Renewal

A core element of sustainability is the maintenance of environmental assets to a level that meets the needs of the present generation without jeopardizing the interests of future generations. Environmental asset, which constitutes most of our natural capital, includes soil, atmosphere, forests, waterways, dry lands and other ecosystems. They can be utilized for the production of goods and services. There are two forms of natural capital: environmental assets and cultivated natural capital. In the management of environmental assets, it is crucial that consumption that is based on the depletion of natural capital should no longer be counted as income.

Both the industrialized nations and developing countries have come to accept that sustainable development involves creating and maintaining the options for prosperous social and economic development and that a close relationship exists between resilience, diversity and sustainability of social-ecological systems (Folke *etal*. 2002). There is now increasing support for policies that strengthen the perception of humanity and nature as interdependent and interacting and stimulate development that enhances resilience in social-ecological systems, recognizing the existence of ecological threshold, uncertainty and surprise (Folke *et al*. 2002).

For Nigeria, this new perceptive to human development presents an unusual opportunity for planned economic development based on the framework of the Earth Charter and Agenda 21. It presents a solid framework for utilizing our natural resources as a tool and the foundation for sustainable development based on social equity. The perceived Nigeria's comparative advantage in the new global economy can be grouped into three main categories:

Natural Capital

Land, Water, air, forestry/ vegetation - Existence of rich and unique biological diversity that is linked to very resilient cultural systems that have resisted complete assimilation to modernization, which will permit pluralism in the technological choices available to us to create enormous assets.

Human Capital

Skills, knowledge, capacity and adaptive strategies – Globally acknowledged capacity and capability to produce and deploy highly trained multi-disciplinary workforce and world-class scientists through investment in education and training that could expand our human capital stock.

Man-made Capital

Physical goods and services - A modest industrial base with a sophisticated private sector that could be supported to expand Nigeria's man-made capital.

Social capital

This relates to the importance of social cohesion, common identification and ownership of the structure of governance.

Given Nigeria's enormous endowment of human and natural capital, the country should embrace this development paradigm that is socially compatible for rapid and sustainable development aimed at substantially reducing poverty and designing a secure future.

3.8.5. Biodiversity Prospecting

Biodiversity prospecting refers to the exploration of biodiversity for commercial, valuable, genetic and biochemical resources. The value of biodiversity as raw material for pharmaceutical and biotechnology industries is only a portion of its value to society. As commercialization of genetic resources is already underway, it is necessary to ensure that this does not adversely affect biodiversity conservation.

Three problems must be overcome if biodiversity prospecting is to contribute to national sustainable development.

Growing commercial interest in biodiversity must be accompanied by increased investment in resource conservation. Unregulated biodiversity prospecting and drug development could speed the destruction of the resources.

Through massive environmental awareness campaigns, appropriate policies and regulations, every Nigerian (including corporate citizens) must be made aware of the important role each has to play in maintaining and improving the status of the country's biodiversity.

3.9. Obstacles and threats to biodiversity conservation

Globally, biodiversity is in jeopardy. For example, 1,111 or 11% of the world's known bird species are under various degrees of threat which if not addressed may lead to their extinction. In Nigeria, most people are not aware that many of our biological resources are threatened by intense pressure from various human-related activities. For example, two bird species, the Bannerman's Weaver *Ploceus bannermani* and the White-throated Mountain Babbler *Kupeornis gilberti,* are threatened by the loss of patches of their highland forest habitats on the Obudu and Mammbilla Plateaus, the only locations where they are found in the country. These forests and many other important habitats throughout the country are being lost through forestry operations, agriculture, industrialization and pollution, urbanization and solid wastes, desertification and drought, wild fires, flooding and erosion, invasive species, and poor environmental policy. A brief overview of these major constraints to biodiversity conservation in Nigeria is as follows.

3.9.1. Loss of Biodiversity Through Forestry Operations

About 20% of Nigeria was previously covered with forests of the Guineo-Congonean type. Both authorised and illegal forestry operations together with agriculture have combined to drastically reduce the country's forest cover to barely 10% of its original extent. The annual rate of deforestation in Nigeria averages 3.5%. Based on this, it has been estimated that the country will lose all her forests by the year 2020. Table – illustrates the increasing trend in the domestic consumption of sawn wood

Table 3.5. Domestic Consumption of Sawn Wood in Nigeria, 1981 and 1991

State	Consumption	
	1981	1991
Cross River	29,900	2,800
Edo/Delta	839,900	814,867
Kwara/Kogi	22,600	37,485
Lagos	231,300	385,500
Ogun	494,200	236,400
Ondo	644,800	704,000
Oyo/Osun	350,400	586,530
Others	104,100	133,848
Total (Nigeria)	2,722,200	2,903,470

(Source: Raw Materials Research and Development Council, Lagos.)

In Nigeria, Enabor (1976) predicted that Nigeria's consumption of wood might rise to 122 million m3 by the year 2000. In some locations (e.g., the Olokemeji and Nimbia Forest Reserves in Ogun and Kaduna States respectively) natural forests have been replaced with monocultures of exotic trees. Apart from logging roads opening up forests for poaching and other illegal uses, the total effects of forestry operations on Nigerian biodiversity are not well known. Scientific studies to unravel these effects must therefore form part of an action plan to conserve the forests.

3.9.2. Effects of Agriculture on Nigerian Biodiversity

Because a large proportion of Nigeria's population is rural, agriculture plays an important role in the national economy. Nigerian agriculture affects biodiversity because it is largely subsistence, and based on the shifting, slash-and-burn method, of which a piece of land is productive only for a few years. This farming method has combined with forestry operations to degrade a large proportion of each of Nigeria's biomes. Furthermore, even in rural areas, farmers are increasingly opting for high yielding and improved crop varieties in preference to indigenous cultivars. This potentially leads to impoverishment of the gene pool of local crop cultivars. Agricultural activities such as (over) fishing, (over) grazing, and the increasing and indiscriminate use of pesticides and chemical fertilizers, have also contributed to the erosion of Nigerian biodiversity. Ita (1993) listed 24 pesticides that are commonly used in Nigeria, including DDT, which has been banned in many countries. He also listed 13 herbicides and 13 insecticides that are produced and distributed by a Nigerian-based chemical company. The adverse impacts of pest control biocides, especially on non-target

organisms, are well known. For example, when Queletox was used in the control of Queleas in the northeast of Nigeria, several waterbird species were inadvertently killed. These included Cattle Egrets *Bubulcus ibis,* which control insect pests of farmlands.

These problems notwithstanding, it is possible, through research, to develop agricultural systems that would positively contribute to biodiversity maintenance in the various ecological zones of the country. Tested practices such as mixed-cropping and agro-forestry must become part of the national agricultural policy if agriculture is to become a positive contributor to biodiversity conservation in Nigeria.

3.9.3. How Industrialisation and Pollution Impact on our Biodiversity

The petroleum industry accounts for over 90% of Nigeria's national income. The majority of the industry's activities take place in the Niger Delta and in coastal areas, where they have caused considerable environmental pollution and forest degradation. Nigeria is widely believed to flare more gas than the rest of the oil-producing world put together. The impact of the gas emissions and other pollutants from the petroleum industry on Nigerian biodiversity is often overlooked or underestimated. Also roads constructed for oil exploration purposes often open up areas for use by poachers and other illegal exploiters of forest resources. Other minerals that their exploitation has also contributed or is contributing to environmental degradation in Nigeria include coal, iron ore and tin. Illegal mining of gemstones in some parts of north-central Nigeria is also degrading the quality of the environment there. The problems arising from mineral explorations and their exploitation may be added that of pollution arising from other industries such as the textile, tanning, and cement industries, whose industrial wastes are undermining the ecological integrity of many of our rivers and streams.

3.9.4. Urbanisation and Solid Wastes

Although large urban areas constitute a small percentage of Nigeria's land area, many cities are growing very rapidly and spreading into critical habitats and sites of conservation interest. The pace of urbanisation has also increased with the creation of 36 states and their administrative capitals. For example, large areas of the Lekki Peninsula (an important mangrove and lowland swamp forest habitat for many threatened hydrophilic species) has been cleared and "reclaimed" to create more space for the rapidly expanding city of Lagos. Our new capital city, Abuja, also stands on what was two decades ago, a near pristine savanna woodland. The city's original plan which provided for many green areas, to offer biodiversity connections with the city's surrounding countryside, appears to have been abandoned for the construction if large contiguous concrete jungles.

3.9.5. The Impact of Desertification and Drought on Nigeria's Biodiversity

Researchers (e.g., Fry 1975) have reported evidences of increasing aridity in the north of Nigeria. The aridity is largely human induced, but is also exacerbated by periodic drought. Some of the activities blamed for the increasing dryness include large-scale land clearing for agriculture and river damming. For example, the extent of flooding reduced from about 3,500 km2 in the 1950s to less than 1,000 km2 in the 1990s as a result of the construction of the Tiga, Challawa and over 20 other dams and river impoundments in Kano State (see Hollis *et al* 1993, Ezealor 1995). The drop

in water table and other hydrological changes engendered by desertification and drought has adversely affected hydrophilic flora (especially the non-phreatophytic species) and aquatic fauna in the country.

3.9.6. Wild Fires

Wild fires, often started by humans, impact negatively on biodiversity. Small mammals, ground-nesting birds and numerous invertebrate species are often victims of wildfires. In forest ecosystems, wildfires repress seedling establishment and create wounds on big plants through which disease agents may enter. Sources of wildfires include the use of fire for clearing farmlands, and for driving animals out from cover during hunting.

3.9.7. Flooding and Erosion

Flooding and erosion is a serious ecological problem in most parts of the country. About 18,000 km2 of Nigeria is affected by gully erosion and 20% of the country's population is potentially at risk of annual flooding of their homes and or farmsteads. Whereas gully and sheet erosion ravage parts of the south (particularly the southeast), wind erosion is culprit in the north. All forms of erosion are exacerbated by widespread poor agricultural practices, which denude the landscape. Nigeria is also experiencing serious coastal erosion believed to be worsening as a result of borrowing of sea sand for swamp reclamation from the nation's continental shelf. In both the inland and coastal erosion biodiversity are list and livelihoods are threatened.

3.9.8. Invasive Species

Some exotic and indigenous species are invading habitats from where they were previously unknown. In coastal mangrove swamps, the Nipa Palm *Nypa fructicans* is displacing native species. Water Hycith *Eichornia crassipes* another exotic plant species is rapidly clogging up waterways and lakes throughout the country, as is Cattail *Typha* spp. In farm fallows in the southern and central parts of the country, an introduced weed *Chromolaena odorata* is often the dominant plant, and sometimes forms monospecific plots. It is widely believed that these invasive species were either accidentally introduced or brought in as ornamental plants.

Because invasive species can have deleterious effects on native biodiversity, it is important to institute monitoring programmes that would assist in predicting the impact of invasive species on local biodiversity.

3.9.9. Widespread Poverty

Despite her rich renewable and non-renewable resources, poverty in Nigeria is widespread and rated among the worlds worst. A 1996 survey showed that about 67% of Nigerians (mostly women) live below the poverty level. This is an indication that the countries natural resources are being poorly harnessed, and demonstrates the need for environmental policies that .are tailored to marry conservation and development in a practicable manner. In Nigeria poverty is directly linked to biodiversity loss. This is because rural livelihoods depend almost entirely on biodiversity. In order to address biodiversity concerns, the problem of poverty must be addressed by providing alternative livelihood options to rural communities.

Table 3.6. Species in which significant population changes have occurred over the last 10 years

Groups/Species	Type of change	Lost Benefits	Causes of Change
PLANTS			
Orchids **(Orhidaceae)**	Deforestation	Decreasing	Spp. diversity & genetic resources
Utile *Entandrophragma utile*	Overexploitation	Decreasing	Timber
African Ormisia *Pericopsis elata*	Overexploitation	Decreasing	Timber
Calanus spp.	Overexploitation	Decreasing	Raw material for cane Furniture
Ebony *Diospyros* spp	Overexploitation	Decreasing	Raw materials for Woodcarving
Pterocarpus osun	Overexploitation	Decreasing	Timber & material for handicrafts
Mahogany *Khaya* spp.	Overexploitation	Decreasing	Timber & medicinals
Neem *Azadirachta indica*	Increasing	Though a source of medicinals, biopesticide and timber,	Fuelwood, poles,
This exotic species is displacing indi-genous spp even in national parks!		**Invasive habits of the**	
SPECIES			
Water Hyacinth *Eichornia crasipes*	Invasive habits of species	Increasing	Fishery, Water ransportation
Cattail *Typha* sp.	Invasive habits of species	Inreasing	Fishery, Water transportation
Sterculia setigera medicinal	Deforestation	*D*ecreasing	Forage, traditional culinary
Fan Palm *Borassus aethiopum*	Overexploitation	Decreasing	Wild fruit, timber
Dum Palm *Hyphaene thebaica*	Hydrological drought	Decreasing	Wild fruit, timber
**Crateranthus talbotii*	Not known	Decreasing	Spp. diversity & genetic resource
**Locesenera talbotii*	Not known	Decreasing	Spp. diversity & genetic resources
**Crypyosepalum diphylum*	Not known	Decreasing	Spp.Diversity & genetic resources
**Pipstostigma pilosum*	Not known	Decreasing	Species diversity & genetic resources
**Didelia africana*	Not known	Decreasing	Spp. diversity & genetic resource
**Salvadora persica*	Not known	Decreasing	Food for migrant Palearctic birds

ANIMALS

Nile Perch *Lates niloticus* Overfishing Decreasing Fishery

Lungfish *Protopterus anectens* Loss of wetlands Decreasing Fishery, species diversity

*Quealea *Quealea* spp. Poor husbandry Probably Agricultural produce increase (cereals)

Gray Parrot *Psittacus erithacus* International pet trade Decreasing Tourism opportunities

*Ostrich *Strythio camelus* Poaching & illegal trade Decreasing Tourism opportunities

*Black Crowned Crane *Balearica pavonina* Illegal local pet trade Decreasing Tourism opportunities & erosion of national pride (the bird is said to be the national bird!)

Hooded Vulture *Necrosyrtes monachus* Habitat degradation Decreasing Species diversity

Darter *Anhinga melanogaster* Habitat Loss Decreasing Species diversity

Sudan Golden Sparrow *Passer luteus*) Increasing aridity Increasing Agricultural produce (cereals)

African Elephants *Loxodonta africana* Habitat loss, poaching Decreasing Tourism opportunities

Lions *Panthera leo* Habitat loss Decreasing Tourism opportunities

Giraffe *Giraffa camelopardalis* Poaching Extirpated Tourism opportunities

Antelope species **(Bovidae)** 'Bush-meat' trade Decreasing Tourism, Genetic diversity

Monkeys and Apes **(Primates)** Bush-meat and international trade Decreasing Tourism, Genetic diversity

Crocodiles **(Crocodylidae)** Over-harvesting Decreasing Tourism, skins

Pythons **(Boidae)** Poaching Decreasing Tourism, skins

Turtles and Tortoises **(Chelonidae)** Over-harvesting Decreasing Tourism opportunities

CHAPTER 4. NATIONAL EFFORTS AT BIODIVERSITY CONSERVATION

In the past two decades, Nigeria had made rather bold but unsustainable efforts towards biodiversity conservation. These steps relate to the strengthening of policy, legislative and institutional frameworks and the implementation of intervention measures aimed at the conservation of biological diversity, the sustainable utilization of its components and equitable sharing of benefits. This section attempts to review the major past and present efforts of government and civil society organizations in biodiversity conservation and equally reflect on the major constraints and lessons arising from such actions.

