

UNITED REPUBLIC OF TANZANIA

**NATIONAL REPORT ON THE IMPLEMENTATION OF
THE CONVENTION ON BIOLOGICAL DIVERSITY**

**DIVISION OF ENVIRONMENT
VICE PRESIDENT'S OFFICE**

DAR ES SALAAM

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ABBREVIATIONS/ACRONYMS

AGENDA	Agenda for Environment and sustainable Development
AWF	African Wildlife Foundation
CEEST	Centre for Energy, Environment, Science and Technology
CGIAR	Consultative Group on International Agricultural Research
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo (International Centre for maize Research) – Mexico
COSTECH	Commission for Science and Technology
DANIDA	Danish Development Agency
FAO	Food and Agriculture Organization
GEF	Global Environmental Facility
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IMS	Institute of Marine Sciences
IITA	International institute for Tropical Agriculture
IRRI	International Rice Research Institute
JET	Journalists Environmental Association
NCSSD	National Conservation Strategy for Sustainable Development
NEAP	National Environmental Action Plan
NEMC	National Environmental Management Plan
NGO	Non-governmental Organization
NORAD	Norwegian Agency for Development
NPGRC	National Plant Genetic Resource Centre
ODA	Overseas Development Administration
SADC	Southern African Development Community
SIDA	Swedish International development Agency
SAREC	Swedish Agency for Research and Economic Cooperation
TAFIRI	Tanzania Fisheries Research Institute
TAFORI	Tanzania Forestry Research Institute
TANAPA	Tanzania National Parks
TAWICO	Tanzania Wildlife Corporation
TFAP	Tanzania Forestry Action Plan
TPRI	Tanzania Pesticides Research Institute
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
USAID	United States Agency for International Development
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

Tanzania is rich in biological diversity due to diverse ecosystems, topography and climate. The diverse ecosystems, species richness and endemism make Tanzania one of the fourteen biological diversity hot spot countries in the world. Biological diversity is a keystone to the economy of the nation. Most of the people depend on it for food, medicine, building materials and energy. Other values of bio-diversity include tourist attraction and decomposers of organic wastes and soil conditions. Despite these values, there is increasing loss of forests, wetlands and wildlife areas.

In recognition of the need to conserve and exploit biological resources sustainably, Tanzania signed the International Convention on the Conservation of Biological Diversity on June 12, 1992, and ratified it on March 1, 1996. Since the signing of the Convention, Tanzania has been committed to implementing the Articles of the Convention, and has taken necessary measures to conserve biological diversity.

Tanzania is a large country, and is endowed with vast natural resources, including forests, water, agricultural land, wildlife, rangelands, aquatic resources, mineral resources and biological diversity. Agriculture is the mainstay of the economy, and about 55% of the total land area is potential for agriculture, though only 6% is currently under cultivation. Forestry resources comprise of forests, woodlands and grasslands. Forests and woodlands are currently estimated to cover 33.5 million ha. Closed high natural forests cover about 53% of the forest area, while open miombo woodlands and grasslands cover over 50% of the total land surface. Mangrove forests cover a stretch of about 1000km along the coast. About 51% of the country's total land area is covered by rangelands which supply over 90% of the feed requirement of the ruminant livestock.

Tanzania is also rich in wildlife resources. These have both consumptive and non-consumptive values. Most of these resources are found in protected areas, including national parks, game reserves, game controlled areas and Ngorongoro Conservation area. Because of their biological, cultural and socio-economic values, Ngorongoro Conservation Area, Serengeti and Kilimanjaro National Parks, Selous Game Reserve, Kilwa Kisiwani and Songo Mnara have been designated internationally as World Heritage Sites.

There are aquatic resources, including marine and freshwater ecosystems, rivers and wetlands that provide the livelihood for a significant part of the population. The extensive national parks, the 'Eastern Arc' Mountains, wetlands, coastal forests and marine and freshwater systems are outstanding reservoirs of plant and animal species.

