MINISTRY OF ENVIRONMENT & SCIENCE

NATIONAL CAPACITY SELF ASSESSMENT PROJECT
(UNDP/GEF/GHA/03/4G1/A/1G/99)

CAPACITY NEEDS FOR MEETING GHANA'S COMMITMENTS UNDER UN-CONVENTION ON BIODIVERSITY

By

Prof. Kwabena Tufuor
(CONSULTING FORESTER)

Tufuhene Forestry Consults
P. O. Box AT 180,
Achimota Market, Accra

NOVEMBER, 2005

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TERMS OF REFERENCE FOR BIODIVERSITY CONSIERVATION EXPERT)

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III) Analyze the complete capacity development needs to effectively undertake her obligations under the Conservation of Biodiversity

IV) Analyze linkages to sustainable development priorities e.g. Poverty Alleviation

V) Develop a National Implementation Plan/Action Plans

LIST OF ABBREVIATIONS AND ACRONYMS

BNARI	:	
CB	:	Biological Diversity
CBD	:	Convention on Biodiversity
CSB	:	Commission on Sustainable Development
CSIR	:	Council for Scientific and Industrial Research
FAO	:	Food and Agricultural Organization of United States
GEF	:	Global Environment Facility
GMO	:	Genetically Modified Organism
LMO	:	Living Modified Organism
NGO	:	Non-Governmental Organization
CBOs	:	Community-based Organizations
EIA	:	Environmental Impact Assessment
FAO	:	Food & Agric Organization of United Nations
FMU	:	Forest Management Unit
FORIG	:	Forestry Research Institute of Ghana
FSD	:	Forest Services Division of Forestry Commission
FOSA	:	Forest Outlook Study for Africa
GIS	:	Geographic Information System
IITA	:	International Institute of Tropical Agriculture
IUCN	:	World Conservation Union
IRRI	:	International Rice Research Institute
IPGRI	:	International Plant Genetic Resource Institute
IPR	:	Intellectual Property Rights
MDG	:	Millennium Development Goals

HBS	:	National Biodiversity Strategy
NCSA	:	National Capacity Self Assessment
NARP	:	National Agricultural Research Project
R & D	:	Research and Development
PSI	:	Presidential Special Initiative
WD	:	Wildlife Division of Forestry Commission
SAP	:	Structural Adjustment Programme
S. D.	:	Sustainable Development
SFM	:	Sustainable Forest Management
TK	:	Traditional Knowledge
WARDA	:	West African Rice Development Association
WWF	:	World Wide Fund for Nature
WSSD	:	World Summit on Sustainable Development
UNEP	:	United Nations Environmental Programme

LIST OF TABLES AND FIGURES

EXECUTIVE SUMMARY

A) Ghana is a signatory to the UN Convention on Biodiversity in 1994. Articles 18 (21, 22 of Conservation of Biodiversity expect Parties to the Convention to strengthen national capabilities (technical and human) to enable countries to implement the Convention for the ultimate benefit of their people.

The National Capacity Self Assessment Project (NCSA) funded by GEF promises to help Ghana identify capacity gaps/and constraints for implementation of the Convention on Biodiversity.

This Report on Biodiversity along with others on Climate Change, Desertification is aimed at identification of the Capacity Needs and associated constraints within the three thematic areas of the three Rio Conventions.

B) CAPACITY NEEDS ASSESSMENT FOR BIODIVERSITY CONSERVATION IN GHANA

The range of climatic conditions (coastal savannah, rainforest, semi deciduous forests, forest-transition zone, northern savannah woodlands, and geomorphology found in Ghana has created a wide diversity of habitats from which various flora and fauna have evolved over several millennia.

Capacity Building for sustainable use of natural resources (in agric, forestry, fisheries etc) involves the development and strengthening of human resources, institutions, facilities and funding for the protection, management and utilization of natural resource sustainably.

Depending on their specific mandates, Institutions for Biodiversity conservation may emphasize particular aspects of human capital development useful to their activities.

Capacity Building will evolve around the three pillars of Capacity Building

Systematic Capacity – government provides legal and enabling environment for the participatory process (partnership)

Institutional Capacity – strengthening existing institutions within and outside government

Human Capacity – updating of human skills

C) THE MAIN COMPONENTS OF CAPACITY BUILDING FOR BIODIVERSITY CONSERVATION IN GHANA CAN BE OUTLINED AS FOLLOWS:

Capacity building must not only recognize the whole breath of the concept of biodiversity but also the need for interconnectivity among **institutions** that participate in the protection, inventory and utilization of biodiversity.

National assessment of technological capabilities are crucial for informing policy and institutional changes and policy measures for promoting capacity building.

Capacity Building may require reorientation of National and International institutions and major national policy reforms to ensure that issues relating to critical and efficient use of existing capabilities are given significant legitimacy.

Institutions for biodiversity conservation in Ghana lack critical human capital for scientific research and conservation. There is the need to develop professional and institutional expertise in fields relating to the conservation of biodiversity. This includes technical and scientific skills created through formal training in specific areas of Biodiversity conservation. The concern here is how resources and techno/scientific professional knowledge and expertise are deployed to meet specific national goals in Biodiversity conservation

National technological capabilities for biodiversity conservation are largely articulated in several national and private **institutions** charged with mandates for undertaking their respective expert roles in conservation activities. The following thematic areas and institutions are worthy of mention.

I) Forest Biodiversity - MLF, FC, FORIG, FSD

II) Agro biodiversity - CSIR: CRI, SRI, OPRI, ARI, PGRC

- MES: BNARI
- Cocobod - CRIG
- Universities: Legon, KNUST (IRNR)

MOFA - Crop Production Department

- Animal Production Department
- Fisheries Department

III) National Centre for Plant Medicine, Mampong/Akwapim

- Arboretum/Herbarium of medicinal plants

IV) NGOs

- Centre for Biodiversity Utilization and Development (CBUD), established in 1999, linking conservation and development through a series of projects to develop different NTFPs and their related markets.

D) BROAD PARTICIPATION

- Re-establishing community collaboration for natural resource management, given the fact that legal disenfranchisement of local communities from forest reserves has been the underlying causes of deforestation.

- Capacity building applies equally to strengthening and improving government agencies and NGOs from national to local levels

- Increased capacities should lead to communities that are more self-reliant and equitable and more open, participatory and integrated in their decision-making

- Strengthening community forest-use rights and responsibility (and the capacity to carry out appropriate actions) through supportive policies, legislation and programmes would enhance community initiatives to protect forests/natural resources against destruction.

E) Identification of funds is integral to any organization's institutional capacity, and sustainability of funding is essential; i.e. long-term operating funds derived from dependable sources

Private, bilateral and multilateral funds may form part of the institutions' budget, and they may come in big denominations, but GoG should pay more attention to public funds generated from natural resources management e.g. revenues from high-value resources extraction in wildlife safaris, timber royalties etc.

Admittedly, limited budgets have meant that PAs have lacked sufficient institutional capacity and consequently, adequate control and management

F) GENETIC RESOURCE MANAGEMENT

Conservation of genetic resources can be achieved in several ways:

I) In-situ Conservation of indigenous strains of plants, breeds of animals, and micro-organisms conserved in their natural habitats

- A system of PAs already exists, and attempts have been made at identifying areas of high species richness and endemism – the so-called "hot spots"

II) Seed Gene-Banks (Ex-situ Conservation)

- In Vitro Gene Banks
- Plant varieties are conserved in the form of callus and tissues by cyro-preservation techniques
- Safe movement of gemplasm (Bio Safety)

III) Need for Taxonomic input in many activities aimed at conservation and sustainable use of Biodiversity

- to develop national collection, human and institutional capacity in taxonomy
- taxonomy capacity building through a Global Taxonomic Initiative
- to enhance taxonomic information, checklist, Literature in electronic form
- development of national, sub-Regional and global training initiatives, (taxonomic training, and infrastructure, new technology)

G) UTILIZATION OF GENETIC RESOURCES

I) The National government must still play the critical role of regulating utilization, as well as providing the technical and financial support for sustainable utilization of biological resources

II) Recognizing the positive role of indigenous and local communities in resource utilization

III) The trade in tropical timber, a significant factor underlying both tropical deforestation and loss of biodiversity, must be reformed

IV) Agro Biodiversity

1) Traditional agriculture, involving diverse agro ecological conditions and development of land races, has evolved into a modern agrarian system dependent on a few commercial crops and uniform varieties with a narrow genetic base, attributable to the "Green Revolution". New developments

such as genetic modification (GMO) threatens to limit the choice between varieties still further

2) Luckily, the new Organic Market farmers are looking for more varieties that are not genetically modified and are less uniform

3) It is especially crucial to draw on indigenous knowledge and experience which have enabled indigenous people to survive for many generations; their knowledge of local plant and animal species can be used to incorporate valuable characteristics of local varieties and breeds into farming and harvesting systems, thus preserving the rich biodiversity of many rural habitats

4) Accelerated habitat loss through conversion of natural habitats to urbanization, industry, demographic pressure, pollution for urban and industrial sources, introduction of alien spp.

H) INSTITUTIONAL CHANGES AND SYNERGY

Biodiversity conservation demands the convergence of different skills and technological knowledge, but no single institution in the country (or international institutions) holds all the technological skills and knowledge needed for specific conservation activities. Naturally, institutional partnerships are crucial for building and utilizing national technological capabilities.

I) National Institutional Partnership

The Ghana Wildlife Division (GWD) of Forestry Commission of Ghana has developed over the past decade institutional partnership with IUCN and Conservation International to help GWD to develop its capacity to conserve biodiversity and sharing techno-scientific knowledge and expertise.

University of Ghana Botany Department currently combines teaching with research that relates to biodiversity conservation – e.g. tissue-culture of pineapple and forest trees, and provide the conservation institutions with scientists and technicians.