4.1. National Policy overview

Nigeria is committed to a national policy on environment aimed at achieving development. In particular, the policy is to secure a quality environment that is adequate for good health and well being; conserve and use the environment and natural resources for the benefit of present and future generation and restore, maintain and enhance the ecosystems and ecological processes for conservation of biological diversity. The policy has relevant sections identifying implementation strategy on human population, culture, housing and human settlements. Strategies for biological diversity, natural resource conservation, land use and soil conservation, agriculture and water resources were given prominence. The implementation strategies also cover such sections as wildlife, marine and costal area resources, mining and mineral resources, industry, energy, oil and gas, construction, health, education, transport and communication systems, trade and tourism, science and technology, natural disasters and desertification, flood and erosion. Others include sanitation and waste management, toxic, hazardous and radioactive substances, air pollution, the working environment, public participation, institutional arrangements, funding mechanisms and monitoring and evaluation. Other policies directly relevant to biodiversity conservation are those on agriculture, integrated rural development and forestry and water resources.

4.2. Established Legislative Framework

The relevant constitutional provisions and laws are reviewed below.

4.2.1. Status of Environmental Laws

The constitution of Federal Republic of Nigeria (Anon 1999) provides some policy statements concerning the environment under chapter 2, which deals with fundamental objectives and directive principle of State policy. The most relevant sections include the following:

S. 14 (2) (b): - It is hereby declared that security and welfare of the people shall be the primary purpose of government.

S. 16 (1) (a): - The state shall, within the context of the ideals and objectives for which provisions are made in this constitution, harness the resources of the nation and promote national prosperity and an efficient, a dynamic and self reliant economy.

S. 17 (2) (d): – In furtherance of the social order, exploitation of human or natural resources in any form whatsoever for reasons, other than the good of the community, shall be prevented.

S.20: – The state shall protect and improve the environment and safeguard the water, air and land, forest and wildlife.

The National Policy on the Environment 1999 and relevant environmental laws enacted prior to or after the policy to give effect to the nation's environmental protection objectives and strategies appear to have a support base in the above stated fundamental principles expressed in the 1999 Constitution.

Those who would like to see a stronger and more direct constitutional provision addressing the issue of environmental protection consider the current constitutional basis for the protection of the environment and conservation of natural resources rather weak. They would like to see conservation of natural resources entrenched in the country's constitution.

Besides the constitution, the Federal Environmental Protection Agency Decree, 1988 as amended by Decree 59 of 1992 was the statutory threshold of environmental protection in the country. Basically, it established the Federal Environmental Protection Agency and provides the legal framework essential for the implementation of policies, goals and objectives pertaining to environmental protection, natural resources conservation and sustainable development. FEPA's mandate to protect the environment was dictated primarily by the federal environment statutes and international treaties to which Nigeria is party.

Section 4 of the Federal Environmental Protection Agency Decree imposes upon the Agency a number of duties, thus:

Prepare a comprehensive national policy for the protection of the environment and conservation of natural resources, including procedure for environmental impact assessment for all development projects;

Prepare in accordance with National Policy for the protection of the environment, periodic master plans for the development of the environment, sciences and technology and advice the Federal Government on the financial requirements for the implementation of such plans.

Advise,

The Federal Government on the national environmental policies, the conservation of natural resources and sustainable development, and scientific and technological activities affecting the environment and natural resources;

The president on the utilization of the 1 percent Ecological Fund for the protection of the environment.

Carry out such other activities as are necessary and expedient for the full discharge of the functions of the Agency under the decree.

As the institutional body and focal point for the effective planning, management and protection of the Nigerian environment, there are other statutory provisions in the decree imposing specific statutory duties on FEPA. Under sections 15-19, the Agency is required by law to establish national

standards, codes and guidelines for water quality, effluent limitation, air quality, atmospheric and ozone layer protection, noise control and hazardous substances to protect the health and welfare of the population from environmental degradation. To this end, the Agency spearheaded the issuance of the (I) National Environmental Protection (Effluent Limitations) Regulations, 1991; (ii) National Environment Protection (Pollution Abatement in Industries and Facilities Generation Wastes) Regulations, 1991; (iii) National Environmental Protection (Management of Hazardous Wastes) Regulations, 1991 and (iv) Enactment of the Environmental Impact Assessment Decree, 1992.

Practical guidance in respect of FEPA's environmental duties is given under the decree establishing it, the regulations made pursuant thereto, the Harmful Waste (Special Criminal provisions etc); Decree, 1988 and the Environmental Impact Assessment decree 1992. In view of the recent absorption of FEPA by the newly created ministry of Environment, the FEPA decree is currently being reviewed to take account of the change. There are other legislations of environmental protection significance enacted prior to and after the Agency was established, which may also be taken into account by the Agency as the appropriate authority. These include:

Public Health Act, 1917
Factories Act, 1937

Civil Aviation Act, 1964

Antiquities Act, 1915
Live Fish (Control of Importation) Act, 1965.
Exclusive Economic Decree, 1964
Navigable Waters Declaration Decree, 1978
Petroleum Decree, 1969
Petroleum (Drilling and production) Regulations, 1969
Oil in Navigable Waters Decree, 1968
Oil Pipelines Act, 1956
Associated Gas Re-Injection (Amendment) Decree, 1985
Nigeria Atomic Energy Commission Decree, 1985
Natural Resources Conservation Council Decree, 1989
River Basins Development Authorities Decree, 1987
Sea Fisheries (licensing) Regulations, 1992
Quarries Decree, 1969
Land Use Decree, 1972
Factories Decree, 1987
National Parks Decree, 1991

International treaties pertaining to the environment most of which Nigeria has played an active part in negotiating and signing up include the following:

International Convention for the Prevention of Pollution of the Sea by Oil, 1954 - 62 Convention on the High Seas, 1958.
Convention on Fishing and Conservation of the Living Resources of the High Seas, 1985 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, 1963.
Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter, 1972

United Nations Convention on the Law of the Sea, 1982 Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their destruction, 1972 Vienna
Convention for the protection of Ozone Layer as amended by the 1990 London Conference.
The Ramsar Convention on the Conservation of Wetlands of International Importance Especially as Waterfowl Habitat, 1971, the Convention concerning the Protection of the World Culture and Nature Heritage Convention.
Convention an International Trade in Endangered Species of Wild Fauna and Flora, 1973 (CITES).
Convention on the Conservation on the Conservation of Migratory Species of Wild Animals, 1969 or the Convention of Migratory Species of Wild Animals, 1973
Convention on fishing and Conservation of Living Resources of the High Sea, 1966
Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, 1989
Convention on Climate Change, 1992
Convention to combat Desertification, 1994
Act regarding navigation and Economic Co-operation between the States of the Niger Basin, 1963
Agreement Concerning the River Niger Commission and the Navigation and Transport on the River Niger, 1964
African Convention on the Conservation of Nature and Natural Resources, 1968
Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region, 1984

With the exception of the Oil in Navigable Waters Decree, 1968, National Park Decree, 1991 and Sea Fisheries Decree, 1992 to some extent, the nation's laws above merely contain provisions addressing issues relevant to the preservation of the air, water and land environment. Not only do most of these existing national laws fall short of effective environmental protection legislation, but also they are overdue for amendment to meet the realities of present times. For example, most of the existing penalty provisions are grossly understated and cannot provide any deterrent effect, nor are they commensurate with the harm or damages inflicted on the environment as a result of the conduct penalized under the respective legislation.

Furthermore, many of the existing laws still require pertinent regulations to be made by the designated authority - usually the Minister charged with such responsibility under the legislation. In most cases these provisions in the existing legislation are not complied with. Even in the few cases where the statutory provisions have been effected and the regulations made, these are quite inadequate towards advancing the cause of environmental protection.

None of the existing status relating to the environment listed in paragraph 4.1.2.7 imposed duties on FEPA that it was to carry out, nor were any of these amended to reflect this; rather most of these laws specifically assigned such duties to a specific body or bodies. For example, under the Sea Fisheries (Licensing) Regulations, 1992, the Federal Ministry of Transport and Communications is charged with the registration of vessels intended for fishing or shrimping purposes, while under that same decree, the Minister of Agriculture is charged with issuance of license authorizing a vessel to carry out fishing or shrimping in Nigerian territorial waters. Under the State Forestry Laws, the Governor of a State is required to constitute as Government Forest Reserves and Protected Forests, specific forestlands. Similar power is vested in Local Government Council to declare any land within the area of its jurisdiction as a Forest Reserve or Protected

Forest. Forest Rangers are employed to ensure that prohibited activities in the forest reserves are strictly observed.

4.2.2. Limits of Biodiversity Laws

The following paragraphs assess the extent of legal coverage along the line of eleven distinct aspects of biodiversity.

Identification

The process of locating, and thereafter establishing the identity, distribution occurrence, status and value of biodiversity components, should be relevant to the wild and domesticated fauna and flora. The National Crop varieties and Livestock Breed (registration etc.) Decree, 1987 does not cover wild fauna and flora and gives limited coverage to domesticated fauna and flora. Essentially, the decree establishes the National Crop Varieties and Livestock Breeds Register in which shall be inscribed in a permanent form, the names of old and new crop varieties and livestock breeds in Nigeria. The decree also sets up National Crop Varieties and Livestock Breeds registration and Release Committee which is expected to operate under the Genetic Resources Unit of the Department of Agricultural Resources Science and Technology and charged with the general responsibility for crop varieties and livestock breed validation, registration of name and release in Nigeria. Both the Natural Resources Conservation Council and the National Park Decrees recognize the need for the maintenance and compilation of a checklist of plants and animal species and the desig nation of sites and species of conservation interest.

Box 4.1: Land Tenure and Land Use

The *Federal Land Use Decree of 1978* was designed to regulate ownership of land, the principles of land tenure, rents and rights of occupancy (Federal Land Use Decree, Sec.1). The motivation behind the establishment of the decree was fourfold: to make land more easily available for development, to reduce the cost of acquiring land for development, to facilitate planned development of settlements, and to eliminate land speculation—especially in urban and peri-urban areas. Essentially, the decree allowed for the transfer of land tenure from traditional rulers, village heads, heads of family, etc. to the state, and according to the decree, overall responsibility for the control and management of land in urban areas, including land allocation, was to become the responsibility of the governor of each state. Responsibility for land allocation in rural areas was to fall to local government. In practice, however, the decree has failed to supersede customary law for communal ownership of land resources and has never been fully enforced.

There are three basic, *de facto*, and tenural systems in force in Nigeria. These are:

- State Tenure: Under this system, land estates are put under the management of the state (either federal or state government; e.g., National Parks, State Forest Reserves, etc.), to be held in trust and administered for the use and benefit of the local—and larger—Nigerian population.

- Communal Tenure: Here, members of a community hold customary rights to land within the area controlled by that community. Within this system families, special interest groups and individuals may be granted usufruct rights over certain parcels of land and associated resources. Traditional rulers or village heads are generally responsible for exercising control over the management of unallocated community holdings. Generally, communal lands are not alienable.

- Private Tenure: In this case, exclusively an individual or a corporate entity holds property acquired through purchase, inheritance, gift or exchange.

While in many parts of Nigeria land tenure continues to be a contentious point and a source of conflict— between communities and the state; among communities; and among individuals—environmental degradation seems to be less directly tied to any one land tenure system, and more directly to:

- Conflict between land tenure systems (especially between state and communal systems), and

- Resource management practices associated with certain land use systems.

Currently no land use policy exists in Nigeria. Instead, states are encouraged to derive their legislation from the Federal legislative framework. While some states have taken steps to develop legislation to improve (from an environmental perspective) resource management through decrees against bush burning, agricultural expansion into forestlands, etc., major impediments to sustainable environmental management still exist. Two key land tenure and land use issues that require future consideration include how to mediate/resolve problems that arise between tenure systems; and how, within the various tenure systems, to support policy/institutional frameworks that are capable of promoting the sustainable use of natural resources.

(Adapted from Nigeria Environmental Analysis – USAID 2002 - ARD Inc.)

Protection *in-situ*

Article 8 (a) of the Convention on Biological Diversity calls on each Contracting Party to establish a system of protected areas where special measures need to be taken to conserve biological diversity. *In-situ* Conservation' means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings where they have developed their distinctive properties. Some of the legislation on *in-situ* conservation includes the Forestry Laws, Forestry Regulations, and the National Parks Decree, 1991. The 1991 Decree established five national parks - Kainji Lake, Chad Basin, Cross River, Gashaka-Gumti and Old Oyo National Parks. The Yankari Game Reserve was elevated to the level of a national park by virtue of the Yankari National Park Decree of 1993. The stated objectives for the creation of national parks include:

To promote the preservation, enhancement, beauty, protection, conservation and management of indigenous flora and fauna resources;
To promote their sustained growth for zoological and botanical specimens;
Encourage general interest and education in the knowledge of wild animals; and
To encourage the general public to visit national parks and the study of nature it affords, thereby popularizing them as recreational and tourist attractions. The decree imposes restrictions on

Entry into or residence;
Hunting, etc; and
Weapons etc. in the Parks.

It also prohibits: introduction of wild animals, domestic animals and vegetables into the Parks. There are prescribed penalties for offences under this decree.

Protection *ex-situ*

Article 9(d) of the CBD enjoins each Contracting Party 'as far as possible and as appropriate, and predominantly for the purpose of complementing *in-situ* measures', to 'regulate and manage collection of biological resources from natural habitats for *exsitu* populations of species.' *Ex-situ* protection involves preservation of living, species or genetic materials in gene banks, zoological parks, botanical gardens and sites other than their natural habitats. The 1991-92 Country Study on Biological Diversity in Nigeria identified no less than 51 existing *ex-situ* sites in the country made up of private wildlife sanctuaries, zoos/zoological gardens, botanical gardens/arboreta, museums, herbaria and aviaries. Legal coverage of this aspect is still rather weak and is an area that needs to be addressed in keeping with Article 9(d) of the CBD.

Access and Extraction

This ranges from controls on the kind and amount of access to fauna and flora in the wild, *ex-situ* collections to genetic material, and also modes of extraction of these components. Legal regulation of these is relatively undeveloped in the country, although an effort was made under the Sea Fisheries (Fishing) Regulation, 1992 that requires the Nigerian Institute of Oceanography to determine yearly, the minimum total length of fish that may be caught.

Use

This section describes attempts at utilizing biodiversity for subsistence, commercial, scientific, or other purposes. Some of the laws regarding this have been discussed, especially in connection with wild fauna and wild flora. But generally for purposes of biodiversity conservation the laws are inadequate and would need to be up-dated to meet the objectives of the CBD.

Breeding, Cultivation and Multiplication

This involves artificial or induced measures for regenerating populations of flora and fauna in captive or closed conditions. There is partial legal coverage for wild fauna and flora and this needs to be augmented. Legislating on domestic fauna and flora as well as genetic materials have been largely ignored. This is imperative in view of the increasing concentration of biotechnology, yet law in the country does not regulate it.

Trade

Activities relating to the barter, sales, import, export and other forms of exchange of biodiversity components. The existing laws need to be reviewed in line with the country's obligations under the CBD.

Introduction, Augmentation and Re-Introduction

Measures to deliberately stock an ecosystem with species that did not previously exist there (introduction), or where they have declined or need to be increased in number (augmentation) or where they have died out (re-introduction). This is partially covered within existing laws.

Release

This involves disposal of biodiversity components, without the specific purpose of introducing, augmenting, or re-introducing into the environment. There is no legal provision for this in Nigerian statue.

Movement

Measures transport by humans, biodiversity components from one location to another; relevant in cases of transportation across ecosystems or bioregions involving the possibility of accidental release of components. Does not include natural or voluntary movement of animals, or movement of seeds or other flora parts by natural means. There is a need for appropriate legislative measures at the national level, and pertinent protocols, Memorandum of Understanding (MOU), or in fact treaties at the regional and international levels to which Nigeria should be party. This will be very important, especially for answering questions such as: 'who pays for damage resulting for example, from accidental release of genetically modified organisms in the process of trans-boundary movements?'