Tanzania's population has been increasing at a rate of 2.8%. In 1995, the population was estimated to be 28.9 million, an increase of about 25.1 % from the 1988 population of 23.1 million. Nearly 90% of the population lives in the rural areas. However, rural-urban migration is increasing because of poor economic opportunities in the rural areas.

Tanzania is faced with a number of environmental problems. Resources are being depleted, with major developmental and environmental implications. The major environmental problems facing Tanzania are land degradation, lack of accessible, good quality water for urban and rural inhabitants, environmental pollution, loss of wildlife habitats and biological diversity, deterioration of aquatic systems and deforestation.

There are several pieces of legislation, which regulate the use and management of environment and natural resources. These laws have evolved along sectoral lines, and many of them are either weak and/or outdated. They lack an umbrella/framework in order to operate in an integrated manner. Most of these laws are currently being reviewed to make them address bio-diversity issues. The formulation of the environmental protection law will be instrumental in conserving bio-diversity.

The institutional framework for environmental management is in place. The Vice President's Office, through the Division of Environment is responsible for policy making and coordination of all environmental matters. The National Environmental Management Council (NEMC) has the responsibility of advising the government on all matters related to the environment. The actual management of environment and natural resources, however, is done by the line ministries, such as the Ministry of Tourism and Natural Resources, Ministry of Water and Livestock Development, Ministry of Agriculture and Food security and others. There are also a number of organizations and institutions that play an important role in natural resources conservation. These include TANAPA, TAWICO, Ngorongoro Conservation Authority, TAFORI, TAFIRI, and many others. Non-governmental organizations, both local and international, such as Wildlife Conservation Society of Tanzania, AGENDA for Sustainable Development, AWF and WWF also play a key role in environmental conservation.

Tanzania has a rich and diverse fauna and flora, including a wide variety of endemic species and sub-species, and unique habitats. There are, for example 11,000 species of higher plants, 20 species of primates, 1060 species of birds, over 1,000 species of fish and about 290 species of reptiles. This rich biological diversity is not evenly distributed. There are six biological hot spots that have value as centres of high species diversity, high level of endemism and contain high proportion of world's total population. These areas are the 'Eastern Arc' Mountain Forests, the coastal forests, the great lakes, the ecosystems of the alkaline Rift valley lakes and the grassland savannas

There is a diverse range of ecosystems and habitats that support some of the greatest concentrations of large mammals in the world as well as species diversity and endemism. These ecosystems include the moist forest mosaic, coastal forests and thicket, afro-montane forest, *Acacia* savanna grassland, *Acacia* – *Commiphora* thorn bush and *Brachystegia* – *Julbernardiasavanna*. Many of the endemic species, including the rare African Violet and amphibians are found in these ecosystems. Freshwater and marine ecosystems also contain a large number of invertebrates, fish and phytoplankton. Agricultural genetic diversity is also high, although none of the cultivated crops is endemic to Tanzania. There is a wide range of crops and domesticated animal species. The country is also rich in terms of germplasm, both for crops and forage.

Biological diversity in Tanzania is generally threatened. Human activities, such as agriculture and felling of trees for fish curing, woodfuel and timber are major threats to forests. Coastal forests have disappeared at an alarming rate as a result of agriculture, pit sawing, charcoal production and mining of salt, limestone and beach sand. Poaching of animals for meat and trophy, particularly in the protected areas and loss as well as fragmentation of wildlife habitats are also a threat to biological diversity. Bio-diversity in wetlands is threatened by pollution and human activities. Because of these threats, the future existence of individual species and ecosystems is in jeopardy.

The world community is concerned about the threats to species and ecosystems, particularly the extinction of species caused by human activities that is proceeding at an alarming rate. It is this concern, and the concern for sustainable development that inspired the International Convention on Biological Diversity. The Convention was adopted at the United Nations Conference on Environment and Development (UNCED) in June 1992. It calls upon all Contracting Parties to take adequate measures to conserve bio-diversity and ensure its sustainable utilization. Its objectives are conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits.