But there is an explicit separation of the research activities of the universities and those of pubic institutions, i.e. there is a weak linkage between the universities developing human capital for scientific and technological research and conservation, and other public institutions that draw and utilize the scientific expertise.

The consequence of this separation of universities' efforts and those of public institutions is that there is no synergetic accumulation of technological capabilities; instead there are

"islands" of experts in Ghana whose full potentials are not being utilized through "team-work".

II) Technological capacity change involves:

- Acquisition and establishment of machinery (or hardware)
- Transfer of technology in relation to biodiversity conservation
- Liaise, cooperate and affiliate with other national organizations, and international institutions with common objectives: IUCN, CIFOR, CIAT, IITA, ILCA, IRRI, WARDA, IBPGI, ICRAF
- Institutional Memory

  Without a system for recruiting and incorporating new people, and infusing them with the commitment to the institution's programmes, goals, personnel turnovers can quickly strip the organizations of both their driving force and their management capacity

Incentives

The training should be complemented by incentives and institutional environment that promote efficient utilization of trained personnel.

III) Pool of Scientific Expertise

- A large pool of scientific and technical capital is scattered in a wide number of public institutions that are not being efficiently utilized. Thus the nation can benefit dramatically from institutional diversity, complementarity and synergy.
- The build-up of local scientific technical manpower should be implemented by other deliberate measures to enhance procurement or acquisition of new technological knowledge for biodiversity conservation; this includes building national information or data bases, and linking these to international network; the deliberate efforts to utilize scientific publications, workshops and conferences for professional growth.
- Institutional capacity building involves creation of flexible institutional organizational structures that provide space for experimentation and technological learning.

IV) Public Awareness and Education

- The need to ensure that awareness and knowledge of biodiversity conservation is diffused throughout society, so as to generate a sense of ownership, responsibility and duty for managing the environmental resource.

- Contributing to efforts aimed at raising community consciousness of their biodiversity heritage, their responsibilities in relation to the development and sustainable utilization of biological resources, in order to ensure an improvement in living standards

- The use of folk media and other innovative methods to spread the message of the importance of biodiversity conservation

- Adverts in major national and regional newspapers, and magazines, carrying excepts of important documents like National Biodiversity Strategy for Ghana and its translation into all major languages in Ghana.

I) SYNERGIES BETWEEN CLIMATE CHANGE, BIODIVERSITY & DESERTIFICATION

Developing countries including Ghana are by far the most vulnerable to climatic variability, air and water pollution, deterioration of forests and biodiversity, overexploitation of fish stocks and the irresponsible impact in the use of certain agro-chemicals.

Majority of our people in rural areas are deriving their livelihoods of subsistence activities largely based on environmental goods and services; their family incomes are highly dependent on the vagaries of weather and climate.

Vulnerability to Climate Change

In Africa, grain yields are projected to decrease in many climate change scenarios, reducing food security; desertification would be exacerbated, especially in the Northern Africa and in Sub-sahara West Africa.

Sea level rise would put ecological security at risk, threatening mangroves and coral reefs.

People living in arid or semi-arid regions of the Northern Regions of Ghana, low-lying coastal areas, regions that are dry or subject to floods are particularly vulnerable to the risks associated with climate change.

Deforestation; soil erosion, desertification and pollution: in the long-term these destroy the means of subsistence in the rural areas and the towns and cities; and exacerbate the precarious nature of existence.

Solutions to Poverty Reduction

Institutional reforms must allow the rural poor to increase their control over and access to natural resources in the areas in which they live.

Government must therefore help in building their capacity to co-manage these natural resources more efficiently and sustainably.

Government must also ensure steady investment in rural productivity – e.g. in the provision of basic infrastructure and access to micro-credit.

J) COOPERATION AND SYNERGIES AMONG GOVERNMENT AGENCIES

Line agencies of Government need to develop the capacity to manage biodiversity of particular relevance to their respective missions.

Supreme effort is therefore required to develop sufficient technology and expertise in the various Biodiversity line agencies so that they can manage the areas for which they are responsible, and thereby ensure the sustainability of their respective development efforts.

The Ministry of Environment and Science with oversight/coordinating responsibilities should ensure that the management plans of the various biodiversity-related agencies are prepared in accordance with national objectives for biodiversity i.e. to conserve, sustainable use, and equitable share of benefits arising from the utilization of Biodiversity.

Develop cross-sectoral institutional capacity to monitor, coordinate and supervise environmental resources efficiently and develop centres of excellence in biodiversity planning and management, policy analysis and timely detection of policy failures.

Local support for protecting natural areas are being enhanced through such measures as:

- education, and awareness creation; educational programmes should incorporate approaches for facilitating the altitudinal and behaviour shifts needed to mobilize groups into active participation

- revenue sharing of royalties; land tenure issues should be resolved so as to assure equitable resource sharing and recognition of customary rights

- people's participation, decision-making and co-management of forest and wildlife resources

- concrete steps are actually being taken to ensure that PAs are managed in ways that will bring sustainable benefits to forest fringe communities

K) REDIRECTING DEVELOPMENT POLICY AND PRACTICE TO INCORPORATE BIODIVERSITY CONSERVATION

Ghana has a relatively large proportion of its land under some form of state protected management; 15 Wildlife Protected Areas with 12,685 km2 or 5.2% of the land area of Ghana; 285 Forest Reserves covering 26,700km2 or 11% of Ghana. A Range of hill-sanctuaries and traditional conservation areas called sacred groves are found throughout the country.

Ghana has a good record of forest reservation from mid-1920's to the 1960's, but the people never forgave the colonialist for expropriating their native lands. Even the indigenous successors to the colonial conservation officers are looked upon with suspicion. The conservation areas were meticulously "policed" against the traditional land owners' interests: Powerful concessionaires with big economic interests protected by military governors, further distanced local people from reasonable share of revenue from the forests and woodlands. In the process, illegal mining threats have intensified, illegal chainsaw operations are on the ascendancy.

Poor forest governance structures and difficulties with low enforcement compounded these problems. Trying to redirect peoples' interest away from mining in reserves, logging, bush-meat hunting is really going to be difficult for people to change their entrenched mind sets unless alternative livelihoods are made available.

L) In general, available data suggest that despite a variety of initiatives in Ghana (Long List of Biodiversity – related Projects), biodiversity continuous to decline. But many threats to biodiversity such as habitat loss and invasion by introduced species continue to intensify.

In addition, new threats may be emerging, such as climate change and the introduction of GMOs.

Overall, it appears that the drivers of biodiversity loss are so pervasive, that biodiversity conservation efforts have at least only slowed the rate of change at the National or Global levels.

M) ECONOMIC VALUATION OF ENVIRONMENTAL GOODS & SERVICES

Traditional development view, which concentrates solely on merchantable standing timber value, is no longer tenable. We must cast our analytical net wider to include other environmental goods and services provided by forest ecosystems – biodiversity benefits, climate control benefits, watershed benefits, eco-tourism and net benefits from intact forests.

However, the majority of ecosystem functions are not tradable and can be considered as public or collective goods, to be managed by a

cooperative, supervising body such as government, to ensure their maintenance.

Biodiversity is not the preserve as a subject for taxonomists, geneticists and conservation activists. It is a resource that is a component of ecological environmental and social welfare and development.

The planning and management of Biodiversity conservation requires the cooperation and building the capacities of many disciplines and organizations.

Regional Cooperation (and integration) is needed in devising policies, programmes and projects that harmonize biodiversity management; managing trans-boundary resources.

N) General global consensus has set **capacity building** as a main priority and necessary pre-requisite for achieving the ultimate goal of sustainable development of natural resources of a country.

Capacity building is an adaptive process and it involves "learning by doing", learning by exposure and debate; it should improve the coordination and effectiveness of existing institutions and (cross-sector agencies) and build on existing processes and endogenous capacity.

Research centres and universities and other relevant organizations should play an important role in providing capacity building services and facilitating the flow of knowledge, best practices and information capacity building in support of achieving the objectives of Conservation of Biodiversity; should maximize synergies between CBO and other global environmental agreements as appropriate.

O) The setting up of a Commission for coordinating the three Thematic Areas – Conservation of Biodiversity, UNFCCC, UNCCD – because of the close synergistic relationship between them

P) The setting up a National Biological Diversity Secretariat

INTRODUCTION

1) In the implementation of the Convention on Biodiversity, Article 18(2) and Article 22 of the Conservation of Biodiversity remind every party of the Convention to pay special attention to the development and strengthening of national capabilities and institutional building

2) Recognizing the critical need for enhanced national capacity in environmental conservation and natural resources management, Ghana is undertaking the NCSA project under GEF. The project promises to help Ghana to identify the huge capacity gaps (human and technical resources) in order to fulfill its legal obligations under the three Conventions viz; UNFCCC, UNCBD; UNCCED.

3) This Report on Biodiversity is a component in the implementation of NCSA Project.

The Report gives an assessment of the Capacity-Building Needs relevant to the implementation of UNCBD in Ghana.

4) Background

The Conservation of Biodiversity was signed at UNCED in Rio June 1992 and subsequently came into force in November 1994.

The Conservation of Biodiversity is a legally binding treaty that commits Parties to a trinity of objectives:

- Conservation of biological diversity
- Sustainable use of its components
- Fair and equitable sharing of benefits arising from the utilization of genetic resources

5) The Convention sets out commitments for National and International measures for conserving vital ecosystems and biological resources on which earth plane teers depend.

6) Ghana's membership of multilateral Environmental Agreements is set out below:

Table 1

RELATED CONVENTIONS			RIO CONVENTIONS	
CBD	CITES	RAMSAR	UNFCCC	UNCCD
1992	1973	1971	1992	1992

Source: UNEP 2001: Global Biodiversity Outlook

7) Article 22: Implementation of Existing International Treaties/Convention Relating to Biodiversity Convention include the following

- Convention on Wetlands (Ramsar Convention, 1971) management plans have been prepared under GEF for 5 major Ramsar sites in Ghana since 1999; Keta Lagoon Complex, Songor, Sakumo, Densu Delta, Muni, Pomadze Lagoons.