Intellectual Property Rights

These are measures pertaining to the rights of the state, organizations, or individuals over biological and biotechnological knowledge, including patents, royalties, intellectual property rights, farmers' rights and breeders' rights. To what extent our laws can be improved in this regard will be determined by the answers given to a number of issues that are being raised nationally and internationally. Developed countries contend that differences in intellectual property rights regimes among countries will pose potential barriers to free trade. Developing countries, however, believe that intellectual property regimes should be tailored to development needs and not subjected to international control. The truth of the matter though, is that the right intellectual property regimes will help developing countries tap their genetic resources sustainably and strengthen incentives for conservation. The wrong one will exacerbate inequities in the distribution of benefits from the exploitation of genetic resources and undermine conservation efforts. It is left to the country to decide whether to adapt intellectual property rights protection for genetic resources and how strong that protection should be.

4.3 Major Institutions Involved in Biodiversity Conservation

Following the Koko Toxic Waste Scandal in August 1987, the Federal Government of Nigeria established FEPA in 1988. Also in 1989, Government established the Natural Resources Conservation Council, which was responsible for the conservation of nature and natural resources. In 1992, the body was merged with FEPA and in 1999; the Federal Ministry of Environment was created to absorb FEPA and some Departments and Units including the Natural Parks Service from sister Ministries. The Ministry was established to provide overall policy guidelines for environmental management across the country at all levels of government. The Ministry was expected to play a catalytic role in:

Defining the broad policy framework.

Providing selected service functions, such as environmental data management, EIA, environmental education and awareness etc. to other sectors.

Assisting in the development and improvement of environmental legal and regulatory framework

Managing ecosystems and promoting sustainable use of natural resources

Enforcing environmental quality norms, standard and rules.

The Ministry is structured into the following departments: -

Planning, Research & Statistics.

Pollution Control and Environmental Assessment.

Drought and Desertification

Erosion, Flood and Coastal Zone Management

Forestry to include Conservation, which hitherto was a separate Department when the ministry was inaugurated and many stakeholders in the country consider the present status of conservation as a division of Forestry Department retrogressive and unacceptable.

Other relevant Ministries and Agencies at the Federal level include the following: -

The Ecological Funds, which was established as a financial mechanism to support a wide range of initiatives that promote improved environmental management including conservation. This fund is now being reformed to ensure its conformity to the new Federal Constitution.

National Parks Service

Forestry Research Institute of Nigeria

National Center for Genetic Resources and Biotechnology

15 other agricultural based research institutes

Ministries responsible for Water Resources, Health, Agriculture, Transport, Education, Works & Housing, Solid Minerals, Power and Steel, Culture and Tourism, Science & Technology and related parastatals.

52 Government and Private Universities and 12 colleges of Agriculture, Fisheries or Forestry

BOX 4.2: NATIONAL CENTRE FOR GENETIC RESOURCES AND BIOTECHNOLOGY (NACGRAB)

The National Center for Genetic Resources and Biotechnology was set up in 1987 by the Federal Government to act as the National focal point for research, data gathering and dissemination of technological information on matters relating to genetic resources (biodiversity) conservation, utilization and biotechnology.

The programmes of the center include:

(a) Exploration, conservation, preservation and maintenance of genetic resources for immediate utilization and posterity
(b) Networking and co-ordinating activities in biotechnology i.e. tissue culture.
(c) Servicing the activities of the National Committee on Naming. Registration and Release of Crop varieties. Livestock breeds and fisheries (Decree 33, 1987 & 72, of 1992).

Routine exploration, collection, evaluation and characterization of germplasm (indigenous and exotic) for agricultural development are vital functions of the center. The centre has a total of 30,000 accessions of various germplasm i.e. food and economic crops, ornamental and medicinal plants, fruit and forest trees, root and tuber crops, forage and fodder. The germplasm are maintained as living collections on the field, in short and long term storage genebanks as seeds and plantlets in-vitro.

At the State level, there exist the State Forestry Services, which are responsible for forest and biodiversity management, plantation establishment and management of Game Reserves. There are also other relevant ministries including agriculture, health, water resources, education and commerce. The Federal and State Institutions are coordinated through the National Council on Environment, which comprise of the Federal Ministry of Environment and the State Commissions of Environment. Presently, there is no agency of government either at the Federal or State level devoted solely to Biodiversity Conservation. In order to provide the desired attention to conservation issues, such an agency needs to be created.

There are other organization particularly NGOs and Private foundation actively engaged in biodiversity conservation efforts. One of the longest standing NGOs is the Nigerian Field Society, established in 1930, and known for the publication of the Nigerian Field Journal. In 1980, the NCF was formed and has grown in partnerships with the WWF and BirdLife International, into Nigeria's strongest and most active conservation NGO. A number of other NGOs have proliferated since then throughout Nigeria. Among the most prominent are the Nigerian Environmental Action/Study Team (NEST), Bioresources Development and Conservation Programme (BDCP), Savanna Conservation Nigeria, Center for Environmental Resources and Sustainable Ecosystems (CERASE), Delta Environmental Network, Niger Delta Wetlands Center, NGO Coalition for Environment, Cercopan and Pandrillus. Although the GFRN is not a member of the IUCN, four Nigerian NGOs are members: NCF, NEST, CERASE and Savanna Conservation. Various international NGOs, including Wetlands International, the Wildlife Conservation Society and others also have ongoing programs within Nigeria. Many other smaller local and regional NGOs have also proliferated around the country. Activities of these NGOs range from environmental education, to community development work, to species and habitat-focused programs, and most involve a myriad of stakeholders and partners. Together these NGOs have a major civil society role that may well turn out to be the most effective mechanism to ensuring the sustainability of wildlife and ecological resources in Nigeria.

In addition, universities have played a role in Nigeria's conservation efforts. Faculty members at many Nigerian universities have long been involved in academic studies of wildlife, plants and other natural resources in various areas of the country. The foci of these studies is widely scattered and the data and results are often difficult to access. Recently, as part of Nigeria's activities on behalf of the Convention for Biological Diversity (CBD), a number of "Linkage Centers" have been established in Nigerian universities and institutes to consolidate and disseminate this information. One such center, the Linkage Center for Forests, Conservation and Biodiversity at the University of Agriculture in Abeokuta is focusing entirely on coordinating data and research relevant to biodiversity conservation. Other such nodes in the country include Linkage Centers for Arid Environments (in Maiduguri), for Freshwater Environments (in Minna), for Highlands/Montane Environments (in Jos), for Delta Environments (in Port Harcourt) and for Marine and Coastal Environments, in conjunction with the Nigerian Institute for Oceanography and Marine Biology (in Lagos). The Oceanography Institute resides within the University of Calabar. As a rule, most of these programs are under-funded and could use added resources before they can be successful in their various missions.

Many of the conservation entities and activities described here are funded in part by multilateral donors, like the World Bank and the UN Environmental Program (UNEP), and bilateral donors such as the UK Department for International Development (DFID) and the Canadian International

Development Agency (CIDA). A variety of other foundations also play a role in supporting various conservation efforts. Some of these foundations are the not-for-profit and public relations arms of various industrial giants, such as multinational oil companies. Shell, Chevron and Mobil oil are highly visible in this regard in the Niger Delta and beyond, but not as visible in the conservation world as their extraction activities are on the natural horizon. Other private foundations in the U.S. and Europe also play a role in supporting conservation activities in Nigeria. The Leventis Foundation, for instance, is said to invest $600,000 in biodiversity conservation activities each year in Nigeria. The Ford and the MacArthur Foundations in the U.S. are visible in providing NGO support in various conservation activities throughout Nigeria.

4.4. Government Programmes

Major past and on-going biodiversity related programmes of government include activities centered on biodiversity inventories, rehabilitation of degraded natural ecosystems, control of alien and invasive species and development of bio safety guidelines. Others include the management of protected areas, species and watersheds, capacity building on conservation technologies and techniques, sustainable use of wetlands, demonstration projects on medicinal plants and environmental education and awareness activities.

Other related programmes are focused on erosion and flood control, national action programmes to combat desertification, solid waste management, forestry development programmes, pollution control, water and sanitation, climate change mitigation and phase-out of ozone depleting substances. *Ex-situ* conservation efforts, which are the major focus of the Research Institutes are centred on gene banks establishment, development of botanical and zoological gardens, herbaria, museums and wildlife sanctuaries.

Internationally assisted programmes include the following: -

(i) GEF-UNEP – Integrated Management of Natural Resources in the Trans-Boundary Areas of Nigeria and Niger Republic.
(ii) GEF – World Bank Local Empowerment and Environmental Management Project.
(iii) UNDP – support programmes on Sustainable Agriculture, Environment and Rural Development.
(iv) GEF-UNDP/World Bank – African Stockpile Programmes.
(v) GEF-UNDP/World Bank – Reversal of Land and Water Degradation in the Lake Chad Basin Ecosystem.
(vi) GEF-UNEP – Reversal of Land and Water Degradation in the Niger River Basin.
(vii) Various Capacity Building Projects on Climatic Change, Biodiversity, Persistent Organic Pollutants and Ozone Depletion.

Other Bilateral and Multilateral institutions particularly USAID, CIDA, DFID, GTZ and the European Union are increasingly becoming active partners in biodiversity conservation.

4.5. Initiatives by NGOs and the Private Sector

Non-governmental organizations (NGOs) have been playing important role in biodiversity conservation in Nigeria. The Nigerian Conservation foundation, Savanna Conservation, IUCN,

BirdLife International, Bioresources Development and Conservation Programme (BDCP) and a few others have been involved in forest conservation, protection of the major national parks and wetlands in the country. They are also active in public awareness and biodiversity education programmes, research and capacity building. With the support of the RSPB, the NCF is executing Bird Life International's IBA[1] programme in Nigeria. Table 4.1 summarizes the biodiversity attributes of 30 sites assessed by the programme as rich in biodiversity.

Table 4.1. Important Bird Areas (IBA) of Nigeria

IBA Code	Site Name	Administrative Region	Criteria for Selection as IBA	Other Biodiversity
NG 001	Obudu Plateau	Cross River	i) Globally-threatened birds, ii) Restricted-range birds of the Cameroon Mt. EBA, iii) Biomerestricted birds of the Afrotopical Highland biome	*Cercopithecus preussi* (EN).
NG 002	Gashaka-Gumti National Park	Taraba and Adamawa	i) Globally-threatened birds, ii) Restricted-range birds of the Cameroon Mt. EBA, iii) biomerestricted birds of the Afrotopical Highland, Guinea-Congo, and Guinea-Sudan savanna biomes	103 of Nigeria's 247 mammalian spp., some of which are threatened, e.g., *Pan troglodytes* (EN) and *Syncerus caffer* (CD); the only national site for *Redunca fulvorufula* (EN).
NG 003	Ngel-Nyaki Forest Reserve	Taraba	i) Globally-threatened birds, ii) Restricted-range birds of the Cameroon Mt. EBA, iii) Biomerestricted birds of the Afrotopical Highland biome	*Pan troglodytes* (EN) and *Syncerus caffer* (CD).
NG 004	Chad Basin National Park (Chingurmi-Dugume)	Borno	Biome-restricted birds of the Guinea-Sudan and Sahel savanna biomes.	*Loxodonta africana* (EN), *Gazellarufifrons* (VU), and *Giraffa camelopardalis* (CD)
NG 005	Afi River Forest Reserve	Cross River	i) Globally-threatened birds, ii) Restricted-range birds of the Cameroon and Gabon Lowlnds EBA, iii) Biome-restricted birds of the Guinea-Congo Forests	*Gorilla gorilla* (EN), *Pan troglodytes* (EN), *Mandrillus leucophaeus* (EN), and the rare Anomalurid *Zenkerella insignis.*
NG 006	Okomu National Park	Edo	i) Globally-threatened birds, ii) Biome-restricted birds of the Guinea-Congo Forests	*Loxodonta africana cyclotis* (EN), the endemic *Cercopithecus erythrogaster* (EN), *Syncerus caffer* (CD).
NG 007	Cross River National Park (Oban Division)	Cross River	i) Globally-threatened birds, ii) Restricted-range birds of the Cameroon and Gabon Lowlnds EBA, iii) Biome-restricted birds of the Guinea-Congo Forests	*Loxodonta africana cyclotis* (EN), *Cercopithecus preussi* (EN), *Mandrillus leucophaeus* (EN),

				Arctocebus calabaensis (Rare) and the endemic monkey *Cercopithecus sclateri* and plant *Biophytum zenkeri.*
NG 008	Omo Forest Reserve	Ogun	Biome-restricted birds of the Guinea-Congo Forests	*Loxodonta africana cyclotis* (EN) and the endemic *Cercopithecus erythrogaster* (EN).
NG 009	Pandam Wildlife Park	Plateau	i) Globally-threatened birds, ii) Biome-restricted birds of the Guinea-Sudan savanna	*Hippotragus equinus* (CD), *Trichechus senegalensis* (VU), and *Syncerus caffer* (CD).
NG 010	Cross River National Park (Okwangwo Division)	Cross River	i) Globally-threatened birds, ii) Restricted-range birds of the Cameroon and Gabon Lowlnds EBA, iii) Biome-restricted birds of the Guinea-Congo Forests	18 primate spp., the highest diversity for any one African site; these include the endemic *Cercopithecus sclateri* (EN), *Mandrillus leucophaeus* (EN), *Gorilla gorilla* (EN), *Cercopithecus preussi* (EN). Also *Syncerus caffer* (CD), and *Loxodonta africana cyclotis* (EN), and a diverse Lepidopteran fauna including 2 species and 1 sub-species that are new to science.
NG 011	IITA, Ibadan	Oyo	i) Globally-threatened and Restricted-range endemic bird (*Malimbus ibadanensis*) of a secondary EBA, ii) Biomerestricted birds of the Guinea-Congo Forests	15 plant species of conservation concern, including *Entada* sp.which produces West Africa's longest fruit.
NG 012	Lower Kaduna-Middle Niger	Niger	i) Congregatory species (over 15,000 breeding *Merop malimbicus*),	Local people report of occasional *Crocodylus* sp.