Tanzania is committed to implementing the Articles of the Convention. Already, measures have been undertaken to implement Article 6 of the Convention which calls on all Parties to develop national strategies, plans and programs and for integration of conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programs and policies. The measures that Tanzania has taken to implement this Article are:

- Developing a framework for integration of environment and development in decision making and conservation of the environment. This includes formulation of the NCSSD, NEAP and the National Environmental Policy
- Review of sector policies and legislation, for example, forestry, wildlife and tourism policies and the Forest Ordinance
- Planning for protected area network and identification of priority areas for conservation
- Formulation and implementation of conservation programs, such as Bio-diversity country study, Lake Victoria Environmental Management Program, and Lake Tanganyika Bio-diversity and pollution control Project.

Tanzania is also implementing other Articles of the Convention, especially those dealing with cooperation, ex-situ and in-situ conservation, research and training, and public education and awareness.

Tanzania is responding to the challenges of conservation and sustainable use of biological diversity. She is committed to implementing all the Articles of the Convention. However, in order to fulfil this task, her enabling environment needs to be improved. Therefore, there is need for more support in the form of technology transfer and funding to create a more enabling environment for bio-diversity conservation. The capacity of NGO's needs to be built and strengthened since they play an important role in managing the environment and spearheading community-based programs.

1.0 Introduction

Tanzania is endowed with abundant natural resources and rich biological diversity due to diverse ecosystems, topography and climate. Apart from vast areas of arable land, she has extensive forest and wildlife resources, rangelands, aquatic resources and minerals. Her species richness and endemism and ecosystem diversity make her one of the fourteen biological diversity hot spot countries in the world along with such countries as Indonesia, Brazil, Zaire and Madagascar. On average, Tanzania ranks fourth out of the 48 countries in the Afro-tropical Realm, 3rd for birds and 2nd for reptiles, amphibians and plants. The number of higher plant species is estimated at nearly 11,000, with about 600 species (over 60% of all Tanzania's endemic plant species) being endemic in the Eastern Arc Mountains.

Tanzania fully recognizes the values of biological diversity and its role in socio-economic development. Biological diversity is a keystone for the national economy. Most of the people are dependent on biological diversity in one form or the other, for example, for its ecological services, including source of food, medicine, building materials and energy, tourism attraction, and decomposers of organic wastes and soil conditions. Unfortunately, there is increasing loss of this important resource because of loss of forests, wetlands and wildlife areas. This has led to the loss of and/or extinction of some species such as rhinoceros, violets and fish. Equally important is the loss of equity as the rural poor have lost their access to local resources, are marginalized and have little alternative but to over-exploit.

The world community has been concerned about the threats to species and ecosystems, particularly the extinction of species caused by human activities that has been proceeding at an alarming rate. It is this concern and the concern for sustainable development that inspired the International Convention of Biological Diversity. The Convention on Biological Diversity was adopted at the United Nations Conference on Environment and Development (UNCED) in June 1992 and entered into force in December 1993. The Convention provides a framework for conservation and sustainable utilization of biological diversity. It calls upon all subscribing countries to develop and implement a biological diversity conservation strategy and action plan. The objectives of the Convention are:

- The conservation of biological diversity
- The sustainable use of biological diversity components
- The fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and appropriate funding.

Tanzania recognizes the need to conserve and exploit her rich biological diversity sustainably. It is on this basis that Tanzania signed the Bio-diversity Convention on 12 June 1992 and ratified it on 1 March 1996. Since the signing of the Convention, Tanzania has been committed to implementing the Articles of the Convention. Various measures, actions and programs have been undertaken to conserve and sustainably use biological diversity in accordance with the objectives of Bio-diversity Convention. Special attention has been given to:

- Information generation in order to provide an understanding of the Tanzania's biological diversity resources their status and trends, and the costs and benefits of their conservation

- Conservation and utilization of biological diversity in order to prevent and control the causes of significant reduction or loss of the resources
- Development of biotechnology to ensure fair and equitable sharing of the results and benefits arising out of utilization of genetic resources
- Bio-safety
- Integration of policies strategies and programs for the conservation of biological diversity and sustainable use of biological and genetic resources into relevant sectoral/cross-sectoral policies, strategies and programs
- Strengthening links with neighbouring countries in conservation and utilization of biological diversity and developing research programs with neighbouring countries.