- Convention on International Trade in Endangered Species (CITES 1973): CITES appendices place various levels of control or restrictions on trade of threatened and endangered tree species.

- International Tropical Timber Agreement (ITTA) 1994: has played a catalytic role in supporting efforts in SFM through its innovative criteria and indicators.

8) Relevance of the Convention to Ghana

Countries throughout the world at Rio '92 declared themselves in favour of economic development based on the sustainable use of the environment and its resources. Human welfare is the result of a process that uses as inputs natural capital (environmental functions), labour and physical capital.

Many ecosystem functions are often interrelated. Maintenance of biodiversity is a very important function, especially because it generates many other functions. Biodiversity is linked with global life support, education and research, reservoir and provider of genetic information, object of cultural and aesthetic (and spiritual) value.

Biodiversity is again the result of a long evolutionary process. This means that once lost, it will take many centuries to recover, if at all. Biodiversity translated into th e number of extant species which are declining at an unprecedented rate, as a result of human – induced destruction.

9) The loss of biodiversity undermines prospects for sustainable development. Renewal resources such as forests, fisheries, wildlife, and crops, make up a subset of biodiversity of immediate use to people. The genetic diversity of these resources provides the basis for continuing adaptation of the world's changing climate. Further, the highly diverse natural ecosystems which support this wealth of species also maintain hydrological cycles, regulate climate, build soils, absorb and break down pollutants, and provide sites for spiritual enrichment, visiting places for (eco-tourists) and Research, commercial timber and non-timber forest products.

10) Dependence on Biodiversity

Biodiversity is useful to human for food, breeding stocks, pharmaceuticals and medicine, ornamental plants, wood and fibre, and provides social benefits including recreation, and cultural values.

A large part of the population is reliant to a large degree on natural resources for direct subsistence use or indirectly as a form of income generation. A growing population coupled with increasing poverty and urbanization have compounded impacts on the natural resources base. There is severe pressure on all components of Biodiversity in the high forest, transition forest, communal grassland leading to reduction of indigenous richness – thus multiplying the risk of deforestation, land degradation, and desertification.

11) Biological resources play a critical role in overall sustainable development and poverty alleviation. How biological resources are managed and accessed from community-led decisions to state policies, from practices of conservation by public institutions to those of extraction by individuals and private sector – will determine how much and in what conditions those natural resources will be available to future generations.

SOME DEFINITIONAL ISSUES

12) Biodiversity Defined (Article 2 of CBD)

Biological diversity covers the number, variety and arrangement of living organisms, i.e. all of life on planet earth.

It is typically described, quantified, managed and used at several levels.

First, it includes heritable genetic variation within and between populations of a given species.

- Extent and pattern of population variation, the variation of genotypes and the frequencies;
- Effects of flows of alleles (the different mutational forms of a given gene, and the unit upon which selection works to result in genetic diversity: of particular interest to geneticists, and breeders);
- Chromosomes, genes and DNA – the building blocks of life – determine the uniqueness of each individual and each species

Second, it refers to variation among species, which is of special concern to taxonomists, ecologists, and conservationists and includes the number, abundance or rarity and endemicity, of species

Third, it concerns the variation among ecosystems and the way in which species interact among themselves and with their environment; of interest to ecologist, foresters as it includes the global and local importance of the composition, structure, and function of ecosystems, and existence of so-called "hot spot" of biological diversity.

13) Forest Biological diversity refers to the diversity within forests at the three levels. It includes all species of plants, animals and microbes occurring in the forest.

Tropical forest alone contains some 50% of all known vertebrates, 60% of plant species and possibly 90% of world's total species.

The optimum management systems should at best maintain these different levels of Biodiversity (in Table 2) and their characteristics that must be known before adequate evaluation and conservation can be developed.

Table 2: Levels of Biodiversity and Information Required

(a)	ECOSYSTEM	:	Global and local importance
(b)	SPECIES	:	Number, abundance/rarity, endemicity identification of some key-stone/ importance
(c)	POPULATIONS	:	Extent and patterns of variation
(d)	GENOTYPES	:	Variation, propagation
(e)	GENES	:	Frequencies, effects, flows

14) Status of Biodiversity in Ghana

Ghana ranks among the top 25% of African countries for number of species in all the major groups (WCMC, 1992). This is because it spans both the high forest and savannah zones, and includes marine and coastal habitats.

Ghana's biological resources are used for agricultural, construction, clothing, medicinal and ornamental products, and have significant economic values.

15) Biological diversity encompasses all species of plants and animals and micro organisms and the ecological systems (Boxes 1 & 2).

Our wild tree species, and agro-crop species and the variation within them, constitute significantly to a viable forest industry and the agricultural economy as a whole. But human activities over the last century have reduced the abundance and distribution of species.

Box 1

Flora:

1) 3,600 plant species identified in Ghana

2100 found in forest zone

125 Plant Families identified in forest zone

Species diversity of 300 plants identified in a single Ha. in High Forest

43 Endemic species, 23 found to exist in forest zone

730 tree species; 680 attain dbh of 5cm in high forest

5 Endemics in southern outlier forests

- Talbotiella gentii, Dalbergia Setifera Turraea ghanensis.

Box 2

Mammal Fauna:

Ungulate species: Maxwell duiker, bush buck, buffalo, bongo, Ogilby's duiker

Carnivores: Leopard, golden cat, African civet, mongoose

16 Primates: Black and white colobus monkey, forest elephant, rare pigny hippo

74 species of Bats

37 Rodents

3 species of Flying Squirrel

721 Birds: Reptiles; African Python

200 species of birds found in forest zone

80 species of birds found in primary forestry
850 butterflies

Amphibian and fish species

WCMC/Conservation Atlas of Tropical Forest of Africa

16) BIODIVERSITY THEMATIC AREAS

The major ecosystems in Ghana include:

- Marine and Coastal Biological Diversity
- Inland Freshwater Biological Diversity
- Forest Biodiversity
- Agro-Biodiversity
- Dryland and sub-humid Lands

The major ecosystems provide a complex web of interacting natural processes that provide the multiplicity of goods and services that have guaranteed human survival and development throughout history – water, food, shelter, fuel, clothing, medicines, building materials, aromatics, dyes, means of transport (canoes), power generation. But rising population and unsustainable consumption of components of Biodiversity, industrialization etc. have put pressure on natural processes resulting in land degradation and genetic erosion.

17) Ghana provides a refuge for a significant number of plants and animals considered to be globally threatened with extinction. These "Red Data Book" species include 34 plants, 17 mammals, 10 birds, 5 reptiles and a butterfly (GWD, 1998). The highly endangered species which include "flagship" species such as Waldro: Red Colobus, Diana Monkey – are heavily dependent on the rain forest/high forest habitat which is fast disappearing, being cleared for agriculture and other uses.

18) Categories of Land-Use

In Ghana, major categories of land-use including Agric, forestry, mining, urban development, hunting, tourism, transportation and infrastructure, energy, grazing and fishing have impact on Biodiversity.

Perhaps the most important area where human activities with Biodiversity are intrinsic is agriculture, - reducing species level through forest clearing for agric field and through such clearings create a mosaic of micro-ecosystems.

Table 2: Land Use (General)

Land Use	Area (000km2)	% of Total
Savannah Woodland	71	30
Bush fallow and others	60	25
Unimproved Pasture	36	15
Forest Reserves	26	11%
Wildlife Protect Areas	13.5	5.6
Tree Crops	17	7
Annual Crops	12	5
Unreserved Forest	3.5	1.4
Total	**239**	**100**

(PPMED/MOFA 2000)

19) Between 1950 and 1990, Ghana's Forest cover had been rapidly depleted both in terms of quantity and quality. Land clearing for cocoa farming and uncontrolled timber harvesting had reduced the country's closed forests from 145,000km2 (61% of the total land area in 1900 to 15,800km2 (6.6%) in 1990.

20) Threats to Forest Biodiversity in Ghana (Vide Fig. 1)

1) Deforestation:

- Deforestation Rate: 22,000ha/year or 1.3%
- Deforestation is associated with
  - Population and economic development – clearance for farming, fuelwood
  - Timber extraction destroying forest habitats – diminution of species diversity (both fauna and flora)
  - Desertification resulting from poor farming practices, fuelwood collection in forest transition/semi-arid savannah zones
    - 35% of land area subject to desertification (UNSO, 1982)

- Mining and Quarrying – and Mining Pollutants
  Mining for gold, diamonds, bauxite, iron ore.

- Bushfires (community used in Agric farmland preparation

- Grazing (with fire) – important for determining the structure of the surviving ecosystems

- Unregulated Hunting for bush meat

- Lack of recognition of indigenous knowledge and property rights

21) Implications for Loss of Forest Biodiversity

I) Threatened/Endangered species increase in the number of threatened species to be added to "Red List" at turn of century.

In secondary forests, the floristic structure (number of species, species mix, species range) does not approach that of primary forests. Secondary forest characteristically has a large proportion of light-demanders (pioneers) and reduced biodiversity as well.

II) Loss of native genetic material for future development of crops, medicine and industrial products. Genetic loss within and between populations due to overexploitation of prime economic species, fragmentation and reduction of its populations, is a critical factor to value the conservation of tree populations.