	Floodplain		ii) Biomerestricted birds of the Guinea- Sudan savanna	
NG 013	Kagoro - Nindam Forest Reserves	Kaduna	i) Biome-restricted birds of the Guinea-Sudan savanna, ii) Biome-restricted birds of the Guinea-Congo Forests	None known
NG 014	Donga River Basin Forests	Taraba	i) Biome-restricted birds of the Guinea-Sudan savanna, ii) Biome-restricted birds of the Guinea-Congo Forests	*Pan troglodytes* (EN), *Syncerus caffer* (CD).
NG 015	Upper Orashi Forest Reserve	Rivers	i) Part of the secondary EBA for a Data Deficient, Retricred-range endemic bird (*Estrilda poliopareia*), ii) Biome-restricted birds of the Guinea-Congo Forests	Potential habitat for *Procolobus verus* (EN) and the endemic subspecies slopi of *Hexaprotodon liberiensis EN*).
NG 016	Biseni Forests	Rivers	i) Part of the secondary EBA for a Data Deficient, Retricred-range endemic bird (*Estrilda poliopareia*), ii) Biome-restricted birds of the Guinea-Congo Forests	Potential habitat for *Procolobus verus* (EN) and the endemic subspecies *heslopi* of *Hexaprotodon liberiensis* (EN), two endemic primates *Cercopithecus sclateri* (EN), and *Cercopithecus erythrogaster* (EN).
NG 017	Akassa Forests	Bayelsa	i) Globally-threatened birds (congregation of over 100 *Sterna balaenarum*), ii) Restricted-range birds of the Cameroon and Gabon Lowlnds EBA, iii) Biomerestricted birds of the Guinea- Congo Forests	Sea turtles *Chelonia midas* (EN), *Demochelys coriacea* (EN), *Lepidochelys olivacea* (EN); the endemic subspecies *heslopi* of *Hexaprotodon liberiensis* (EN) and *epieni* of *Piliocolobus pennanti* (EN).
NG 018	Yankari National Park	Bauchi	Biome-restricted birds of the Guinea-Sudan savanna	Largest concentration of large mammals in the country, including *Loxodonta africana* (EN), *Panthera* leo (VU), Hippotragus *equinus* (CD),

				Alcelaphus buselaphus (CD), *Syncerus caffer* (CD), and *Hippopotamus amphibius* (VU).
NG 019	Kainji Lake National Park	Kwara and Niger	Biome-restricted birds of the Guinea-Sudan savanna	*Loxodonta africana* (EN), *Panthera* National Park Niger leo (VU), *Hippotragus equinus* (CD), *Alcelaphus buselaphus* (CD) and *Syncerus caffer* (CD), *Kobus kob* (CD), *Redunca redunca*. (CD), *Lycaon pictus* (VU), and *Hippopotamus amphibious* (VU).
NG 020	Amurum (Taboru) Woodlands	Plateau	Biome-restricted birds of theGuinea-Sudan savanna, including two data deficient national endemics *Vidua maryae* and *Lagonosticta sanguinodorsalis*	Flora of the site includes *Costus spectabilis*, Nigeria's national plant.
NG 021	Hadejia-Nguru Wetlands	Jigawa, Yobe, and Bauchi	i) Globally-threatened birds, ii) Biome-restricted birds of the Guinea-Sudan and Sahel savanna biomes, iii) Congregatory (over 300,000 counted) water-birds	***Gazella rufifrons* (VU)**; at least 89 species of freshwater fish.
NG 022	Kamuku National Park	Kaduna	Biome-restricted birds of the Guinea-Sudan savanna	*Loxodonta africana* (EN), *Panthera* leo (VU), *Hippotragus equinus* (CD), *Alcelaphus buselaphus* (CD), *Redunca redunca* (CD).
NG 023	Assop Falls and Hills	Plateau	Biome-restricted birds of the Guinea-Sudan savanna, including two data deficient national endemics *Vidua maryae* and *Lagonosticta sanguinodorsalis*	None known

NG 024	Sambisa Game Reserve	Borno	Biome-restricted birds of the Guinea-Sudan and Sahel savanna biomes	*Loxodonta africana* (EN), *Panthera leo* (VU), *Hippotragus equines* (CD), *Syncerus caffer* (CD), *Alcelaphus buselaphus* (CD).
NG 025	Falgore and Lame Bura Game Reserves	Kano and Bauchi	i) Biome-restricted birds of the Guinea-Sudan savanna, ii) Biome-restricted birds of the Guinea-Congo Forests	*Syncerus caffer* (CD), *Gazella rufifrons* (CD).
NG 026	Sunvit Farms (Agenebode Forests)	Edo	Biome-restricted birds of the Guinea-Sudan savanna, ii) Biome-restricted birds of the Guinea-Congo Forests	*Syncerus caffer* (CD) and *Potamochoerus porcus* (Rare).
NG 027	Ebok-Kabbaken (Ebok-Boje) Swallow Roost	Cross River	Biome-restricted birds of the Guinea-Congo Forests; Congregatory spp. (over 1 million swallows).	*Pan troglodytes* (EN), *Mandrillus leucophaeus* (EN).
NG 028	Old Oyo National Park	Oyo	Biome-restricted birds of the Guinea-Sudan savanna	*Syncerus caffer* (CD)
NG 029	Mouth of the River Yobe	Borno	Globally threatened bird (*Aythya nyroca*), Biome-restricted birds of the Sahel Savanna	*Gazella rufifrons* (VU) and *Hyaena* sp.
NG 030	Itu Wetlands and Swallow Roost	Akwa Ibom	Biome-restricted birds of the Guinea-Congo Forests; Congregatory spp. (over 15,000 swallows).	*Trichercus senegalensis* (VU) and *Cercopithecus nicticans*

[1] **The IBA progamme is a global conservation initiative that uses birds to identify sites that are of global significance for conserving birds and other biodiversity.**

4.6. Financial Support Policy

The policy approaches adopted to provide financial support for biodiversity conservation in Nigeria are as follows:

Budgetary allocations at the Federal and State Government levels.
Grants from the Federal Government to State Government to assist them (as the need arises) in coping with problems of forest fire, erosion and floods.

iii. Grants and Concessionary loans from international partner organizations.
Grants from the organized private sector.

Funding for environmental conservation is severely limited despite the establishment of an Ecological fund which receives 2% of the Federation Accounts to tackle environmental problems particularly erosion and desertification control, oil and gas pollution and biodiversity conservation. In the past 4 years, the environment sector has received less than 0.2% of the total annual budgetary provisions of government. When compared to other environmental programmes, biodiversity conservation has received even less government attention.

4.7. Constraints and Lessons Arising From Past and Present Actions

The past biodiversity conservation programmes have had limited success due largely to a number of factors. These include the top down approach to biodiversity management, severe funding constraints, frequent policy shift and policy failures, capacity under utilization, inappropriate technology, low level of biodiversity awareness among policy makers, neglect of indigenous knowledge, inadequate institutional capacity and non-integration of biodiversity concerns in sectoral policies and programmes.

The major lessons arising from the identified constraints are summarized as follow: -
(i) Strengthening community-based actions in biodiversity planning and program implementation through local institutions and social organizations is crucial.

(ii) Policy failures and summersaults arise mainly from frequent changes in government, over centralized control, weak legal framework, poor governance and limited understanding of biodiversity dynamics.

(iii) Local management systems for biodiversity should be tuned to the needs of local people so as to enhance their capacity to adapt to dynamic social and ecological circumstances.

(iv) Local rights to biodiversity resources must be recognized and maintained.

(v) Biodiversity concerns need be interpreted into national development policies, strategies, plans and programmes.

CHAPTER 5: STRATEGIES FOR BIODIVERSITY MANAGEMENT IN NIGERIA

5.1 Vision

Nigeria operates a three-tier planning system in its development strategy, which provides for conceptual modelling and implementation of programmes and projects with long gestation periods and maximizes the flexibility and response of public sector programmes to short-term fluctuations as the plans are reviewed annually in line with economic realities. According to the National Planning Commission, the perspective plan covers 15-20 year period and is the pivot upon which the medium term and the annual budget rotate. The NBSAP is therefore articulated within the National Economic Empowerment and Development Strategies (NEEDS) in a manner that allows for its integration within other sectoral frameworks of the national programme for sustainable development. It derives from and is anchored within the National Policy on Environment, while accommodating other strategy directives such as the National Vision 2010, the Nigerian Programme of Work for Agenda 21, the Millennium Declaration, and the country's international undertaking at the World Summit on Sustainable Development.

The strategy envisions a Nigeria that:

Integrates biodiversity conservation in a truly national programme of sustainable development aimed at substantially reducing poverty and designing a secure future and facilitate the growth of the Nigerian biodiversity industry as a natural capital for socio-economic development of Nigeria for the benefit of Nigerians and the economy in line with the principles of ecological sustainability and Social Equity.

A key focus of this vision therefore is the consideration of genetic materials as a strategic but fragile resource to be conserved, sustainably utilized and perhaps more importantly to be deployed as natural capital for socio-economic development of Nigeria. It will explore the policy elements necessary for the transformation of biological diversity to biological resources, as an asset base. It attempts to proffer methods to capture an equitable share of benefits arising from access to, and the use of Nigeria's genetic and biochemical resources for the Nigerian economy and communities. It has deliberately involved the private sector and the civil society as partners in development in harnessing Nigeria's biological resources to create wealth generate employment and contribute to the general economic development of the country. Regarding environmental resources as an asset raises the possibility that it can be shared or transferred across generations and as a resource it can be drawn upon, built upon traded and developed.

For Nigeria to be able to do this requires full strengthening of existing institutions and the establishment new institutions and organizations that are capable of translating this complex knowledge to action, to engage in bold priority setting and transforming the Nigerian economy into a sustainable knowledge based economy. The strategy recommendation will require mobilization of the entire nation and all stakeholders in this new mission of economic renewal and sustainable development. The transformation will require the establishment and formalization of the "Development Triad" involving the government, the civil society and the private sector.

The Development Triad – Adapted from WCMC Handbook of Information Management, 1998

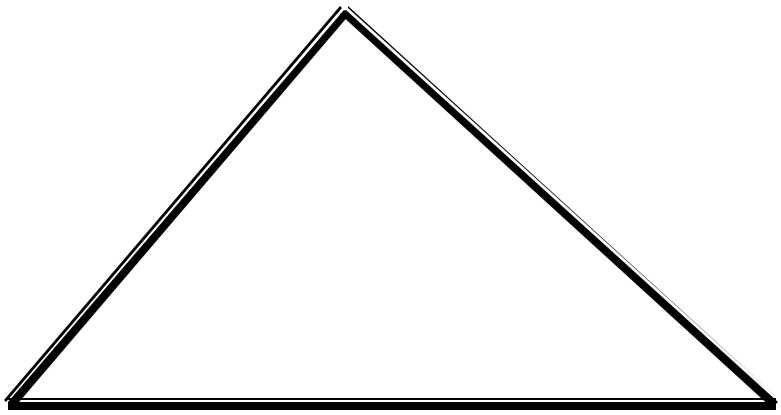

Figure 5.1: Development Triad

5.2 Policy Framework for Meeting the Overall Challenge of Nigerian Biodiversity

The conceptual framework adopted for the NBSAP include:

a. Integration of environmental elemets (climate, vegetation, soils, water) and societal processes (economic, political, social/cultural) in biodiversity conservation.
b. Interaction between these processes through *time*, recognizing that different elements have different fundamental temporal characteristics and linking these processes through adaptive management.

c. Interaction at and between different *scales* from the household to the global scene in determining the socio-economic aspects of sustainable use of genetic materials.

d. That the patterns of interaction is determined by the structure and application of authority within a federal political structure, in which biodiversity conservation is recognized as a major aspect of resource-management but decision concerning what and how biodiversity is to be conserved involves many tradeoffs between conservation and other management goals.

To meet the overall goal of Biodiversity Protection in Nigeria and in consonance with **Articles 1,3,5,6,8,18,20 and 21** of the Convention, the following specific goals: conservation, sustainable use and access and benefit sharing and some cross sectoral issues are to be pursued.

5.3. Goal 1 – Conservation

Aim: To conserve biodiversity for the present and future generations

Strategic Directions

- Promote and enhance measures for both *in-situ* and *ex-situ* conservation through identification, evaluation, monitoring, research, education, public awareness and training.
- Increase understanding of the status, genetic diversity and ecological relationships of species and populations.
- Expand and strengthen the network of protected areas to include all the major ecosystems: Savanna, High forests, Wetlands, Mangrove, Montane, Coastal and Marine vegetations.
- Restoration and establishment of grazing reserves and stock routes for nomadic pastoralists
- Protect watersheds along all intra and interstate watercourses to protect the water bodies and aquatic biodiversity.
- Establish migratory corridors where practicable for isolated species and populations.
- Identify genetic resources at the species level based on their present or potential Socio-economic value and their conservation status.
- Assess the conservation status of target species and their population.
- Identify specific conservation requirements or priorities at the population level for single species and at the ecosystem level for groups of species.
- Encourage the development of *ex situ* facilities including rescue and breeding centers to protect threatened species.
- Develop and implement restoration/rehabilitation plans in degraded ecosystems.
- Conserve biological resources that are essential to agriculture, industry, domestic animals, plants and microbes and their wild relatives.
- Develop and promote programmes that encourage beneficial co-existence of biodiversity in agricultural farms.
- Establish reserves to conserve freshwater, brackish water and marine biodiversity
- Establish and maintain gene and clone banks for plants and animals gentic diversity.
- Implement measures to eliminate or reduce environmental pollution that adversely affect biodiversity

- ❖ Monitor the effects of climate change on ecosystems, species and genetic diversity

- ❖ Encourage community participation in Biodiversity conservation.

5.4: **Goal 2 – Sustainable Use and access and benefit sharing**

Aim: To promote sustainable use of biological resources and ensure fair and equitable sharing of benefits for poverty reduction.

Strategic Directions

- ❖ Promote farming systems that are compatible to biodiversity conservation.

- ❖ Integrate community management of biodiversity as a means of poverty reduction and within the context of national planning.

- ❖ Establish and promote policy guidance for bioprospecting and indigenous knowledge (intellectual property right).

- ❖ Adopt integrated management approach for the control and utilization of invasive species particularly water hyacinth, Nypa palm and cattail (*Typha* sp)

- ❖ Establish norms for the use of biodiversity for eco-tourism.

- ❖ Improve methods and technologies that support the sustainable use of biological resources and eliminate or minimize adverse impacts on biodiversity resulting from resource use.

- ❖ Reduce the adverse impacts of land use practices on forest, watersheds, soils, other ecosystems and species.
- ❖ Take all necessary steps to prevent the introduction of harmful alien and Living Modified Organisms (LMO's) and eliminate or reduce their adverse effects to biodiversity and human health to acceptable levels.

- ❖ Determine and mitigate human impacts on biodiversity.

- ❖ Identify mechanisms to use traditional knowledge, innovations and practices and encourage equitable sharing of benefits arising from the utilization of such knowledge, innovation and practices.

- ❖ Encourage equitable sharing of benefits from bioresources utilization with the community

5.5: Goal 3: Cross Sectoral Issues

Aim: To enhance biodiversity management capability through education and awareness, appropriate formulation of policy and legislation, research and international cooperation.

Strategic Directions

- Review government policies and programmes that create unintentional adverse impacts on biodiversity.
- Strengthen measures to reduce and eliminate the release of substances that are harmful to ecosystems, species and genetic resources.
- Develop indicators to monitor trends and support the management of wild populations, species, habitats and ecosystems.
- Increase the nation's biodiversity management capability (human, infrastructural, institutional and technological) and strengthen national centers for the exchange of data and information relevant to the conservation of biodiversity.
- Revise, prepare and implement legislations and policies, inventories, plans, guidelines, monitoring programs and other measures to support the establishment and management of protected areas.
- Assess current and proposed major government agric policies and programmes to ensure that ecological, economic, social and cultural objectives are considered.
- Conserve inland and ocean-based fisheries resources through enforcement of relevant laws.
- Develop linkages in the implementation of the UN conventions on climatic change, Desertification, Biological Diversity and Persistent Organic Pollutants.
- Strengthen capacity to collect, analyze and distribute data and information on biological diversity.
- Strengthen training opportunities in biodiversity management.
- Develop and deliver effective biodiversity education and awareness programmes.
- Maintain or develop and use social/economic policies and incentives as a means of conserving biodiversity.
- Participate in international efforts to coordinate and enhance activities related to biodiversity conservation.
- Promote the objectives of sustainability science in Biodiversity conservation, sustainable use of its components and fair and equitable sharing of benefits.

- ❖ Carry out analytical studies on linkages between Poverty and Biodiversity.

5.6 Further Strategic Directions on Some Cross Sectoral Issues

Manpower Development

Given that there are hardly any formally trained professionals in biodiversity *per se,* and in keeping with **Article 12,** University curricula in the Universities of Agriculture, in particular, but also in the established Departments of Forestry, Fisheries and Wildlife management in other Universities must be revised for "biodiversity - concentrated" options.

For the (sub-professional) support staff, there is the need for in-service and short-term specialised training in biodiversity aspects of their functions.

Institutional Collaboration

Since the activities of several arms of Government have direct relevance to the conservation of biological diversity, a focal point approach is adopted to coordinate and harmonize policies and activities of these various government institutions. Federal Ministry of Environment will take the responsibility for all issues relating to biodiversity conservation. A National Biodiversity Task Force (NABITAF) with representation of Universities, Research Institutes, Federal Ministry of Agriculture and Rural Development, Federal Ministry of Science and Technology, Federal Ministry of Water Resources, National Planning Commission, Ministry of Women Affairs, Nigerian Conservation Foundation, Nigerian Environmental Study/Action Team, the Manufacturers Association of Nigeria (MAN), National Chambers of Commerce, Industries, Mines and Agriculture (NACCIMA) and the NDIC, among others; shall operate through its appropriate Committees (e.g. Manpower, Finance, Technology).

The relevant State Ministries and Agencies will be involved through their respective National Councils of which the Secretariats are the respective Federal Ministries. This is in keeping with Article 18 of the CBD.

Financial Resources and Mechanisms

Funding strategies must address inceptional and sustainable funding with direct subvention to FME of a monetary value representing 50% of the Ecological Fund. This is derivable from Articles 20 and 21 of the CBD.

The proposed National Biodiversity Task Force, under the aegis of the Federal Ministry of Environment as Nigeria's Focal Point, will:

- ❖ Institute possible avenues of developing sustainable revenues to support biodiversity programmes;

- ❖ Re-evaluate proposals to allocate some percentage of profits/taxes and/or revenues from the timber industry to conservation of protected areas through the establishment of endowment payments system on wildlife and plant trade;

- ❖ Develop a system to return revenues generated in Parks and Reserves (from Tourism) to the protected area system;

- ❖ Investigate the applicability of Debt for Nature Swap campaigns;

- ❖ Encourage greater support for biodiversity conservation from the private sector, through MAN, NACCIMA, NDIC and the Nigerian Stock Exchange, etc.; and

- ❖ Encourage fund-raising concerts by Nigerian performing artistes through the Performing Musicians Association of Nigeria (PMAN).

- ❖ These are without prejudice to international financing as recognised by Article 21, including transparent governance, using facilities of GEF, UBDO, FAO, ADB, WWF, IUCN, UNESCO and Private Organisations.

International Cooperation

Consistent with Articles 5,18,20 and 21, FME, as Focal Point, must relate closely with UNEP as the international governing agency for Biodiversity; and with the FAO and UNDP, among others, in terms of programme funding and implementation.

Box 5.1: Goal Platform for Partnership Advocated by Nigerian President Olusegun Obasanjo at the U.N. Monterey Conference 2002:

One: rededication to the Millennium Declaration, and joint pursuit of the Millennium Development Goals.

Two: debt relief at a substantial level for all developing countries, not only limited to the HIPC process.

Three: significantly improved market access and removal of distortions, especially in agriculture, through WTO negotiations, which should not be vitiated by unilateral legislation

Consistent with with **Articles** 4,15,16,17,22 and 42, Nigeria will institute appropriate constitutional, legislative and legal frameworks, in consultation with the Federal Ministry of Justice (FMJ), The Law Review Commission and the Nigerian Institute for Advanced Legal Studies, for responsiveness to the new vision of identified challenges, which shall be in consonance with national aspirations of the convention and its relationship to other international conventions.

Public Education and Awareness

Consistent with Article 13, FME as focal point, will commission, a public awareness programme in collaboration with the Federal Ministry of Information (FMI), extension agencies in relevant ministries, the Broadcasting Organisation of Nigeria (BON) and the Newspapers Proprietors Association of Nigeria (NPAN), the Nigerian Guild of Editors (NGE), among others, through appropriate mass media instrumentalities; and local modalities through relevant active CBOs.

CHAPTER 6: SECURING THE FUTURE: PLAN OF ACTION FOR NIGERIAN BIODIVERSITY

6.1 Overall Objectives of Nigeria's Biodiversity Plan

The natural environment and biodiversity resources in Nigeria have been severely damaged and are under increasing threats as indicated by the 1995 LAND-SAT Land-Use and Vegetation maps of FORMECU. The overall objective of biodiversity conservation in Nigeria, therefore, is to set in place, as soon as possible, measures that would conserve the dwindling resources and avoid further damage, and over a long term, taking necessary steps to reverse the trend of the damage done. Although biodiversity conservation features as a major component of the environmental priority (Box 6.1), it is expedient to integrate biodiversity conservation into the nation's economic and social development, by:

- Protecting ecosystems and species that are rare, endangered or facing extinction.
- Encourage rational and sustainable use of biodiversity that abound in reasonable quantities,
- Restocking biological resources where they have either been lost or have become scarce.
- Restore, maintain and enhance ecosystems and ecological processes essential for the functioning of the Nigerian biosphere, to preserve biological diversity and apply the principle of optimum sustainable yield in the use of living natural resources and ecosystems.
- Raise public awareness and promote understanding of essential linkages between biodiversity, environmental stability, development, and encourage individual and community participation in biodiversity conservation and protection efforts.
- Co-operate in good faith with other countries, international organisations/agencies to achieve optimal use of biodiversity and effective prevention or abatement of trans-boundary biodiversity degradation.

WHERE WILL BENEFITS TO PEOPLE COME IN

6.2. In--Situ Conservation in Forests, Game Reserves and National Parks

- To establish an integrated protected area system with all terrestrial habitats represented and covering approximately 25 per cent of Nigeria's land area.

- To strengthen the Federal Ministry of Environment, the main agency for Environmental Protection and Natural Resources Conservation including biodiversity.

- To strengthen Institutions and Departments, custodians of Forest, Fish and Wildlife Resources.
- To gain local support for biodiversity conservation through buffer zone projects and involvement of local communities and NGOs.

- To develop appropriate and sustainable strategies for funding the management of Forest Reserves, Game Reserves and National Parks.

❖

Box 6.1: Nigeria Ministry of Environment's Priority Action List

(Adapted from report submitted by the Hon. Minister of State of the Federal Ministry of Environment to the USAID Environmental Analysis Team - USAID, 2002).

- **Decrease gas flaring:** The private sector, with appropriate economic incentives, could capitalize on opportunities aimed especially at the energy and agricultural sectors.

- **Protect marine and coastal resources:** Nigeria should proactively pursue a cohesive process with other sub-Sahara Africa countries to address the transboundary issues that threaten these resources.

- **Halt desertification:** In the northern and central states, coordinated physical, biological, educational and political actions are needed to stop this threat.

- **Mitigate industrial and urban pollution:** The health and quality of life of almost half of the nation's population are threatened by the decreasing quality of water, air and soil resources in urban areas

- **Reduce land-based sources of pollution of the marine environment:** Vegetative and fishery resources along Nigeria's 879 km of coastline are increasingly threatened by pollutants entering the country's air and watersheds.

- **Protect against the detrimental effects of exotic species:** Invasive species such as Nypa palm and water hyacinth are effectively undercutting the economic activities and compromising the ecological systems associated with native species.

- **Stop gully erosion and provide shoreline protection:** Erosion is widespread throughout the country. Management of mine tailings, stream-banks and floodplains, coastal shorelines, and agricultural lands require immediate and more aggressive attention.

- **Conserve biodiversity:** Sustainable resource management practices need to be more carefully adhered to in order to conserve and protect the nation's diminishing flora and fauna diversity.

- **Ensure food security:** Nigeria's diminishing agricultural land base needs to be aggressively conserved and programs promoting biotechnology carefully scrutinized for potential negative impacts.

- **Improve management of Protected areas and national parks:** Human encroachment should be prevented in Nigeria's Protected areas and these areas need to be managed cooperatively with local populations in order for them to yield their maximum benefit to the nation and the region.

Priority Actions

- ❖ Develop National Policy and Plans on Biodiversity Conservation and Environmental Protection.

- ❖ Legalise proposed and designate conservation areas in each State and curtail further de-reservation activities.

- ❖ Re-designate these conservation areas, where appropriate, in each State and provide adequate protection through enabling legislation and enforcement.

- ❖ Provide or Review current management plans and conservation options in each conservation area in the country.

- ❖ Provide adequate funding and facilities for plan implementation and review the quantity and quality of available manpower for biodiversity conservation.

- ❖ Carry out resource inventories using GIS facilities and organise research into dynamics of resources in conservation areas to ensure sustainability.

- ❖ Organise storage and retrieval of data from conservation areas and make these available to policy makers and managers.

- ❖ Designate appropriate parts of protected areas for managed harvesting of non- timber products by local people to ensure benefits to local people and guarantee of protection of resources.

6.3. *In Situ* Conservation Outside Reserves

The state of in situ conservation in Nigeria is such that even if the Forest Reserves in Nigeria are restocked and adequately protected, they will still constitute less than 10 per cent of the total land area of the country as against the United Nations requirement of 25 per cent minimum conservation area for each country. To achieve this goal, the role of local people in biodiversity conservation has become crucial.

Priority Actions

i. Survey of flora and fauna outside forest reserves including those in sacred groves, community lands, abandoned farmlands and homesteads and assist local people in the management of such sites on a sustainable basis.

ii. Strengthen the capability of communities, private industries, Universities, and NGOs to manage natural forests outside forest reserves on a sustainable basis.

iii. Carry out a study of the indigenous knowledge of timber and non-timber plant species and ascertain values from the utilisation of these plants and encourage local people to participate in joint research programmes.

iv. Conserve wild species that are of significance particularly those that have become almost lost or have gone extinct.

v. Conserve special ecosystems e.g. wetlands, arid lands and montane vegetation types. Review and up-date the marine coastal conservation strategy. Encourage oil exploration without the destruction of natural vegetation (especially the mangrove).

vi. Encourage local communities to participate in natural regeneration of wetlands and arid Zone vegetation.

6.4. *Ex Situ* Conservation

To strengthen ex-situ collections as a supplement to in-situ conservation in botanical gardens, gene banks, germplasm collections and plant breeding centres.

Priority Actions

i. Evaluate all projects, which involve capturing or collection of rare or endangered species to determine that these operations do not threaten the survival of wild populations. This will involve an inventory of ex-situ population and scientific studies of wild species.

ii. Survey and collect indigenous fruit trees and other useful plants and extend arboreta and germplasm collections.

iii. Establish captive propagation programmes for non-protected wildlife that are easily bred in captivity to reduce the drain on wild populations (Relevant Research Institutes, Universities and NGOs).

iv. Promote collection of genetic resources and development of appropriate biotechnology for improving food production, pharmaceutical products including indigenous knowledge and biodiversity prospecting by local and international industries (Relevant Research Institutes and NGOs).

v. Encourage Local Governments, Local Communities, NGOs and private individuals to develop private forests of multipurpose trees in rural and urban area (Federal Ministry of Education).

vi. Rehabilitation of plant nurseries operated by States for the production of 5 million multipurpose plant seedlings every year. The nurseries will eventually be turned over to Local Governments and local communities to manage on a sustainable basis. The action plan will also provide training for schools, NGOs and local communities on seedling production and establishment.

vii. Establishment of a National Arboretum. This is a high priority project, which will involve the acquisition of 5,000 ha within the rainforest zone to be located in the Delta State of Nigeria. Other arboreta, 1,000 ha each, will be located in 10 other parts of the country covering major ecological setting in each zone of the country, including Abuja.

viii. Development of a National Herbarium and other herbaria in the country. The Forestry Herbarium (FHI) at the Forestry Research Institute of Nigeria, Ibadan, has collected over 100,000 specimens. There are still many specimens including those of endangered species whose collection requires urgent attention. There is an urgent need to preserve in perpetuity the specimens already collected. The FHI will assist in the development of herbaria in at least 30 institutions (Universities, Research Institutes, NGOs etc. all over the country). The maintenance of FHI and its linkage with National Arboretum will also be carried out.

ix. Establishment of Botanical Gardens, Urban Parks and Recreational areas, Periurban woodlots and promotion of 36 Botanical Gardens, one in each State Capital to add to the new one in Abuja. It will also involve the development of recreational open spaces in many towns, where indigenous and exotic plants will be developed. Peri- urban plantations will be established for conservation and fuelwood. Each Local Governments would be encouraged to take charge of the beautification of towns, villages and cities within its jurisdiction. This will also involve the planting and management of street trees and shrubs of aesthetic value. Universities, Colleges and Schools will be encouraged to participate. These activities will be co-ordinated by the Federal Ministry of Environment in conjunction with State and Local Government Area administrations, including NGOs.

6.5. Specific Actions for Conservation and Development of Biodiversity

S/No.	Specific Actions (in-situ conservation of forests outside forest reserve)	Duration (year)	Executing Agency
1	Conservation of special ecosystems e.g. wetlands, lands, fragile ecosystems and montane vegetation types and arid zone.	3	FMEnv, FMANR, NIOMR, FRIN, NIFFR, SMEnv and FCT
2	Encouragement of local communities to participate in restorative management of wetlands and arid zone vegetation	2	FMEnv, FMANR, SMEnv, SMANR & SME
3	Encouragement of local governments, local communities, NGOs and private individuals to develop private forests of Multipurpose trees in urban and rural areas.	5	SMEnv, LGAs, NGOs, CBOs
4	Rehabilitation of plant nurseries operated by State Departments of Forestry for the production of 5 million multipurpose plant seedlings every year.	4	FMEnv, FMANR, SMANR, FRIN, SMEnvs, NGOs.
5	Strengthening of the capability of private industries, Universities to manage natural forest outside forest reserves on a sustainable basis.	5	FMEnv and FMANR
6	Organisation of storage and retrieval of data from conservation areas and making them available to policy makers and managers.	1	FMEnv & FMANR SMEnv
7	Designation of appropriate parts of protected areas for managed harvesting of non-timber products by local people to ensure benefits to local people and guarantee of protection of resources.	1	FMEnv, FRIN, FMANR, SMEnv & SMANR

6.5. Specific Actions for Conservation and Development of Biodiversity

S/No.	Specific Actions for Wildlife Conservation	Duration (year)	Executing Agency
1	Institutional capacity building in order to increase the total wildlife conservation area from the present 5.8% to 25%.	2	FMEnv & SMANR & SMEnv
2	Creation of Biodiversity Reserves in each ecological zone as “Ecozone Biodiversity Centres”	5	FMEnv & FMANR, SMEnv & SMANR
3	Enactment of a comprehensive modern national law that would ensure efficient conservation biodiversity in Nigeria.	--	FMEnv, FMJ, Nigerian Institute for Advanced Legal Studies
4	Ecologically based management plans for appropriate game reserves for dual utilisation of wildlife for game viewing and game cropping.	1	FME & FMARD, SMANR, SMEnv
5	Strengthening of FORMECU to perform the functions of information dissemination and extension programmes to farmers and the public (to serve FRIN).	2	FMEnv, FMANR, NARP.
6	Introduction of Biodiversity Conservation Education	1	FMEd, NUC, NBTE

	into the curricula of all tertiary institutions in Nigeria.		
7	Reviewing and up dating of curricula of Universities which specialise in Wildlife in the light of the reality of Nigeria's declining economy and high unemployment.	2	FMEd & NUC

Specific actions – Fisheries

S/No.	Actions for Fish Biodiversity Conservation and Development (Inland Fisheries Sub-sector)	Duration (Year)	Executing Agency
1.	Protectionn of the inland aquatic environment from pollution by oil exploration, agro-chemicals, and pesticides, industrial domestic wastes.	2	FME, FMARD, FMPR, SMEnv & NIFFR
2.	Enforcement of appropriate countrywide fishery laws and edicts for the inland fisheries, their conservation and sustainable development and management.	2	FMJ, FMEnv & FMANR
3.	Encouragement of the private sector to invest in the Distant Water Fishery through: a) Preferential reduction of costs of lubricants and Automotive Gas Oil (AGO) used by licensed fishing trawlers to bring down the cost of fishing operation b) Reduction of duty on imported fishing materials, outboard motor engines, used trawlers canoes etc. in the inshore waters.	2	SMEnv, FMF, FMARD, FMIA, Customs and Excise
4.	Promotion of export of high quality shrimps.	2	FMANR, SMEnv & NEPC
5.	Enforcement of penalties to curb pilferage and exportation of fish and shrimps from trawlers in the high seas.	4	FMARD, FMEnv, NIGERIAN NAVY, NPF
6.	Creation of specialised funds kept with a bank for lending at special concessions to fishermen.	4	NACB, FMARD, Commercial and Community banks, Bank of Industry
7.	Encouragement of fish farming at small and large scales through:	4	
	a) Training of fish farmers	4	FMARD, NIFFR NIOMR, Private Sector
	b) Provision of simple fish feed pelleting machine to fish farmers and fish feed millers	2	FMANR, FIIRO, NIOMR
	c) Provision of fingerling through research centres, government-sponsored fish hatcheries and the private sector.	2	FMARD, NIFFR, NIOMR, Private Sector
8.	Establishment of at least 10ha. Fish Farm (with its support hatchery and fish seed service) by all local governments.	5	FMARD, SMANR, Private Sector
9.	Establishment of strong machinery for enforcing of regulations and monitoring catch data.	2	FMARD & FMJ, NPF & NN
10.	Assistance to artisanal fishermen to organise themselves into viable co-operatives.	1	FMARD, NACB NGOs CBOs &Banks

11.	Establishment of industries for the manufacture of (a) Fishing gears (gill nets, lipats, twines, etc.) in Nigeria.	2	FMARD, FMI, Bank of Industry
	(b) Construction and maintenance of fishery boat yards.	3	FMANR, FMWH, NIOMR, NIFFR
12.	Training of fishermen to upgrade their proficiency in catching, handling and processing of fish.	4	FMARD, FD Fisheries NIFFR,

6.6. Education, Training and Extension Programmes

The focus of education and training would include:

- ❖ Assessement of training needs for conservation professionals and extension staff in all relevant agencies to produce a cadre of well-trained, competent and committed conservationists;
- ❖ Design of an in country and on-the-job courses relevant to staff and local people;
- ❖ Strengthening of training, educational and extension programmes on biodiversity issues for conservation professionals, NGOs and the private sector; and
- ❖ Production of field guides, tree identification keys. Develop information materials on ecotourism.