- loss of the best individual trees were cut for the export trade

- the residual stands are badly degraded, deformed, and different from the original populations. SFM is that management that preserves productivity, the forest structure; can contemporary forest management in Ghana claim to fulfil the criteria for "sustainability"

III) Loss of Species:

- Loss of medicinal plants

- Threat to economic trading of primary timber species overexploited and unmanaged. Ghana is already importing logs from Central Africa for furniture manufacturing

- Uncontrolled hunting

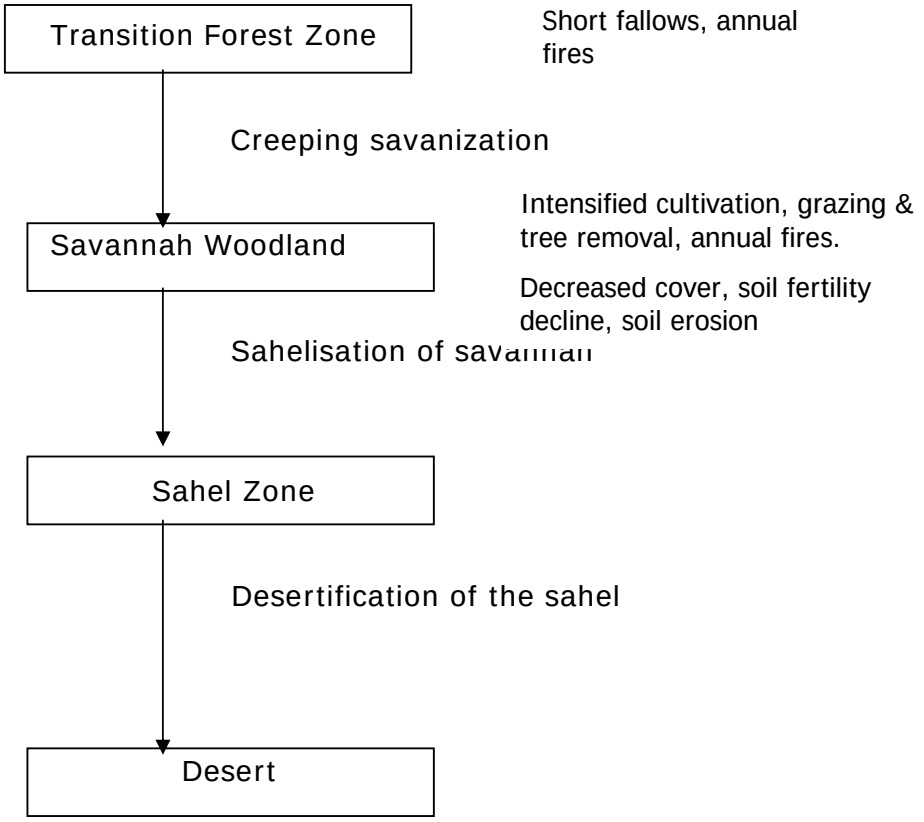
IV) Ecological communities are impacted.

- Threatening predator/prey relationships
- Removing agents of pollination, seed dispersal or germination e.g. insects, elephants, primates.

The seeds of only 15% of tropical tree species are dispersed by wind; most tree species are dependent upon animals for seed dispersal.

Fig. 1

Effects of Forest / Woodland Degradation



22) CAPACITY NEEDS ASESSMENT FOR MEETING OBLIGATIONS OF PARTIES TO THE CONSERVATION OF BIODIVERSITY

Capacity needs assessment under major Articles of CDB follow the format in Table 3

- Article No.,
- Obligations
- Implementation Status

- Capacity Needs for fulfilling the Country's obligations under the Convention

TABLE 3

OBLIGATIONS AND IMPLEMENTATION STATUS UNDER THE CONSERVATION OF BIODIVERSITY

CBD Provisions	Obligations	Implementation Status	Capacities Needed
Article 1 & 6 – (a) Article 10 – (b) CITES Article 16 (c)	Conservation of Biodiversity Sustainable use of Biodiversity Fair and equitable use	(a) Landmark Law Cap 157 of 1927 initiated system of Forest Reserves (b) Concession law of 1962 (c) Inadequate legal instruments for benefit-sharing	- Additional PAs needed to capture representative ecosystems - Relevant legislation and political will
Article 6 (a) (b)	Developing Biodiversity National strategies, plans Mainstreaming Biodiversity into National Development Plans	(a) NBS undertaken in 2002 (b) "Greening" of national development plans inadequate	- Cross-sectoral/multi disciplinary cooperation - Broad participatory process needed - Social and political consensus
Article 7	Identification and monitoring	(a) Identification of components/Indicative List of Biodiversity in Ghana inadequate	- Biota inventory and taxonomic assessments - Taxonomic experts

CBD Provisions	Obligations	Implementation Status	Capacities Needed
		(b) Inadequate information on Land-use changes/ecosystem functions, biota inventory (c) Baseline information on Biodiversity initiated in 1994/95 to determine levels of threats to Biodiversity	- State of the art equipment for analysing Biodiversity - Surveys of ICT - Documentation and communication networks
Article 8	In-situ Conservation (Ecosystem Protection)	System of National Parks, forest reserves predate CBD; but exist more as "paper reserves" with increased demographic pressure, weak governance Agro biodiversity in precarious condition Attrition of land races/native breeds	- Improve institutional and regulatory measures - Improve staff management capacity of natural habitats - Improved governance/ decentralization - Documentation/ characterization for direct use of land races/breeds NTFPs
Article 9	Ex-situ Conservation	Gene banks established in Zoos, Botanic gardens, arboreta but inadequate	- Development of storage facilities in Regions - Characterization and evaluation to facilitate use and collaboration

CBD Provisions	Obligations	Implementation Status	Capacities Needed
			- Data bases for ex-situ holdings of wild species
Article 11	Incentive measures (to encourage conservation and sustainable use)	- GSBA established within 30 Forest Reserves affected farmers in forest fringe compensated under High Forest/Savannah Biodiversity Conservation Projects - Root and tuber improvement project - Fisheries sub-sector capacity programme	Enhance contribution of PAs to well-being of participating forest fringe communities
Article 12	Research and Training (Technical and Scientific Training, Research)	Several Biodiversity related public institutions established – CRI, SRI, FORIG, PGRC, etc doing basic and applied research on Biodiversity	- Training Biodiversity professional, technicians and users of Biodiversity – local communities, private sector, NGOs - Improve Research capabilities in topical areas – inventory genetic resources, habitat and ecosystem diversity, Biodiversity indicators

CBD Provisions	Obligations	Implementation Status	Capacities Needed
			- Improve monitoring of Biodiversity and ecosystem functions - Population ecology - Valuing Biodiversity goods and services
Article 13	Public Education and Awareness	University level Biodiversity related studies in Agric, forestry, wildlife, fisheries, Public awareness of Biodiversity heritage not adequate to prevent degradation	Heighten public awareness and environmental education Career incentives to increase attractiveness of Biodiversity professional work
Article 14	Impact Assessment and Minimizing Adverse Impacts	Procedural requirements of EIA established (EPA Act 490) (1994) Forestry Commission Act 1999	Development of EIA expert consultants
Article 15	Access to Genetic Resources and Benefit Sharing	Sovereignty assured over resources but tenure and ownership rights, bio-piracy contentious issues	Strengthen regulations on access and benefit sharing, bio-piracy
Article 16	Access to Transfer of Technology	- Most technology in Africa linked to foreign direct investments - Continued use of technology, developed elsewhere –	- Incorporate TK - ICT - Development in biotech

CBD Provisions	Obligations	Implementation Status	Capacities Needed
		creating technological divide between N. & S.	
Article 16/17	Exchange of Information & Technical and Scientific information	Participating in global mechanisms for exchanging and integrating information on Biodiversity	- Network development and information management system to enhance collaborative work - Develop technology linkages between Industry, NGOs - Develop practical field hand books - Information dissemination in local languages
Article 19	Handling of Biotechnology & distribution of its Benefits	- Low level Biotech Research - Participation in Biotech by BNARI, CSIR institutes, private sector, Naguchi Research Institute - Tissue – culture techniques established - Protocol on Bio-Safety on release of GMOs/LMOs	- Build public private partners in biotech Research in micro propagation - Build capacity to assess environmental and health risks - legislation/Guidelines on Bio-safety/Bio-security

CBD Provisions	Obligations	Implementation Status	Capacities Needed
Article 20	Financial Resources	- Ghana, a beneficiary of GEF for Biodiversity Conservation	- Strengthen bilateral and multilateral development agencies, NGOs, private sector in establishing Biodiversity Conservation funding sources and mechanisms - Improve revenue from eco-tourism, Park entrance fees, Game ranching - Charges from Biodiversity services such as hydropower, urban water supplies'
Article 21	Capacity Building Needs	Ghana participated in Agenda 21 Capacity Building Project	- Investments in staff, infrastructure mandatory

23) SUMMARY OF CAPACITY NEEDS UNDER UNCBD

Capacity Building is a process of empowerment that operates at different scales: local and national governments, interest groups and Associations, and at the individual level.

Capacity Building acts as a catalyst of change (e.g. from centralized authority to local government units, local communities and stakeholders.

Capacity Needs will be discussed under the context of systemic, Institutional and Human Resources requirements.