6.7. Research Programmes

Forestry

S/No.	Research Actions for Biodiversity Conservation and Development (Ex-Situ Conservation)	Duration (Year)	Executing Agency
1.	Inventory of ex-situ populations and scientific studies of Wildlife species (plants and animal).	3	Universities FMEnv, FRIN, NIOMR & NIFFR
2.	Survey and collection of indigenous fruit trees and other useful plants and creation/extension of arboreta and other germplasm collections.	2	FMEnv, FMANR, FRIN, NIHORT, NIFOR, Universities, component NGOs
3.	Establishment of programmes for propagation and development for useful and potentially useful wild plants.	3	FMEnv, FMANR, NIFOR, FRIN, NIPRD NIHORT, Universities, NGOs
4.	Collection of Genetic resources and development of appropriate technology for improving food production and pharmaceutical products, including the use of indigenous knowledge and bioprospecting.	3	FMEnv, FMANR, Universities, NIPRID, FRIN, NIFOR, NIHORT, NGOs, M.M.M Botanical Gardens, Epe, Lagos
5.	Provision of training for schools, NGOs and local	3	FMEnv, FMEd, FRIN,

	communities on seedling production.		NABTEB, FMANR, NGOs
6.	Survey of trees outside forest reserves, and assistance to local people in their management on sustainable basis.	2	FME, FMARD, FRIN, SMANR, SMEnvs
7.	Survey of indigenous knowledge, scientific and economic values of timber and non-timber forest	2	FMEnv, FRIN, FRIN, SMANR, SMEnvs

Wildlife

S/No.	Research Actions for Wildlife Conservation	Duration (Year)	Executing Agency
1.	Provision of baseline data on Bioversity for planning and management.	3	FME & FMANR
2.	Comprehensive survey of Nigerian wetlands to determine their significance in terms of biodiversity.	2	FME, FMARD, NCF other NGOs,
3.	National Survey and mapping of forests for their preservation as sanctuaries for plants and animal	2	FME, FRIN, Oil companies, University Linkage Centres, NGOs
4.	Studies of wildlife species of economic importance for: a) Tourism development. b) Meat production technology and nutrient quality c) Pharmaceuticals d) Cultural heritage.	2	FMEnv, FRIN, NIOMR, NIFFR SMEnv, SMARD, University Linkage Centres, National Parks Services.
5.	Establishment of a separate, autonomous Wildlife Research/Training Institute to cater for and co-ordinate the enormous wildlife research responsibilities.	2	FME, FRIN, National Parks Service, NIOMR, NIFFR
6.	Establishment of captive breeding centres in each eco-regional zone for endangered species rehabilitation.	2	FME, FRIN, NARP, National Parks Services.

Fisheries

S/No.	Research Actions for Fish Biodiversity Conservation and Development (Inland Fisheries Sub-sector)	Duration (Year)	Executing Agency
1.	Research on the ecology and genetics of fresh water fish in Nigeria for their biological and genetic improvement and conservation.	5	FMARD, FME, NIOMR, NIFFR, Universities.
	(b) Collection and preservation of reference specimens of all fish species in Nigerian inland waters.	2	FME, FMARD, NIOMR, NIFFR University LinkageCentres.
2.	Collection and analysis of fishery statistics	3	FMARD, FME, NIFFR, FOS NIOMR.
3.	Establishment of a fishery sanctuary	2	FME, FMANR, NIFFR, NIOMR
	Inventorise, and manage traditional fish sanctuaries in collaboration with original owners		FMEnv, FMARD, SMARD, SMEnv, LGAs, Traditional authorities

			and CBOs
4.	Studies of the capacity of inshore fishery to assess and implement regimes for management on a sustainable yield basis	2	FME, FMARD NIOMR, Private sector
5.	Research on fish genetics and improvement of locally cultured fish species	5	FME, FMARD, NIFFR, NIOMR, Universities
6.	Establishment of gene pools for important cultured fish species.	2	FMANR, NIFFR NIOMR.

An Action on Biodiversity Mapping and Inventories: The Okwangwo Project, Cross-River National Park, Nigeria

Increasing worldwide demand for natural esources is exerting pressure on forest ecosystems, many of which are poorly studied. Deforestation is particularly pressing in West and Central African tropical forests, and especially in Nigeria where population increases are estimated as 372 percent over the next three decades. The Guineo-Congolean forest in general, covers approximately 2.8 million km2 and contains 84% of the African primates, 68% of the African passerine birds, and 66% of the African butterflies making it an important focal point for African conservation efforts. One of the most extensive remaining fragments in Nigeria is located in the Cross River National Park of South-eastern Nigeria, adjoining the Korup National Park of Cameroon. It is here that we propose to focus our attention in order to increase our understanding of the natural functions that maintain this important ecosystem.

Through the International Cooperative Biodiversity Group's (ICBG) West and Central Africa Associate Program for Biodiversity Conservation and Training, the Smithsonian Institution (SI) and the Bioresources Development and Conservation Programme (BDCP), have conducted four training courses in Nigeria and Cameroon, providing field technicians and project managers with tools for designing and implementing biodiversity assessment and monitoring projects using an adaptive management framework. In addition, we have established a network of one-hectare biodiversity monitoring plots (BDPs) in Nigeria (five plots) and Cameroon (15 plots), along with a 50-hectare Forest Dynamics Plot (FDP) in Korup National Park. SI, in collaboration with other national and international NGOs has also conducted a detailed assessment of biodiversity in the Takamanda Forest Reserve, Cameroon, which is adjoining the Okwangwo Region of Cross River National Park. The combination of methods provides an important step in achieving the necessary scientific baseline information for assessing and managing the biodiversity resources in the region.

The experience of BDCP and SI in implementing the Adaptive Management Program in Nigeria and Cameroon, has shown that the predominant activity of the key government agencies mandated with biodiversity conservation is the protection of forest reserves from a combination of community encroachment, illegal felling of timber and the poaching of wildlife. The immediate implication is that there has been little attempt generating, collecting and collating of baseline data necessary for managing biodiversity. That information that does exist is limited to projects by non-governmental organizations and a few government agencies. Various organizations, both national and international have been conducting portions of Nigeria's environmental research and development with limited resources and as part of different and diverse mandates. As a result, existing data are not in a form which decision-makers and the public can use.

While the law establishing it mandates the Forestry Research Institute of Nigeria (FRIN) to conduct baseline studies of the country's biological resources, the organization is severely constrained by limitations of funding, high turnover of technical staff, and jurisdictional problems arising from state government ownership of reserves. The result is that biodiversity monitoring and assessment in the country has been severely limited.

To this end, SI and BDCP, in collaboration with numerous other NGOs, have set out to overcome this issue at two locations within Cameroon and Nigeria. The aim is to create a model for biodiversity assessment and monitoring that can be replicated throughout the region.
The first biodiversity assessment was undertaken in the Takamanda Forest Reserve, where SI conducted vegetation assessments and established BDPs along an altitudinal gradient, and coordinated other stakeholder institutions with interests in assessing additional biodiversity components, including large mammals, birds, reptiles, butterflies, and dragonflies. In collaboration with the Cross River National Park, SI and BDCP plan to conduct a follow-up assessment of the Okwangwo Region of Cross River National Park. This assessment, which represents the last of a three-phased project, builds from the momentum generated by both the stakeholder meeting in Abuja in April 2001, and the biodiversity course in October 2001.

Objectives of the assessments:

- Provide quantitative information on the structure, composition and dynamics of the vegetation along an altitudinal gradient using permanent plots.
- Create a link with other stakeholders in the region to facilitate the assessment of other taxonomic groups to increase our understanding of biodiversity in the Okwangwo Region.
- To compare the resulting information from the project to those of the Takamanda Project in Cameroon.
- To identify mechanisms that will enhance our capacity to conserve biological resources in the region.

Partnerships

The multidimensional nature of such a program necessitates inter-organizational linkages and partnerships if the set goals are to be realized. In order to accomplish this, BDCP will consult with the Ministry of Environment and the National Parks Service (NPS). Building on already existing relationships, the NPS will be expected to provide logistics assistance, especially through the Cross River National Park and the State Forestry Commission. The NPS central office will be asked to sponsor the participation of field officers with specific expertise on different facets of the project.

Such participants will subsequently be nominated for participation in the leadership course in Front Royal, resources permitting. In addition, BDCP will seek active collaboration of local NGOs in the area, Forestry Research Institute of Nigeria (FRIN), especially for additional taxonomists, as well as the NCF. Communication with other NGOs with an interest in the area is crucial to the regional

conservation efforts. The Wildlife Conservation Society is conducting biodiversity assessments with a particular focus on gorillas as part of their Cross River Gorilla Research Project.

Bird life International has an interest in the area for its high level of diversity and will also be an important partner.

CHAPTER 7. MONITORING AND EVALUATION

7.1. The Conceptual Model

A fundamental approach in the monitoring and evaluation segment of this strategy is that the process is integrated into the overall plan from the beginning as a component of adaptive management loop. The entire strategy avoids the linear conceptual model, in which monitoring and evaluation come at the end of the implementation processes.

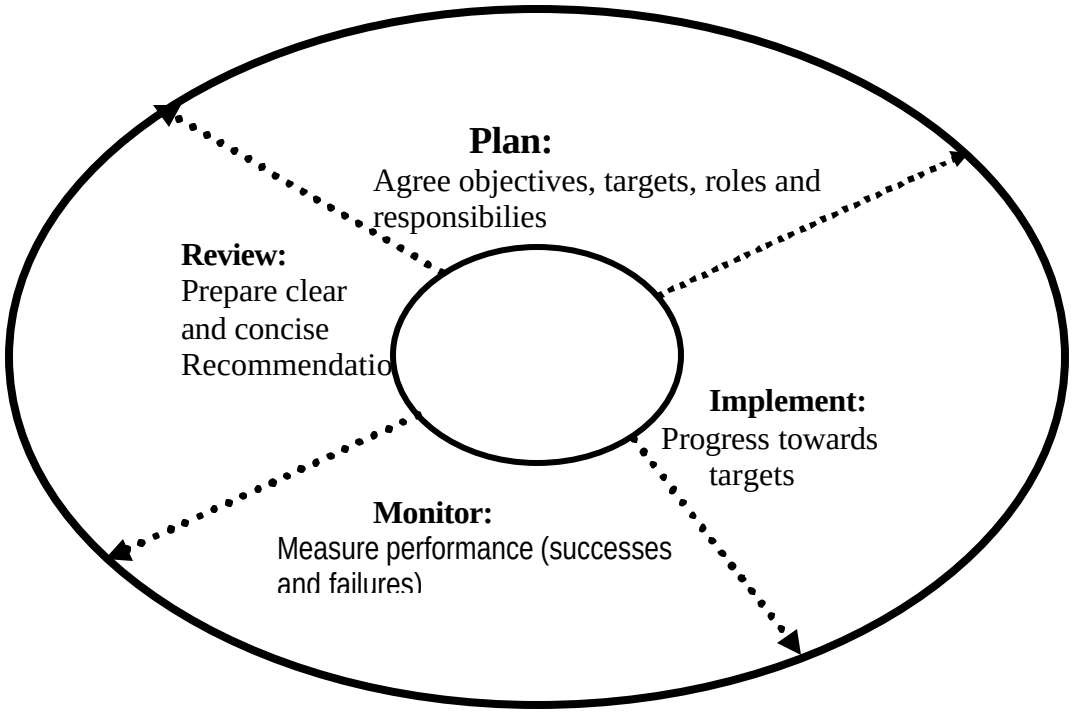

Figure 7.1: Conceptual Model

7.2. Identifying the Issues

Two of the objectives of the CBD relate to the conservation of biological diversity and the sustainable use of the components of biological diversity. To achieve these goals Article 7 of the Convention exhorts each country party to:

(a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I of CBD

(b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;

(c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques; and

(d) Maintain and organize, by any mechanism, data derived from identification and monitoring activities pursuant to subparagraphs (a), (b) and (c) above.

This requires that each Party must have a clear idea of the ecosystem, species, and genomes that are under threat through overuse, habitat degradation, and spread of invasive species. Annex 1 of CBD gives guidelines to the parties on identifying the component of biodiversity, which should be the target of attention and are described as follows:

1) **Ecosystems and habitats:** containing high diversity, large numbers of endemic or threatened species, or wilderness; required by migratory species; of social, economic, cultural or scientific importance; or, which are representative, unique or associated with key evolutionary or other biological processes;

2) **Species and communities:** which are: threatened; wild relatives of domesticated or cultivated species; of medicinal, agricultural or other economic value; of social, scientific or cultural importance; or of importance for research into the conservation and sustainable use of biological diversity, such as indicator species; and

3) **Described genomes and genes:** of social, scientific or economic importance.

Critical to the achievement of these objectives is the need for a systematic and longterm approach to building the knowledge base of Nigeria's biological diversity and the integration this knowledge into the decision-making process. In Nigeria, information about the component of biodiversity is incomplete; at best, only a provisional identification can be made of the components of biological diversity requiring special conservation measures. Data derived from the identification and monitoring of biological diversity, and of activities having or likely to have adverse impacts on biological diversity, are scattered among a large number of organisations.

Similarly, Nigeria has a number of different institutions working on particular biodiversity topics. A number of these institutions hold valuable collections. However, the capacity of these institutions to organise, analyse, evaluate and disseminate data requires strengthening. In addition, there is a need to enhance the pool of taxonomists in the country, as their numbers are insufficient to address the tasks at hand.

7.3. Monitoring and Progress Indicators

Monitoring and Evaluation (M&E) is a periodic assessment of the relevance, effectiveness, efficiency, impact and sustainability of a project, program, Commission, organizational unit or implementation framework in the context of stated objectives. Against this background the long-term goal of Monitoring and Evaluation in Nigeria is to identify components of biological diversity important for conservation and sustainable use. These should be monitored through sampling and other techniques to build in-country capacity for monitoring, assessment and evaluation, based on agreed criteria or indicators. An important goal of the NBSAP is to put in place an effective

monitoring and evaluation process, based on measurable indicators, to assess its progress. This should be done in a transparent and accountable manner.