24) SYSTEMATIC CAPACITY NEEDS

I) Political Will to mobilize national commitment:

- To mainstream Biodiversity Conservation into public policy and land management
- To update legislative instruments to implement the conventions, land tenure and ownership systems, protection of PAs
- Legislation to back up recent initiatives on community forestry, co-management of forest and wildlife resources
- To promote full participation of target groups
    - Decision-makers, local people, private industries, NGOs
    - And ensure the participatory process remains open and responsive

II) Government Support

- To provide necessary infrastructure and basic services to resource managing partners
- To manage transboundary Biodiversity resources
    - Jointly managed PAs (“Peace Parks”) to ensure shared resources, migratory spp, in riverine and wetland ecosystems)
- To monitor and stem illegalities associated with resource management
- Provide fair “due process” for settling resource-user disputes

- Need to build capacities of law enforcement agencies and the Judiciary in order to allow them to better appreciate their roles in environmental management

- Play the crucial role of regulating utilization of Biodiversity as well as the technical and financial support for sustainable utilization services

III) Government to Create an Enabling Environment for peace, stability and security, good governance, including rights to development and gender equity

IV) Increasing Public Awareness and Education

- Broaden existing Curricula to provide courses in social and economic aspects of Biodiversity Conservation and Management

25) Institutional Capacity Needs

I) Biodiversity conservation activities are spread over several ministries and agencies:

MOFA	-	Crops, animal production; fisheries
MLF	-	Forest reserves, Parks, Wildlife
CSIR	-	Research Institutes, CRI, SRI, FORIG, PGRC
MES	-	BNARI (Atomic Energy Commission), CBUD
Universities	-	IRNR, Agric Faculties

- Capacity Building to aim to encourage culture of "team work"

- These groups of institutions need support in the following areas:

  - Re-definition of mandates and responsibilities in relation to Biodiversity

  - Coordination and Networking especially across domains and competencies

  - Create Centres of Excellence in Biodiversity research and development

  - Undertake Research to assess Biodiversity values and develop an understanding of functions influencing the distribution of ecosystems, species and populations for planning and monitoring purposes

- Undertake legislation and policy reviews and update those in response to new information and knowledge in Biodiversity issues

- Involve educational institutions and their students in Biodiversity management and research issues – e.g. at post-graduate level

- Accumulation of technological capabilities and institutional memory to be targeted on major Biodiversity problems

- Funding Needs

  Substantial investment is needed in Re-organizations, and capacity development

- Financial Sustainability

  Biodiversity of THFs will be more at risk than they are today because the prospects for sustainably managed forests which form the basis of landscape – scale Biodiversity Conservation strategy will diminish with decreasing financial viability and the risk of wholesale clearance will increase

- Establish National Database in National Resource with International/Regional Collaboration

- Dissemination of appropriate scientific and technical literature to agencies needing to apply resource findings in to practice

- Development of monitoring and evaluation (M & E) of land-use changes

III) Development of Institutional Capacity/Structure and expertise.

- Promote the establishment of ex-situ conservation facilities for rare, vulnerable and endangered species in botanical gardens, zoos.

- Promote in-situ conservation of land races of important agricultural crops

- Establish Regional networks and partnerships to promote conservation of Agro biodiversity - the backbone of livelihood

- New skills and capacities for Policy Analysis, conflict resolution

- Strengthening institutions and legal framework to serve as a management tool to generate information for stakeholders on achievements and lessons learned.

25) CAPACITY BUILDING AT THE LOCAL LEVEL

Being intimately linked to human skills and social governance, capacity building should be a gradual process; but to most effectively transform decision-making and governance abilities, capacity must be strengthened systematically across all sectors, both within government, and institutions working with the private sector, NGOs, CBOs and individuals.

26) Decentralization requires proper empowerment, which implies that the stakeholders both have the opportunity to assume responsibility and the capacity to carry out the appropriate action, and needs to be supported by enabling policy and legislative frameworks.

The Need for more decentralization by devolving power to the local level, by providing incentives for local community initiatives, and people's participation.

The District Assemblies have cadres of resourceful, innovative natural resource manpower which is underutilized. But their capacities must be built to enable them to complement the central government efforts in resource management.

27) Role of District Assemblies in Biodiversity Conservation

District Assemblies are beneficiaries of the Common Fund and receive a share of forest royalties; their long term economic interests must be safeguarded.

Ways to improve Biodiversity Conservation at District level:

- maintain agroforestry nurseries for establishment of fuelwood plantations, woodlots in degraded sandwinning sites and mangrove regeneration

- clearing of choked stream channels

- establishment of protective vegetation on metro-water reservoir areas to reduce erosion and siltation of catchment areas

- pass bye-laws to give recognition to such important resources such as sacred groves, wetlands.

  These bye-laws will empower local community chiefs for using traditional norms (being highly eroded) to regulate sacred forests

- to promote biodiversity and ecotourism

- development of local support and capacity by involving voluntary organizations, training community leaders (within village Unit Committees), NGOs, CBOs; traditional leaders

- to maximize local government stewardship over the local resources, they should receive training to enable them to meet their objectives, and assume optimal management responsibilities

CBO community that operates more cost-effectively at the community level have low technical capacity to implement Biodiversity conservation activities and need to collaborate with technical expertise at government institutions and NGOs.

28) Capacity Building in NGOs and Private Sector

Capacity building and implementation should embrace the corporate sector, NGOs, and communities as well as government.

Historically, government has been seen as the primary agent to induce and maintain the social and economic changes required for the overall task of nation building.

By and large, government has tended to concentrate on increasing the skills, knowledge and professional capacities of public servants.

We now recognize that NGOs are crucial in organizing and 'brokering' services to local communities; NGOs have an intermediary role to policy, facilitating the flow of information and funds outside the sphere of government organizations.

What is needed is for government to create an enabling environment in all sections of society.

NGOs can be effective carriers of sustainable development, catalyzing participation, organizing and mobilizing groups, obtaining grass roots perspectives, raising awareness, and providing long-term ideas, analysis and advocacy.

For NGOs to work effectively with government, NGOs need simple funding and administrative mechanism that do not compromise their independence.

29) Empowering Communities

1) For community-based environment management to succeed, environment, social and economic objectives must be integrated and pursued with the full participation of the affected groups and individuals.

2) Community participation is facilitated by:-

Giving communities and other interested parties adequate, readily intelligible information. They should be invited to contribute to the body of information on which proposal/policies are based, and given enough time to do so.

3) **Building Community Capacity and Leadership**

Strengthening community organization, leadership and capacity to identify and diagnose problems, plan; implement development activities, and monitor and evaluate results

Deriving ways to increase women's participation in agro-ecosystem management, country political structures, leadership and decision making.

4) Community institutions such as Village Unit Committees generally remain an under-utilized resource for planning and managing activities.

In addition, training in technical skills such as Agro forestry, Nursery establishment, and extension, well construction and maintenance, might be necessary

30) Gender Considerations

Women in rural communities constitute a major stakeholder group.

Women gather wild plants and animals from the forests, grasslands and the search for a variety of uses-food, medicines, construction and income.

As both users and managers of the natural resource base, women have extensive knowledge of their environment.

Women must be integrated into utilization projects as both participants and beneficiaries to meet the dual objectives of better management of the resource base and improved community welfare.

Women should be given skills that enable them to both develop and conserve resources.

31) Building Human Capacities

I) Re-enforce academic and vocational training and Research in Biodiversity Conservation.

- Recruit Biodiversity expertise into all land management agencies

II) Human Capacities

- For Research and Development

- Support for training of personnel in the use of Traditional Knowledge and Traditional Technologies

Human Resources Needs for:

- Improved environmental planning and management, project design, policy analysis

- Training programme to fill identified gaps

Mapping Technologies with extensive potential for environmental monitoring and management

- mapping Biodiversity and recording long-term ecological changes

- technological assistance to complement efforts of National government

III) In the case of Individuals:

Focus more on skills and attitudinal change and building on existing knowledge and cultures

Promoting a balance between rights and responsibilities as well as resourcing and financial commitments of the participating stakeholders

32) Synergies Between UNFCCC, CBD, UNCCD

- There is a growing recognition that each Convention does not stand on its own, with its own defined objectives and commitments, there are linkages and inherent relationships between them all.

- The Conventions operate in the same ecosystems.

- They are to be implemented collaboratively to make progress on all fronts for multiple benefits.

Incipient Desertification can arise from several causes that place ecosystems (from coast mangrove forest to northern savannah woodlands) under enormous pressure – leading to land degradation, loss of biodiversity.

For example, uncontrolled deforestation can lead to increased soil erosion, land degradation which leave thin, unproductive soils behind.

Forests act not only as a natural sink for $C0_2$ through photosynthesis, but also add to the GHGs through bush-burning or processing that timber; so the effect of deforestation is doubly harmful to the climate.

Vegetation affects the albedo of the area and act on the micro/macro climate change.

Vegetation modifies hydrological cycles by regulating rainfall retention (evapotransipiration) and run-off.

Emissions of GHGs may not only have direct toxic consequences for humans, but the resulting climate change like-heat waves and extreme weather events, flooding, droughts, tropical storms, uncontained fires etc. may alter various ecological relationships that may then impinge on human health.

These changes are likely to have enormous physical impacts on low-lying coastal areas, where land loss and coastal erosion are serious concerns.

Global change, ranging from global warming to ozone depletion, deforestation and coastal pollution are together altering Biodiversity.

An environment experiencing multiple stresses are showing increased susceptibility to the invasion and emergence of opportunistic alien species.

33) Challenges to the Crop Scientists

Since the market demands uniformity, the challenge to the breeder is to provide diversity drawn from the gene pool of primitive varieties and wild types.

34) Deforestation and Desertification

Contrary to popular belief, desertification is not necessarily the natural expansion of “sandy” deserts, but results from a combination of human activities and micro/macro climate changes which can transform green landscapes of forests into barren desert-like areas; a contemporary classic example is a desertified area following massive deforestation of a mangrove forest followed by erosion in Haiti.

Wanton destruction of vegetation in all ecozones in Ghana is a gentle reminder that deserts cannot be far from our door steps even within the high forest in southern Ghana (Figure below showing the camel march on the high forest:).

Fig. 2: Deforestation or making way for the Camels

35) Risks to Desertification in Ghana

About 30 – 40% of Ghana's land area is subject to desertification; from the extreme North East of Ghana (Sudan Savannah) to the forest transition areas are characterized by increasing threat of desertification.

36) Vulnerability to Climate Change

The rural poor draw on "natural capital! (conversion of forests, grasslands, mangroves) to survive. The environment in various ways that in turn fuel poverty – and so on in a re-enforcing process.

Rural family incomes are highly dependent on weather and climate, From IPCCC Report, Africa grain yields are projected to decrease for many climatic scenarios: reducing food security, desertification would be exacerbated, especially in sub-Sahara.

37) Planning the Future for Climate Change Adaptation

What is needed is to develop policies for PAs that will be robust across a wide range of possible alternative futures.

PAs are designed to exist in perpetuity, but we know that ecosystems are dynamic and change is inevitable.

PAs are now playing a critical role in supporting local communities, valuable for providing environmental goods and services.

Adapting to climate change remains a major challenge.

38) Impact of Climate Change on Forests in West Africa/Ghana

Climate changes have a major impact on forests, since the distribution of the different species and ecosystems depend greatly on prevailing climatic conditions (precipitation, soil/moisture, frequency of extreme climatic events, temperature and duration of the growing seasons).

1) **Forest Ecosystems** most at Risk:

- mangroves (flooding from Sea level Rise)
- tropical high forests (drought, changes in rainfall patterns, fire, fragmentation of Protected Areas)

2) Impacts on Forest Ecosystems

- Increased fire intensity and frequency (warmer climate will promote dryer conditions in Semi-Arid regions) and incipient desertification
- **Increased Susceptibility to Insect damage**

  Warmer temperature will affect physiological processes in insects, plants and crops
- More extreme weather events (droughts and floods)
- Declines and dieback syndromes from diseases
- Reduced C-storage and increased C-releases
- Change in forest composition and distribution (decline in tree species richness and density)
- Water loss to run off will increase duration and intensity of dry periods (evapo transpiration)

The Rate of global Warming may be a critical determinant in the future of global biodiversity.

39) Vulnerability of Forest Ecosystems to Climate Change may lead to the disappearance or transformation of extensive areas of important wildlife habitats – many species will be unable to move fast enough to survive.

As climate changes, many patches of habitats will be reduced in size, thereby reducing the number of species that they can support.

When faced with **fast climatic change** events, forest species have shown to be better able to adapt to other habitats when the changes were gradual and **natural connectivity** existed. Today's forests are seriously fragmented and degraded, thus reducing their ability to resist change.

In the rush for migration, slower-growing species will tend to suffer more compared to fast-growing, invasive, pioneer species, leading to habitat simplification.

On the **spatial level**, climate change concerns need to be integrated into planning efforts at a much bigger bio-geographic scale; i.e. maximizing the size of PAs, restoring and increasing the habitat connectivity in the landscape, the role of buffer zones around PAs, and collaborative, flexible land-use system. Such a system will ensure N-S as well as altitudinal migrations, and ensure representation of forest types across environmental gradients. Or some species should be assisted to migrate to new areas through Ex Situ conservation efforts.

PA managers and planners are expected to wake up to the need to adapt to the challenges imposed by climate change. Additionally, strengthening the effectiveness of PAs, including focused capacity building efforts and through better application of sustainable financing mechanisms, will be a priority.

Adapting to climate change will essentially include measures to minimize vulnerabilities to climate variability and extreme weather events. Activities such as forest landscape restoration (through reforestation of degraded areas) can help vulnerable communities to reduce their exposure to climate-related hazards and extend options for sustaining livelihoods of forest dependent communities.

40) Measures to Mitigate Desertification Effects

- Integrated catchment management for drought mitigation
- Improved irrigation technologies in areas vulnerable to droughts and crop failures
    - Through effective soil and water conservation and improved water harvesting techniques

- Maintaining and improving the integration of trees in land-use systems – greenbelts, windbreaks and shelterbelts establishing using more and more indigenous species

- Better control and management of grazing and livestock densities

In areas with marked climatic fluctuations from year to year, local germplasm is therefore preferred to improved varieties because of its greater tolerance to severe biotic and abiotic stresses.

Moreso, with ongoing climatic changes national plant breeding programmes and biotechnology should help to achieve adaptation and yield targets, i.e. using plant material with increased tolerance to prevailing biotic and abiotic stresses.

41) Human resources available in the country for undertaking desertification control, Biodiversity conservation and climate change mitigation exist in the following disciplines and professions, among others:-

Forestry, Geography (Climatology), agro-meteorology, Natural Resources Management, Sociology, and other Social Sciences, Biological Sciences, Soil Science, Planning, Environmental Science and Management, Tourism etc.

42) CROSS-CUTTING ISSUES

Sustainable Development forces us to get beyond our usual compartmented thinking and consider inter-relationships between ecology, economy and society. This requires bringing together people who have different backgrounds, mind sets, and agendas. Getting them to understand each other is not easy. Each comes to the round table seeking to impose its view of goals and procedures on the decision-making process.

The result is technically sound decisions which are politically unfeasible, or ethically sound choices which are technically inefficient or politically impossible.

How do we break down the barriers between professions, disciplines, institutions, etc.

Sustainable development requires leadership and a new architecture for political and social organization transforming public attitudes and internalizing ethical values.

43) Three main Types of Capacity are Needed at the National Level

1) Mechanisms for cross-sectoral communication, policy development and decision-making. These include participatory approaches to conflict resolution and consensus building,

improved networking, and structures and tools to facilitate coordination and collaboration

2) Methods for integrating different environmental, social and economic perspectives and objectives

3) Ways of bringing government agencies and NGOs community to understand and fulfill their own environment and social responsibilities.

They include:

- furthering awareness and environmental education, research

- The design and handling of instruments for environmental management, monitoring and forecasting, application of new environmental technologies.

44) Poverty Reduction

Low-level awareness of the need for conservation of Biodiversity; for examples unplanned settlements occur in Biodiversity Conservation areas.

Majority of the rural people are deriving livelihoods from subsistence activities largely based on environmental goods and services.

Poverty is one of the drivers of environmental degradation because the rural poor have limited choices (few alternatives for livelihood supports) and depend heavily on the natural resource base.

NCSA needs assessment must also reflect the international consensus on development priorities encapsulated in the MDGs for reducing poverty by 50% by 2015. At the local front Ghana's Poverty Reduction System is an effort to complement the gains under MDG. 61% of Ghanaians live below the poverty line (Ghana Living Standards Survey 2000)

45) Capacity Building needs to reflect:

Changing or strengthening societal values, traditional knowledge/technologies and institutions.

46) Coping Capabilities

- To anticipate and cope with ensuing adverse impacts, it is imperative to invest in early warming systems/disaster preparedness

- To measure vulnerability as an indicator and early warming

47) Mainstreaming Biodiversity in cross-sector policy initiatives, i.e. "greening" development plans at the national and local levels.

48) Public Education on Biodiversity Conservation using mass-media, local languages, local symbols, animation.

- Education is to empower communities to conserve Biodiversity sustainably

- Transform attitudes and practices with negative impacts on Biodiversity

- Use community-based communication channels to sensitize on issues surrounding Biodiversity

- Increased capacities should lead to communities that are more self-reliant, and equitable, and more open, participatory and integrated in their decision-making

49) Weaknesses for Implementation of Conservation of Biodiversity in Ghana

I) Inadequate valuation of biological resources – goods and services which are not tradable and considered as public or collective goods

II) Inadequate budgets to carry out conservation policies in contrast to the high value of the resources being protected – inadequate staff, equipment and infrastructure for patrolling and enforcement of regulations

III) Exclusion of Local Communities in PA Management

IV) Inequity in sharing of Biodiversity benefits'

Invariably, powerful traditional rulers often take the lion's share, marginalizing forest fringe communities

V) Bio-Prospecting

Bio-piracy is rampant

VI) A major barrier is lack of communication to provide other sectors with the means for having inputs into informed processes.

50) RECOMMENDATIONS

Five Strategic Ways for Conserving Biodiversity

I) Development of National and International legal and economic policy frameworks to foster sustainable use of Biodiversity e.g.

policies that foster development, acquisition, and adaptation of Biotechnologies, and development of in-country expertise

II) The Strategic Need

To create conditions and incentives for effective conservation by local communities – i.e. where communities receive a fair share of the benefits, and assume greater responsibilities in managing biotic resources – PAs, coastal fisheries, forests

III) The Tools for conserving Biodiversity must be strengthened and applied more broadly

- Protected Areas

- off-site facilities like Zoos, Botanic gardens, seed banks are vital tools for Biodiversity conservation. But these tools will not serve their purpose if they remain under-funded and understaffed.

IV) Human Capacity for conserving and using Biodiversity sustainably must be greatly strengthened, especially:

- Taxonomist are needed, specialized in tropical species

- Committed, skilled and motivated people are needed to work on Biodiversity conservation

- Experts in biological and social sciences, economics, law, policy analysis, ethics.

Needs are most acute in plant taxonomy. Taxonomic research needs to be stimulated because it is an essential tool for managing Biodiversity and mobilizing its benefits.

V) Research, Training and information management all help expand the human capacity to conserve genes, species and ecosystem

Biodiversity is the source of all biological wealth. Wild species and genetic variation within them make contributions to agriculture, medicine, and industry.

But natural resources endowment is not sufficient basis for economic growth. If poverty is to be reduced, and eventually eliminated, technological innovations that add-value to raw material resources must be regenerated and applied; and technological innovations are the product of effective research

Most institutions for Biodiversity conservation in Ghana lack critical mass of human capital for scientific research and conservation.

51) Trade and Biodiversity

Research into how commodity prices, inflation, exchange rates and market (trade) instability influence biological resource management.

52) Conservation Education

Devise a range of approaches toward incorporating environment concerns into all educational programmes.

Environment curricula for primary school level and teaching resource packages need to be prepared for teacher training institutes.

53) Public Information

Recognizing that a well-informed public will help make conservation action possible and meaningful, we should carry out multi-media public information programmes, and extension services, through several avenues.

I) Entertainment, advertising, popular arts, and print media

II) Political Leaders: traditional elders, etc. awareness workshops

III) Formal education system curricula to emphasize Biodiversity's contributions to community health and welfare

IV) Respect and mobilize local knowledge of Biodiversity as well as new information and ideas into the community.