Monitoring will enable management to assess the progress of implementation and take timely decisions to ensure that progress is maintained according to schedule. It is an internal activity and an integral part of day-to-day management. The strategic objective of monitoring and evaluation of activities under the NBSAP is to measure the extent to which the three principles of the CBD are being achieved, namely:

- Conservation of biodiversity;
- Sustainable use of its components; and
- Fair and equitable sharing of benefits

In addition and given the critical role biological resources play in livelihood activities in Nigeria, an important criterion for assessment is the extent to which sustainable use of biodiversity impacts positively on poverty levels.

Biodiversity Monitoring

Biodiversity monitoring will include the following elements:

Monitoring of Poverty-Natural Resource Indicators: that affect income, security and vulnerability of the poor. In collaboration with relevant government agencies and NGOs, it is important that the impact of biodiversity on reducing poverty levels be monitored. This recognizes the cause and effect relationship between poverty and biodiversity loss. This will include monitoring of rural poverty levels, annual household consumption from common lands and forest products, distance walked by household members to collect fuel wood and water (Shyamsundar Priya 2001).

Monitoring of Habitats: The Department of Forestry will continue to periodically monitor changes in forest cover and density throughout the country to elucidate and document the dynamics of habitat change in Nigeria.

Monitoring of Ground Conditions: Each Periodic Assessment (PA) will develop its own monitoring program according to the guidelines provided by the Ministry of Environment.

Monitoring of Indicator Species: Some key species shall be periodically monitored in forests, grasslands, agricultural lands, and wetlands through surveys to be conducted by the Federal Ministries of Environment, Agriculture, and Water Resources, in collaboration with other relevant government and non-government organizations and academic institutions.

Monitoring of Benefit Sharing: Periodic Assessments (PA) will be carried out to find out the kinds of products and services used by various stakeholders. Individual projects will have a strong component on the monitoring of products/services and the actual benefits shared by different sub-groups of stakeholders.

Monitoring of Management: The effectiveness of the PA and conservation programme management regimes will be monitored to ensure that natural resource use is sustainable. Each

management plan will include a monitoring component whereby management procedures will be monitored and periodically evaluated.

Monitoring of Physical Parameters: The Federal Ministry of Environment will monitor the level of soil and water erosion in the different agro-climatic zones. The Ministry will also monitor indicators such as air pollution and assess parameters such as water pollution, and levels of carbondioxide and greenhouse gases.

7.4 Objectives and Recommended Actions

Objective 1: Expand and Improve the Information Base on the Biodiversity of Nigeria

Action 1.1 Establish a national centre (with several regional centres) to coordinate biodiversity information, identification and monitoring activities. This centre shall be known as the Nigerian Biodiversity Clearing House Mechanism (NBCHM). This centre shall be Internet-based to facilitate the nationwide distribution of data and to increase international exchang of information. A roster of Nigerian experts and expertise on biodiversity shall be compiled and updated regularly for global distribution. This shall be linked to the CBD Clearing House Mechanism (CHM)

1.1.1. The Clearing House Mechanism center shall:

- ❖ Be equipped to receive, process, store information on Nigeria's biodiversity for easy retrieval.
- ❖ Strengthen information gathering and management activities for other institutions or organizations involved in biodiversity work.
- ❖ Provide guidance on the design and maintenance of national and regional inventories;
- ❖ Coordinate data management on existing and new specimen collections;
- ❖ Promote standardization of data collection and storage to ensure the comparability and transferability of information among databases;
- ❖ Provide support for local initiatives in database establishment and networking;
- ❖ Create and manage meta-databases;
- ❖ Disseminate information on biodiversity to policy makers, natural resource managers, educators, and other parties;
- ❖ Implement Actions 1.2 to 1.6 below.

Action 1.2 Identify national priorities for biodiversity information, including data on threatened ecosystems and species, "hot spots", and zones of endemismand centres of origin of domesticated crops and livestock (in accordance with Annex 1 of the Convention).

1.2.1 This should include:

- ❖ The use of existing data (scientific papers, species lists, museum collections, etc.), to update species distribution, status, and taxonomy;
- ❖ The use of satellite imagery to develop a definitive map of the remaining natural and semi-natural ecological zones of Nigeria;
- ❖ The identification of key information gaps; and
- ❖ The implementation of additional surveys and research studies as required.

Action 1.3: *Create a National Red Data List of threatened flora and fauna.*

Action 1.4: *Advance knowledge of indigenous species for use in biodiversity conservation.*

Action 1.5: *Store and catalogue information in computerized databases, to be maintained by "custodian" agencies.*

Action 1.6: *Foster the sharing of information on biodiversity among research institutions, government agencies, NGOs, and local communities. The incorporation of traditional (local) knowledge with science has great potential for strengthening the information base on biodiversity.*

Objective 2: **Develop and Institutionalise Systems to Monitor Key Elements of Biodiversity**

Action 2.1*:* *Develop and institutionalise regular resource monitoring by the agencies responsible for the conservation and sustainable use of biodiversity. Particular attention should be accorded to monitoring the status of protected areas and the components of biodiversity identified in Annex 1 of the Convention. Monitoring should also be carried out with the active participation of local communities. Existing monitoring projects that fall outside the public sector should be integrated into the system.*

Action 2.2: *Provide periodic assessments (e.g. through a "State of the Environment" report) of key elements of biodiversity and indicators of progress/failure, including resources allocated by government towardsthe conservation of biodiversity and sustainable use.*

Objective 3: **Institutionalise an Environmental Resource Accounting System to Monitor Key Elements of Biodiversity**

Action 3.1: *Institutionalize a system of bio-resource accounting into the national accounting system. (Collaborate with Ministry of Finance, Ministry of Trade, Industry, Ministry of Education, Ministry of Agriculture and Natural Resources, Federal Office of Statistics, Nigeria Academy of Sciences).*

Objective 4: **Establish a Local Evaluation and Assessment of Forest Resources (LEAF)**

Action 4.1: *LEAF will be a multi-agency program implemented under the supervision of the Federal Ministry of Environment but with active collaboration of Ministry of Agriculture.*

Action 4.2: *Institutionalize a forest certification system, with particular emphasis on research of its ecological, social and economic impact. (Involves collaboration of Ministry of the Environment, Ministry of Trade and Industry, Ministry of Agriculture).*

Action 4.3: *Carry out taxonomic and ecological research on lesser-known species. Research on endangered species will continue, and it's content and scope will be determined by conservation priorities.*

Action 4.4: *Research on the factors responsible for maintenance of biological diversity to be encouraged, and research on the management and ecological restoration of natural habitats will be augmented.*

BIBLIOGRAPHY

1. World Bank (2001) World Bank Indicators.

2. Hutchinson, J. and Dalziel, J.M. (1927-36) Flora of West Tropical Africa, Crown Agents, London.

3. Gbile, Z.O., Ola-Adams, B.A. and Soladoye, M.O. (1978): Endangered species of the Nigerian Flora. *Nigerian Journal of Forestry 8(1,2).*

4. Ezealor , A.U.(1995) Ecological Profile of a Nigerian Sahelian Wetland: Toward Integrated Vertebrate Pest Damage Management. *Ph.D. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia., USA. 231pp.*

5. Ezealor (2001): Nigeria. pp 673-692 *In Important Bird Areas in Africa and Associated Islands: priority sites for conservation* (L.D.C. Fishpool and M.I. Evans, eds) Newbury and Cambrige, UK: Pisces Publications and BirdLife International (BirdLife Conservation Series No. 11).

6. Ezealor (2002) Critical Sites for Biodiversity Conservation in Nigeria. Nigerian Conservation Foundation, Lagos, Nigeria. 110pp.

7. Aminu-Kano, M. and Marguba, L.B. (2002). History of Conservation in Nigeria, pp 3-11 in Critical Sites for Biodiversity Conservation in Nigeria (Ezealor. ed.) Nigerian Conservation Foundation, Lagos, Nigeria.

8. Folke C., Carpenter S., Elmqvist T., Gunderson L., Holling C.S., Walker B., Bengtsson J., Berkes F., Colding J., Danell K., Fakenmark M., Gordon L., Kasperson R., Kautsky N., Kinzig A., Levin S., Maler K-G., Moberg F., Ohlsson L., Olsson P., Ostrom E., Reid W., Rocstrom J, Savenije H. and Svedin U. (2002) Resilience and Sustainable Developmnet: Building Adaptive Capacity in World of Transformations – Scientific Background Paper commissioned by the Environmental Advisory Council of the Swedish Government in preparation for the WSSD. ICSU Series on Science for Sustainable Development No. 3.

9. Ita, E.O. (1993) Inland Fishery Resources of Nigeria. FAO Rome.

10. Fry, C.H. (1975): Avian evidence of increasing aridity at Zaria. *Savanna*

11. Hollis, G.E., Adams, W.M. and Aminu-Kano, M.(1993) *The Hadejia-Nguru Wetlands: environment, economy and sustainable development of a Sahelian floodplain wetland.* Gland Switzerland/Cambridge UK: IUCN.

12. Powell, C.B. (1993): *Sites and species of conservation interest in the central axis of the Niger Delta (Yenegoa, Sagbama, Ekermor and Southern Ijo Local Government Areas): a report of recommendations.* Natural Resources Conservation Council, (NARESCON), Abuja, unpublished report.

13. Shyamsundar. Priya (2001): Poverty-Economic Indicator, Environment Department, World Bank, Washington, D.C.

Appendix 1: Globally and locally threatened/ endangered species of Nigerian fauna and some known endemic species

KEY

Ex = Extinct
ExW = extinct in the wild
CR = critically endangered
EN = endangered
VU = vulnerable
NT = near threathened
R = rare
DD = data deficient
LR/nt = low risk – near-threatened
LR/cd = low risk – conservation dependent
OSC = of special concern
K = not well known
? = Doubtful status
* = endemic species by current knowledge

GROUPS or **Taxa** or *Species*	Threat Status
MICROBIOTA (MICROBES)	**Global National**
Viruses	*K*
Bacteria	K
Fungi	K
Algae	K
Protozoa	K
Planktons	K

VASCULAR PLANT	
Bothriochloa glabra (**Graminae)**	R
Arundinella pumilla **(Graminae)**	R
Bitter Cola *Garcinia cola*	NT
Bush Mango *Irvingia gabonensis*	LR/cd
"Ukwa" *Sterculia* sp.	LR/cd
Gao *Acacia albida*	LR/cd
Acacia scorpioides (nilotica)	LR/cd
Acacia Senegal	LR/cd
Baobab *Adansonia digitata*	LR/nt
Adua *Balanites aegyptiaca*	LR/nt
Fan Palm *Borassus aethiopum*	VU
Dum Palm *Hyphaene thebaica*	VU
Ratan	LR/nt
Shea-butter Tree *Vitellaria paradoxa (Butyrospermum paradoxum)*	LR/nt
Locust Bean Tree *Parkia biglobosa*	LR/cd
Tamarind *Tamarindus indica*	LR/cd
Tecoma stans	VU
Costus Spectabilis the National Plant	EN
"Okazi" *Gnetum africanum*	LR/cd
Pericopsis laxiflora	VU
Pterocarpus erinaceus	LR/cd
Dry Zone Mahogany *Khaya senegalensis*	EN

Sapele Wood *Entandrophragma cylindricumi*	EN
Iroko *Milicia excelsa (Chlorophora excelsa)*	EN
Obeche *Triplochiton scleroxylon)*	EN
Mitragyna stipulosa	EN
"Abura" *Mitragyna ciliate*	EN
African Plum *Prunus Africana*	VU
Bush Rubber Tree *Funtumia Africana*	LR/nt
Funtumia elastica	LR/nt
Ebony *Diospyros spp.*	VU
Red Silk-cotton Tree *Bombax costatum*	LR/cd
Stereospermum kunthianum	R
Sterculia setigera	LR/nt
Red Iron-wood *Lophira alata*	LR/nt

INVERTEBRATA (INVERTEBRATES)	
Jellyfish	K
Flatworms **(Platyhelminthes)**	K
Round worms **(Nematodes)**	K
Annelids (e.g. Earthworms)	K
Snails **(Mollusca)**	K
Echinoderms (e.g., Starfish)	K
Arthropods (e.g., Insects)	K
* *Tetrarhanis okwngw*	*?*
* *Tetrarhanis ogojea*	*?*

PISCES (FISHES)	
Amphiliidae	
Amphilius grammatophorus	R
Anabantidae	
**Ctenopoma nebulosum*[1]	?
Bagridae	
Parauchenoglanis ansorgii	R
Gephyroglanis tilhoi	R
**Chrysichthys aluuensis*[1]	?
**Chrysichthys* sp. [1]	?
Carangidae	
Trachinotus goreensis	R
Centropomidae	
Nile Perch *Lates niloticus*	**?**
Characidae	
Alestes dageti	R
Petersius brevidorsalis	R
Cichlidae	
Pelmatochromis arnoldi	R

Pelmatochromis annectens	R
Pelmatochromis ansorgii	R
Gobiocichla wonderi	R
Tilapia heudelotii	R
**Hemichromis cristatus*[1]	?
Citharinidae	
**Nannocharax latifasciatus*[1]	?
**Nannocharax* sp. [1]	?
Claridae	
Clarias angolensis	R
**Clarias agboyiensis*[1]	?
Gymnallabes typus	R
Clupeidae	
Sierrathrissa leonensis	R
Cynothrissa mento	R
Micrithrissa miri	R
Pellonula vorux	R
Cromeriidae	
Cromeria nilotica	R
Cynoglossidae (Pleuronectidae)	
Citharichthys spilopterus	R
Cyprinidae	
Chelaethiops bibie	R
Labeo oguensis	R
Barbus lagoensis	R
Barbus nigeriensis	R
Barbus ablabes	R
Barbus wurtzi	R
Barbus amena	R
Barbus lawrae	R
Barbus warmeri	R
Barbus leonensis	R
Barbus stigmatopygus	R
**Barbus sylvaticus*1	?
Cyprinodontidae	
Epiplatys bifasciatus	R
**Epiplatys biafranus*1	?
Aplocheilus sexfaciatus	R
Aplocheilus senegalensis	R
Aplocheilus longiventralis	R
Aplocheilus maxnoi	R
Aplocheilus grahami	R
Aplocheilichthys cameronensis	R
Aplocheilichthys kingi	R

**Aplocheilichthys* scheeli1	?
Procatopus nototaenia	R
Fundulus bivittatus	R
Fundulus amoldi	R
Fundulus gardeneri	R
Fundurus sjoestedti	R
Eliotridae (Gobiidae)	
Eliotris lebretoni	R
Eliotris pleurops	R
Eliotris vittata	R
Gobius guineensis	R
Gobius nigri	R
Gobius occidentalis	R
Gobius schlegellii	R
Gobius soporator	R
Gymnarchidae	
Gymnarchus niloticus	*?*
Mastacembelida	
Mastacembelus longicauda	R
Mochokidae	
Synodontis obesus	R
Synodontis frontosus	R
Synodontis budgetti	R
Mormyridae	
Hyperopisus bebe	R
Hyperopisus tenuicauda	R
Petrocephalus ansorgii	R
**Petrocephalus soudanensis*1	?
**Petrocephalus pallidomachulatus*1	?
Petrocephalus sauvagii	R
Marcusenius budgetti	R
Marcusenius kingsleyae	R
Marcusenius longianalis	R
Mugilidae	
Mugil grandisquamis	R
Nandidae	
Polycentropsis abbreviata	R
Phractolaemidae	
Phractolaemus ansorgii	R
Polynemidae	
Polynemus quinquarius	R
Galeoides decadactylus	R
Polypteridae	
Polypterus lapradei	R

Polypterus annectens	R
Pomadasyidae	
Pristipoma jubeleni	R
Synbranchidae	
Synbranchus afer	R
Tetraodontidae	
Tetradon pustulatus	R
Trigonidae (Sting-rays)	
Potamotrygon garouaensis	R
Pritidae (Saw-fishes)	
Pristis perrotteti	R
Sphyraenidae (Barracudas)	
Sphyraena guachanacho	R
Scianidae (Drums)	
Corvina nigrita	R
Otolithus senegalensis	R
Monodactylidae	
Monodatylus sebae	R
Prisipomatidae	
Otoperca aurita	R
Pristipoma jubelini	R
Marine Fishes (e.g. Sharks)	K
Newly Described Species	
**Fundulopanchax deltaense*1	?
**Fundulopanchax powelli*1	?
**Bryconaethiops quinquesquamae*1	?
**Neolebias powelli*1	?
**Parauchenoglanis akira*1	?
**Dasyatis margaritella*1	?
Gobiocichla sp.	?

AMPHIBIA (AMPHIBIANS)	
Caeciliidae	
Herpele squalostoma	R
Pipidae	
Hymenochirusboettgeri	R
Bufonidae	
Bufo camerunensis	?
Bufo gracilipes	?
Bufo perreti	?
Bufo superciliaris	R
Woltersdorffina parvipalmadta	?
Ranidae	
Conrauacrassipes	R

Dimorphognathus africanus	R
Phrynobatrachus batesi	R
Phrynobatrachus cricogaster	R
Phrynobatrachus accraensis	R
Petropedates newtoni	R
Rhacophoridae	
Acanthixalus spinosus	*?*
Hyperolius riggenbachi	*R*
Hyperolius ocellatus	*R*
Hyperolius steindachnerii	*R*
Kassina fusca	*R*
Leptopelis palmatus	R
Leptopelis notatus	*R*
Leptopelis bufonides	*R*
Plyctimantis leonordi	*R*
**Dendrobatorana dorsalis*	*R*
Phrynomeridae	
Phrynomeris microps	*R*

REPTILIA (REPTILES)	
Chamelionidae (Chameleons)	
Rhampholeon spectrum	*R*
Chameleo oweni	R
Chameleo cristatus	*R*
Chameleo quadricornis	*R*
Agamidae (Agama Lizards)	
Agama gracilimembris	*R*
Eublepharidae	
Hemithconyx caudicinctus	*R*
Gekkonidae (Geckos)	
Hemidactylus matschiei	*R*
Hemidactylus muriceus	*R*
Hemidactylus intestinalis	*R*
Varanidae (Monitor Lizards)	
Bosc's (Short-tailed) Monitor Lizard *Varanus exanthematicus*	R
Dibamidae	
Feylinia currori	*R*
Scincidae (Skinks)	
Sphenops Delislei	R
Leptosiaphos kilimensis	R
Mabuya albilabris	R
Riopa fernandi	R
Lacertidae	
Holapsis guetheri	R

Eremias nitida	
Typhlopidae (Blind Snakes)	
Pigmy Blind Snake *Leptotyphlops sp.*	?
Colubridae	
Mehelya egbensis	?
Beauty snake *Psammophis sibilans*	?
Boidae	
Pythons *Python spp.*	?
Crocodylidae (Crocodiles)	
Nile Crocodiles *Crocodylusn niloticus*	VU
African Slender-snouted Crocodile (Gaival) *Crocodylus cataphractus*	DD
West African Dwarf Crocodile *Osteolaemus tetrapsis*	DD
Chelonidae	
Demochelys coriacea	EN EN
Chelonia midas Olive	EN EN
Olive Ridley Turtle Lepidochlys olivacea	EN EN

AVES (BIRDS)	
Struthionidae (Ostrich)	
Ostrich *Struthio camelus*	EN
Sulidae (e.g. Garnets)	
Cape Garnet *Sula capensis*	VU K
Anhingidae (Darter)	
Darter *Anhinga melanogaster*	VU
Pelecanidae (Pelicans)	
Great White Pelicans *Pelecanus onocrotalus*	VU
Pink-backed (Grey) Pelican *Pelecanus rufescens*	VU
Ardeidae (e.g. Herons)	
White-crested Tiger heron *Tigriornis leucolophus*	DD R
Ciconiidae (Storks)	
Saddle-bill Stork *Ephipiorhynchus senegalensis*	? R
Threshkiornithidae (e.g. Ibises)	R
Olive Ibis *Bostrychia olivacea*	R
Phoenicopteridae (Flamingos)	
Lesser Flamingo Phoeniconaias minor	NT EN
Anatidae (Ducks & Geese)	
Hartlaub's Duck *Pteronetta hartlaubi*	NT NT
Marbled duck (Teal) *Marmaronetta angustirostris*	VU VU
Ferruginous Duck *Aythya nyroca*	NT NT
Accipitridae (e.g. Vultures Eagles Harriers)	
Lappet-faced Vulture *Torgos (Aegypius) tracheliotus*	VU VU
Eastern Imperial Eagle *Aquila heliaca*	VU VU
Pallid Harrier *Circus macrourus*	NT NT
Falconidae (Falcons)	

Lesser Kestrel *falcon naumanni*	VU VU
Rallidae (e.g. Rails)	
Corn crake *Crex crex*	VU VU
Gruida (Cranes)	
Black Crowned Crane *Balearica pavonina*	NT EN
Otididae (Bustards)	
Denham's Bustard *Neotis denhami*	NT NT
Nubian Bustard *Neotis nuba*	N T? NT
Glareolidae (e.g. Pratincoles)	
Black-winged Pratincole *Glareola nordmanni*	DD ?R
Scolopacidae (e.g. Snipes)	
Great Snipes *Galllinago media*	NT NT
Sternidae (Sterns)	
Damara Tern *Sterna balaenarum*	NT NT
Rhychopidae (Skimmer)	
African Skimmer *Rhyncopsflavirostris*	NT NT
Bucerotidae (Hornbills)	
Brown-cheeked Hornbill *Bycanistes (Ceratogymna) cylindricus*	*NT NT*
Yellow-casqued Wattled Hornbill *Ceratogymna elata*	NT NT
Pycnonotidae (Bulbuls)	
Cameroon Montane Greenbul *Andropadus montanus*	NT NT
Bauman's Greenbul *Phyllastrephus baumanni*	*DD ?R*
Grey-headed Greebul *Phyllastrephus poliocephalus*	*NT NT*
Green-tailed Bristlebill *Bleda eximia*	*VU VU*
Turdidae (e.g. Thrushes)	
Crossley's Ground-Thrush *Zoothera crossleyi*	*NT NT*
Sylviidae (Warblers)	
Bangwa (Cameroon Scrub-) Forest Warbler *Bradypterus bangwaensis*	NT NT
Dorst's Cisticola *Cisticola dorsti*	*DD DD*
Muscicapidae (Flycatchers)	
Tessman's Flycatcher *Muscicapa tessmani*	*DD DD*
Tmaliidae (Babblers)	
White-throated Mountain Babbler *Kupeornis gilberti*	EN EN
Picathartidae (Picathartes)	
Read-headed Rockfowl *Picathartes oreas*	*VU VU*
Malaconotidae (e.g. Bush-Shrikes)	
Green-breasted Bush-Shrike *Malaconotus (Telophorus) gladiator*	*VU VU*
Ploceidae (Typical Weavers)	
Bannerman's Weaver *Ploceus bannermani*	VU VU
*Ibadan (Elgood's) Malimbe *Malimbus ibadanensis*	EN CR
Estrildidae Estrildid Finches)	
*Rock Fire-Finch *Lagonosticta sanguinodorsalis*	? DD
*Anambra Waxbill *Estrilda poliopareia*	VU VU

Viduidae (e.g., **Indigobirds)**	
*Jos Plateau Indigobird *Vidua marya*	? DD

MAMMALIA (MAMMALS)	
INSECTIVORA (INSECT-EATERS or **INSECTIVORES)**	
Tenrecidae	
Gaint Otter-Shrew *Potamogale velox*	EN ?
Soricidae	
Savanna Swamp Shrew *Crocidura longipes*	OSC OSC
Etruscan Shrew *Suncus etruscus*	R R
Small Savanna Shrew *S. varilla*	R R
Climbing Shrew *Sylvisorex megalura*	K ?

CHIROPTERA (BATS)	
Pteropodidae	
Veldkamp's Dwarf Fruit-Bat *Nanonycteris valdekampi*	R R
Zenker's Fruit-Bat *Scotonycteris zenkeri*	R R
Emballonuridae	
Mozambique Sheath-tailed Bat *Coleura afra*	?
Rhinolophidae	
Halcyon Horseshoe-Bat *Rhinolophus alcyone*	K ?
Cameroun Horseshoe-Bat *Rhinolophus alticolus*	K ?
Abyssinian Horseshoe-Bat *Rhinolophus fumigatus*	K ?
Lander's Horseshoe-Bat *Rhinolophus landeri*	K ?
Maclaud's Horseshoe-Bat *Rhinolophus maclaudi*	K ?
Hipposideridae	
Aba Leaf-nosed Bat *Hipposideros abae*	OSC
Dwarf Leaf-nosed Bat *Hipposideros beatus*	OSC
Common African Leaf-nosed Bat *Hipposideros caffer*	OSC
Commerson's Leaf-nosed Bat *Hipposideros commersoni*	OSC
Cyclops Bat *Hipposideros Cyclops*	OSC
Jones's Leaf-nosed Bat *Hipposideros jonesi*	OSC
Noack's African Leaf-nosed Bat *Hipposideros rubber*	OSC
Vespertilionidae	
Rufous Mouse-eared Bat *Myotis bocagei*	K ?
Gambian Light-winged Bat *Scotoecus albofuscus*	K ?
Kabwir Bat *Scotoecus hindei*	K ?
Tiny Pipistrelle *Pipistrellus nanulus*	K ?
Banana Bat *Pipistrellus nanus*	K ?
Ruppell's Pipistrelle *Pipistrellus ruepelli*	K ?
Beatrix Bat Glauconycteris beatrix	K ?
Abo Bat *Glauconycteris poensis*	K ?
Butterfly Bat *Glauconycteris variegata*	K ?
Moloney's Flat-headed Bat *Mimetillus moloneyi*	K ?

Dark-brown Serotine *Eptesicus brunneus*	K ?
Cape Serotine *Eptesicus capensis* K ?	K ?
Lagos Serotine *Eptesicus platyops* K ?	K ?
Tiny Serotine *Eptesicus pusillus* K ?	K ?
Rendall's Bat *Eptesicus rendalli* K ?	K ?
Somali Serotine *Eptesicus somalicus* K ?	K ?
Smith's Wooly-Bat *Kerivoula smithi* K ?	K ?
Molossidae	
Bini Free-tailed Bat *Myopterus whitleyi*	K ?

PRIMATA (PRIMATES)	
Lorisidae	
Angwantibo *Arctocebus calabarensis*	K R
Cercopithecidae	
Drill *Papio leucophaeus*	EN CR
*Sclater's Monkey *Cercopithecus sclateri*	EN EN
*Red-bellied Monkey *Cercopithecus erythrogaster*	VU EN
Grey-cheeked Mangabey *Cercocebus albigena*	R
Red-eared Monkey *Cercopithecus erythroti*	VU VU
White-collared Mangabey *Cercocebus torquatus*	VU VU
Western Pied Colobus *Colobus polykomos*	VU VU
Olive Colobus *Colobus verus*	EN CR
Preuss's Monkey *Procolobus preussi*	EN EN
Pongidae	
Chimpanzee *Pan troglodytes*	EN EN
Cross River Gorilla *Gorilla gorilla diehli*	EN CR

RODENTIA (RODENTS)	
Sciuridae	
Orange-headed Tree-Squirrel *Funisciurus leucogenys*	OSC
Cricetidae	
Agag Gerbil *Gerbillus agag*	K ?
Slender Gerbil *Taterbillus gracilis*	K ?
Lake Chad Gerbil *Taterillus lacustris*	K ?
Nigerian Gerbil *Taterillus nigeriae*	K ?
Muridae	
Hausa Mouse *Mus hausa*	K ?
Pigmy Mouse *Mus minutoides*	K ?
Shaggy Rat *Dasymys incomtus*	?
Striped Grass-Mouse *Lemniscomys barbarusi*	?
Spotted Grass-Mouse *Lemniscomys striatus*	?
Shinning Thicket-Rat *Thamnomys rutilans* R R	R R
Brush-furred Mouse *Uranomys ruddi*	K ?
Three-striped Mouse *Hybomys trivirgatus*	?
One-striped Mouse *Hybomys univittatus*	?

Tinfield's Rat *Aethomys hindei*	?
Bathyergidae	
Ochre Mole-Rat *Cryptomys ochraceocinereus*	?

CANIVORA (FLESH-EATERS or **CARNIVORES)**	
Canidae	
Pale Fox *Vulpes pallida*	K ?
Hunting Dog *Lycaon pictus*	EN CR
Mustelidae	
Cape Clawless Otter *Aonyx capensis*	OSC?
Spotted-necked Otter *Lutra maculicollis*	VU?
Libyan Striped-Weasel *Poecilictis libyca*	K ?
Ratel *Mellivora capensis*	OSCR
Viverridae	
Hausa Genet *Genetta thierryi* R R	R R
Gambian Mongoose *Mungos gambianus*	?
Long-nosed Mongoose *Herpestes naso*	?
Hyaenidae	
Spotted Hyaena *Crocuta crocuta*	OSC NT
Striped Hyaena *Hyaena hyaena*	OSC VU
Felidae	
Caracal *Felis caracal* R	R
Serval *Felis serval* OSC ?	OSC ?
Cheetah *Acinonyx jubatus* VU Ex	VU Ex
Lion *Panthera leo* OSC VU	OSC VU
Leopard *Panthera pardus* VU VU	VU VU

SIRENIA	
Trichechidae	
Manatee *Trichechus senegalensisis*	VU VU

TUBULIDENTATA	
Orycteropodidae	
Aardvark *Orycteropus afer*	VU VU

PROBOSCIDEA	
Elephantidae	
African Elephant *Loxodonta africana*	EN EN

PERISSODACTYLA	
Rhinocerotidae	
Black Rhinoceros *Diceros bicornis*	CR Ex

ARTIODACTYLA	
Suidae	
Red River-Hog *Potamochoerus porcus*	?R R
Giant Forest-Hog *Hylochoerus meinertzhageni*	VU EN
Hippopotamidae	
*(Niger Delta) Pygmy Hippopotamus *Hexaprotodon liberiensis heslopi*	VU ExW
Tragulidae	
Water Chevrotain *Hyemoschus aquaticus*	R R
Giraffidae	
Giraffe *Giraffa camelopardalis*	VU ?Ex
Bovidae	
African buffalo *Syncerus caffer* L	LR/cd LR/cd
Sitatunga *Tragelaphus spekei*	LR/nt EN
Giant Eland *Taurotragus derbianus*	LR/nt R
Bay Duiker *Cephalophus dorsalis*	OSC R
Black Duiker *Cephalophus niger*	OSC R
Maxwell's Duiker *Cephalophus maxwelli*	LR/nt ?
Ogliby's Duiker *Cephalophus oglibyi*	OSC ?
Yellow-backed Duiker *Cephalophus sylvicultor*	LR/nt EN
Red-flanked Duiker *Cephalophus rufilatus*	LR/cd ?
Waterbuck *Kobus ellipsiprymnus*	LR/nt OSC
Kob *Kobus kob*	LR/cd OSC
Mountain Reedbuck *Redunca fulvorufula*	LR/cd EN
Bohor Reedbuck *Redunca redunca*	LR/cd EN
Roan Antelope *Hippotragus equines*	LR/cd EN
Western Hartebeest *Alcelaphus buselaphus*	LR/cd OSC
Korrigum *Damaliscus lunatus*	VU ?Ex
Klipspringer *Oretragus oreotragus*	LR/cd EN
Bate's Dwarf Antelope *Neotragus batesi*	?
Oribi *Ourebia ourebi*	R
Dama Gazelle *Gazella dama*	EN ?Ex
Dorcas Gazelle *Gazella dorcas*	VU ?Ex
Red-fronted Gazelle *Gazella rufifrons*	VU ?CR

Source: Powell (1993).