54) Gender Considerations

Women gather wild plants and animals from the forests, grasslands and the sea for a wide variety of uses in food, medicines, construction and incomes. They provide a critical component of economic systems of most rural communities

One obvious means of increasing women's participation is to develop income-generating activities that utilize all forms of NTFPs, and target on appropriate level of funding to be reserved for use by women. (SIF comes to mind).

55) Needed:

1) Training in specific scientific and technical areas such as:

- Plant and animal taxonomy (high priority)
- Biological and Social Sciences, Policy Analysis, Ethics

- Environmental Science, Economics, Law

2) Training complemented by incentives and institutional environment that provide efficient utilization of trained expertise personnel and their retention.

56) Network Technological Training

Acquisition of new technological knowledge for conservation e.g.

- building national information or databases and linking these to international ones

- Acquisition of scientific publications (through internet)

- Use of conferences, seminars and workshops to update knowledge on the state-of-the- art.

Creation of Institutional organizational structures that provide space for experimentation and technological learning.

57) Competencies and Professional Capacities Required for Natural Resources Management in Agric, forestry and fisheries:

I) Detailed knowledge on physical resilience to the group and multiple demands placed upon them, and assessment of future demands

II) Technical skills, and team work across disciplines

III) New user-oriented data bases and monitoring systems at various levels; networking for collection and use

IV) Capacities to analyze and interpret information must be strengthened

58) People's Participation

It is now widely accepted that the Role of the State needs to change from providing grassroots services itself to providing conductive policies and an enabling legal and institutional environment in which true, respectful participation will flourish; progress may be slow and incremental especially where key stakeholders have been adversaries for even decades.

The links between all players (Government, NGOs, Private Sector and Local Authorities) should be strengthened in order to enhance the involvement of citizens and the elected Representatives in decision-making.

Man, being the concept designer, player and beneficiary must have the central place in that development.

People's participation in decisions which affect their environment is an essential pre-requisite of sustainable and ecologically viable development. Once given a sense of responsibility, the population will be motivated to preserve and improve its living environment.

59) Inter-sectoral Participation

Develop a multi-level system of environment planning based on community participation, inter-sectoral collaboration.

Institutional Capacity Building needs that may be decisive for meeting he obligations of the Conservation of Biodiversity:

- Infrastructure
- Human Resources Development
- Staff Development
- Specialized training – breeding, genetic engineering, tissue culture
- Field equipment

60) Biodiversity Values

Foster the study of taxonomy, distribution and ecology of species and bio-geographic Units; this will enhance the ecological and social value of Protected Areas by increasing the benefits to people in and around Protected Areas:

- in the form of Ecotourism
- micro-financing of projects related to NTFPs

The global values of PAs present real opportunities for generating benefits for the rural poor in recognition of their steward role.

Through the GEF the global community has demonstrated its responsibility by identifying, exploring and supporting

(a) 30 GSBAs set up in Ghana and compensation paid to farmer's in the sum of nearly US$8.7 million by June 2004.

(b) also co-management and collaborative management agreements

(c) obtaining equitable sharing of benefits

61) Genetic Resources Management

In-Situ:

- Strengthen capacity to conserve species, populations, ecosystems and genetic diversity in either late succession or in early successional habitats, on-farm community landscape conservation of land races.

- Identification of threatened species, monitor their populations, and early warming of genetic erosion and lunch recovery programmes for them

- Expand and improve legal mechanisms to protect species in trade (timber, NTFPs) (using CITES).

Ex-Situ

- Infrastructure and technical facilities of core Biodiversity institutions like PGRC can be strengthened to conserve ex situ stocks of most endangered plant species.

- Arboreta, botanical gardens, seed banks, clonal collections, tissue and cell culture collections, field gene banks, forest nurseries, propagating units, captive breeding units (ova and embryos) and Zoological gardens, aquaria; they maintain the largest array of plant and animal diversity outside of Nature, and they have potential as Resource Centres for conservation, education and development, e.g. aquaria have pioneered show-casing of charistimetic or unusual species.

- Threatened Medicinal Plants/Ornamental species can be conserved in Botanical Gardens or cultivated as clones.

- Collection, storage and regeneration, documentation and information management systems, germplasm evaluation and enhancement and exchange.

- Development capacity to assess patterns of genetic diversity e.g. tree genomes etc.

- Identification of collective institutional strengths and weaknesses and evaluate national and international opportunities to further their collective contributions to Biodiversity Conservation.

- Strengthen collaboration and Networking among Biodiversity-related institutions within government agencies, universities private sector and NGOs (local and international).

62) Access to Genetic Resources

Provisions of the Conservation of Biodiversity relating to access have been implemented at the national level through three different types of regulations:

- Environmental Laws – under the auspices of EPA

- Sustainable development, nature conservation; national parks, sectoral and biological diversity laws;

- Access Regulations: e.g. Forest Resource Management Act (1998)

63) Funding Biodiversity

Given the long-term responsibility of gene banks, PAs management, stable funds are essential for capital, maintenance, and labour costs.

64) Potential Awareness/Political Will ultimately underpins availability of supporting legislation, policies, institutions and commitments in the short, medium, and long terms: what is needed is to ensure that stakeholders and collaborators, at all levels, understand that conservation is an everyday concern – not necessarily complex and technically difficult, but essential if nations are to ensure sustainability in forestry and agriculture, fisheries, and in overall national and local development.

65) Capacity Needs within Different Organizations

There is widespread awareness of the value and valuation of Biodiversity; naturally, different organizations and individuals would have varying commitments to the conservation of biodiversity.

The time preference and institutional needs increase from individual farmer through the community organization, private sector entrepreneur to national government institutions:

66) Security of Tenure

Security of tenure provides the assurance, thereby generally providing an incentive for sustainable resource management principally by encouraging long-term planning and greater investments of labour and resources.

Tenure insecurity implies that current land users cannot be assured of capturing long-term benefits of resource conservation hence the adoption of short-term measures which tend rather to degrade the resource base.

- The need for alternative livelihood programmes to alleviate poverty in local communities and for communities that depend on bushmeat in their diet, such as cultivation of mushrooms, snails, and captive husbandry of selected

wildlife animals and promotion of on-farm cropping and domestication of medicinal plants to reduce pressure for illegal harvesting of NTFPs from Protected Areas.

- Government to ensure steady investment in rural productivity, extension of basic infrastructure, and access to credit.

- Strengthening the economic opportunities, management capacity, and advocacy skills of rural communities to enhance collaboration in natural resources co-management.

- The use of renewable energy

- Diversification of rural socio-economic activities and thus of sources of income

- Innovation in Agric/land-use technologies

67) Education and Attitudinal Change

Degradation and Biodiversity loss is due to activities the population is involvement for its immediate survival; in the long-run (like Haiti), the total loss of mangrove biodiversity and loss of such environment to support life resulted in desertification of mangrove swamps, and recurrent flooding.

We need to tackle the deep-seated causes of degradation; - these lie entirely in the poverty and lack of education of the people who live in and around the reserves.

Education to be geared to sustainable development; public awareness must be raised and the public encouraged to assume their responsibilities.

68) Synergies between Climatic Change, Biodiversity loss and Desertification

Effects of Climate Change in Tropical Forests

Climate changes have a major impact on the forests, since the distribution of the different species and forest ecosystems depend greatly on climatic conditions. The most important factors are precipitation, soil moisture, frequency of extreme climatic events, and temperature, and duration of the growing season.

The forest is vulnerability to other anthropogenic factors such as soil and air pollution, land degradation through agricultural expansion, over exploitation of timber, bush burning.

It is the poor or rural folks who suffer most from environmental degradation and deterioration of biodiversity, degradation from climate change; drought (changing patterns of rainfall), deforestation, soil

erosion, and desertification and pollution; in the long term these destroy the means of subsistence, decline in agric productivity in the country-side, and exacerbate the precarious nature of existence.

69) Creation of Green Belts

Considerable effort has been made to halt or even reverse desertification which is the final stage of dryland/woodland forest degradation, by implementing programmes such as afforestation with exotic species; planting "green barriers"; agroforestry development and other measures.

Establishment of Green belts against desertification in North East Ghana can be accomplished through partnership of government with NGOs, District Assemblies and traditional authorities.

70) CONCLUDING REMARKS

The later part of the 20th Century saw a rush to protect critically threatened habitats; but the new millennium will be a time for consolidation and capacity building.

The Ghanaian environment with its diversity has deteriorated steadily over the past four decades, with poverty being the main cause of degradation. Coupled with increasing instances of climatic variability, institutional weakness, poor governance structures, and unfair trading practices have made Ghana more vulnerable biophysically and economically.

Many traditional herbal components are rapidly disappearing through logging and transformation of natural areas into agricultural fields. Protected Areas are expected to provide their last refuge, but Forest Reserves and Protected Areas are not being given adequate protection, and sustainability of utilization of several NTFPs including medicinal plants is in doubts.

Agricultural strategies must be adjusted to conserve and enhance diversity in traditional crop and livestock varieties, and move away from dependence on high input of harmful agro-chemicals and move rather towards low cost organic inputs.

71) Surface Mining is undermining Biodiversity in Ghana

People shudder in disbelief at the looming destruction of the country's gazetted forest reserves through mining; the protected forest and wildlife conservation areas are the country's remaining relatively undisturbed natural forest, and a reservoir of biodiversity. They provide critical environmental services such as catchment areas for the country's

major rivers such as Bia, Tano, Ankobra, Birim, Densu, Pra, Offin, Afram, Oti etc.

No amount of rehabilitation effort will ever restore the mined forests to their primeval condition which has provided stable livelihood to the majority of the rural communities which constitute about 66% of the population and are engaged in primary production on the land.

Continued degradation of the Protected Areas will tend to deepen their poverty; even resettlement of communities is akin to being refugees in their own community, a situation which tends to nurture dislusion and conflict among communities in mining areas.

Ghana was the 12th country of the 157 countries that signed the Conservation of Biodiversity during the Rio Summit in June 1992, and has since 1994 ratified the Convention.

At the Johannesburg Summit on Sustainable Development in August/September, 2002, commitments were made on Biodiversity and Ecosystem management as follows:

- to reduce biodiversity loss by 2010

- to reverse the current trend in natural resource degradation

- to reduce fisheries to their maximum sustainable yields by 2015

Naturally, Ghana should not be found wanting in fulfilling its obligations under the three thematic areas: CBD, UNFCC, & UNCCD

72) Monitoring and Evaluation strategy has been one of the least developed elements of the sustainable development strategy.

People often misconstrue monitoring as a form of witch-hunting, which is not.

Mechanisms need to be set in place so that the country can steer its development according to:

(a) accepted standards

(b) criteria and indicators for sustainable forest resource management, and

(c) with the knowledge of changing circumstances, so that it stays on the sustainable path

73) Monitoring Process provides indicators that may function as an alarm system for telling the resource users that ecological changes are occurring

The alarm system may be used to identify ecosystem-level problems only if these problems are causing (negative) impacts on the keystone species in question

This is not easy as it requires the Ghanaian community to adapt and internalize principles of sustainable development concept.

74) Funding Biodiversity

Too much emphasis has been placed on accessing external sources of funds almost to the exclusion of domestic sources for Biodiversity conservation.

Our country should become more self-reliant – be more proactive in identifying and developing creative mechanisms to generate funds from the country's significant natural resources e.g. the introduction of appropriate taxes and to develop non-tax sources of reserve such as user fees.

Development of natural resources takes place through institutions; institutional building is essential and must be nurtured.

The bane of many institutions is the rapid turn-over of scientific staff for lack of motivation, lack of incentives, poor institutional environment and leadership, loss of institutional memory due to abrupt and often violent take-overs.

Lack of an ethical commitment to sustainable use of biological resources; it can be gainsaid that political and economic elities' have unduly benefited from over exploitation of Biodiversity bringing about some level of community dissatisfaction with the extractive industries.

75) It has remained the special interests of dedicated individuals, NGOs, (especially international NGOs) and a few public agencies, who make continued appeals for the establishment of PAs, and conservation of Biodiversity.

76) Essentially, Capacity Building refers to the process of improving the effectiveness and abilities/skills of the people and institutions, and strengthening their capacities to manage their own sustainable development.

77) Setting up of a Commission for coordinating the three Thematic Areas – CBD, UNFCCC, UNCCD – because of the close synergistic relationship between them.

78) The Setting up of a National Secretariat on Biodiversity Convention with a Focal Point within the MES.

80) CAPACITY NEEDS, BARRIERS AND REMOVAL STRATEGIES

This chapter lists Seven Priority Needs, Barriers and Removal Strategies and Assets.

81) Priority Need No. 1 Institutional Arrangements (Strengthening Biodiversity Institutions)

Strategic Objective:

To incorporate Biodiversity into public policy and law

Specific Objective:

Biodiversity concerns to be integrated into mainstream public policy and laws governing the natural resources – based production sectors, such as forestry, fisheries and agriculture.

Barriers:

- Fragmentation of Policies

- Lack of grass roots and democratic approaches to planning, policy formulation and management of Biodiversity

Main Causes

Government institutions and their centralized set-up and administrative processes preclude effective participation by stakeholder in interest groups.

Actions

Integrate Biodiversity Conservation objectives into forest management, agroforestry, rangelands, fishing grounds, and agric fields; into decisions about developing wetlands, sahel.

- National legislative system/development plans to incorporate Biodiversity consideration, local community rights and public participation

- Need an agency (MES) to coordinate alliances of interested CBOs, NOGs, and government agencies to ensure cross-sector responses

- Element of decentralization to endow the citizenry with appropriate institutional and legal power e.g. local chiefs.

Available Resources

- Initial Support from GEF

- Diverse financial mechanisms are needed for conserving Biodiversity Conservation over the longer term-support needed for CBO, NGO participation

- Mobilizing domestic resources through taxes, fines, resource – user fees

82) Priority Need No. 2: Protection of Representative Ecosystems Strategic Objective

To conserve habitats and species within forestry, agric and fishing activities, and in cultivated and human-dominated landscape.

Specific Objective

A well-managed system of PAs, including representative and largely unmodified parts of ecosystems – compatible with human communities and their activities.

Barriers

- Climatic threats to Biodiversity – deforestation, global warming

- Habitat loss through fire, introduction of alien spp

- Pollutant discharges – GHG emissions

- PA establishment often create conflicts with local people

Main Causes

PAs were expropriated causing continual conflict between government and local people's property rights.

Actions

- Use flagship species to increase support for Biodiversity Conservation

- On-farm/community In-Situ crop conservation and improvement

- Ensure sustainability of PAs and their contributions to Biodiversity Conservation

Available Resources

In-Situ and ex-situ preservation of Biodiversity are key tools in any effective Biodiversity conservation strategy.

PAs are in urgent need of financial, technical, or other support.

83) Priority Needs No. 3: Creating Public Awareness of Ghana's Biodiversity

Strategic Objectives

I) Build awareness of the importance of and values of Biodiversity into popular culture

II) Education programmes facilitating the attitudinal and behavioral shifts needed to mobilize groups into active participation

Specific Objective

To enhance public participation through education and awareness programmes in schools and local communities of the importance of country's heritage of biological resources.

Help institutions to disseminate information needed to conserve Biodiversity.

Barriers

- Public apathy towards Biodiversity Conservation
- Lack of equity in the sharing of benefits from utilization of biological resources
- Non-compliance of law enforcement on PAs.

Main Causes

- Individual short term demands on the resource
- Lack of information on development policies affecting local resources

Actions

- To decode scientific information to the general public
- NGOs and CBOs and private sector to assist in the process of increasing communication and awareness and producing better visibility for scientific programmes and projects in Biodiversity – be it PA protection
- Establish Biodiversity information network e.g. work of wildlife clubs and society

- Public education through mass media

Available Resources

- Information brochures in local languages
- Teachers trained in environmental education, environment, journalists, Agric Extension
- Improved budgets for environmental education through the formal and informal education systems

84) Priority Need No. 4: Promotion of Sustainable Use of Biodiversity

Strategic Objective

Biodiversity must be developed within the framework of overall sustainable development plans.

Specific Objective

Biodiversity should be maintained to the extent that its management is fully incorporated into rural development incorporate core wild and semi-wild zones where nature is conserved to ensure genetic resources and environmental services, agriculture, forestry, fisheries and infrastructure.

Barriers

- Stereotyped development models have tended to be destructive to Biodiversity and local community interests
- Commercial over-exploitation of biological resources
- Notion of equity with regard to th e use of traditional knowledge, practices and innovations.

Main Causes

- Incentives to other productive sectors which tend to encourage degradation of biodiversity, on which rural people depend on heavily for livelihood support e.g. NTFPs.
- Low values given to biological resources which contribute significantly to the resource-based economic sectors.

Actions

- Review of international trade arrangements which encourage local resource degradation (CITES to the rescue)

- Assess full range of goods and services provided by biological resources (e.g. Forests), to build public appreciation and support of those extrinsic/intrinsic and often unmonitized resources

- Reform policies that result in degradation and loss of Biodiversity especially in coastal and marine ecosystems (e.g. using wrong nets in fishing) and other fragile ecosystem

Available Resources

- Developing a NBAP – Biodiversity Action Plan

- Appropriate pricing of biological resources in the market place

85) Priority Need No. 5:

- Access to and Equitable Sharing of the Benefits of Genetic Resources.

Strategic Objective

Specific Objective

Local communities and other stakeholders perceive and receive both immediate and long-term benefits form Biodiversity Conservation action.

Barriers

Property and custodial rights of indigenous people abused.

Main Causes

Indigenous peoples have accumulated knowledge on natural resource but are often excluded from decision-making and management programmes.

Actions

- Land tenure issue to be resolved so as to assure equitable resource sharing and recognition of customary rights

- Benefits are equitably distributed and shared in particular with those having custodial rights and responsibilities

- Recognition of Intellectual Property Rights

Available Resources

86) Priority Need No. 6:

International Cooperation in Biodiversity Conservation.

Strategic Objective

- To recognize the potential hazards of new technology applications.

Specific Objective

Technological development is based on building capacity to manage technologies and evaluate the implications o f t heir use.

Barriers

- Fear of inappropriate introduction of aliens organisms

- Undue reliance on imported rather than national conservation technologies.

Main Causes

- Technological gap between North and South.

Actions

- Projects on Biodiversity to be integrated within long-term programmes

- North South, South – South, cooperation

- The South needs to develop its technological base through well-coordinated partnerships

- Technologies to be developed on the basis of the needs and existing capacities of local communities, NGOs and bio-safety protocol on GMOs, LMOs

- Transboundary cooperation on services of Biodiversity

Available Resources

- Access to GEF operated by W/B, UNDP and UNEP potentially bringing significant funding to the actions to implement the Conservation of Biodiversity

- Establishment of a financial mechanism to provide both technical and financial assistance in support of implementing the Conservation of Biodiversity.

87) Priority No. 7

Biodiversity contribution to the fulfillment of the millennium Development Goals.

Strategic Objective

- Reduce by 50%+ extreme poverty and hunger by 2015

- Loss of environmental resources

Specific Objective

GPRs has established a link between national development strategies and international development targets of MDGs.

Barriers

HIV/Aids affecting human capacity to work towards achieving food security by 2015.

Main Causes

Nexus between poverty and vicious cycle of land degradation and more poverty.

Actions

- Johannesburg Plan of Implementation 2002

- Ensure sustainability of resources on which production is based

- Boost in Agric production which makes the greatest contribution to the GDP

Available Resources

- Improving fiscal policy management

- Providing incentives to enhance agric production

- CBOs, NGOs needs to be fully involved in the process since their perceptions of poverty and well-being may deviate from those of planners.