Implementation of the different articles of the convention is already being pursued. With the National Environmental Policy now in place, a policy framework for implementation of the Articles of the Convention has already been created, and action plans as well as strategies are currently being formulated to guide the implementation.

2.0 Background

2.1 Location

Tanzania, encompassing the Mainland and Zanzibar Islands, is the largest country in East Africa. It is located on the east Coast of Africa between latitudes 1⁰S and 12⁰S and longitudes 30⁰E and 40⁰E. It extends from Lake Tanganyika in the west to the Indian Ocean in the east; Lake Victoria in the north, to Lake Nyasa and River Ruvuma in the south. The country borders with Kenya and Uganda in the north, Rwanda, Burundi in the north - west, Republic of Congo (Zaire) in the west, Zambia to the south - west, and Malawi as well as Mozambique in the south.

The total area of Tanzania is 945,000 km.² of which the Zanzibar Islands cover 2,400 km². Inland waters cover an area of 61,500 km², 88% of which is covered with Lakes Victoria, Tanganyika and Nyasa.

2.2 Physiography

Except for the coastal belt, most of the country is located on the central African Plateau, 1000-1500 metres above the sea level. It also has the highest point in Africa, Mountain Kilimanjaro (5950 m). The country can be divided into four main physiographic regions.

(a) The Lowland Coastal Zone

This zone comprises the coastal plain and lowlands with altitude ranging from 0 to 1000 metres above mean sea level.

(b) The Highland Zone

This zone encompasses the dissected highlands, up to 2100m, which flank the deep trough of Lake Tanganyika to the west and extend, with isolated blocks of the Uluguru, Nguru, Usambara and Pare Mountains, to the north - east border. In the north east, tectonic and volcanic activity has produced spectacular mountain peaks and highlands in the Eastern Rift Zone, including the snow-capped Mt. Kilimanjaro (5950m), Mt. Meru (4966m), the Ngorongoro crater and Ol Donyo Lengai. Lakes Natron, Eyasi and Manyara lie on the rift valley floor. In the south are the Southern Highlands, including the Livingstone ranges, as well as Rungwe, Poroto and Mbeya Mountains.

(c) The Plateau Zone

This zone comprises of gently undulating country over much of the western half of the country, including areas around Lake Victoria, with an elevation of 1200m.

(d) The Semi-arid Zone

This zone mainly lies in central Tanzania. The topography is generally flat to undulating with isolated hills and inselbergs. The altitude is between 1200m and 1500m.

2.3 Climate

The climate is tropical to sub-tropical, with mean annual temperatures ranging from 21⁰C in the high montane areas to 29⁰C at the sea level. The mean annual rainfall ranges from 400 mm in the arid areas to over 2500 mm in the highlands and western side of Lake Victoria. About half of the country receives less than 750 mm of rainfall a year. The rainfall is highly erratic, only 21% of the country can expect annual rainfall of more than 750 mm with 90% probability. In some cases, the central regions (about 1/3 of the country) experience rainfall less than 500 mm, with evapo-transpiration rates exceeding precipitation for most of the year. Most of the country has a long dry season, with rain practically restricted to November – May period. A bimodal distribution is characteristic of the north - eastern part of the country and in the vicinity of Lake Victoria.

2.4 Soils

Tanzania is characterized by a great variety of tropical soils with a generally low nutrient content. The coastal zone is mainly covered with deep, sandy to heavy textured soils, with moderate to high water content. The plateau soils on the crests are deep, slightly acidic infertile sandy-loams, changing to dark clay soils in the shallow valleys and extensive interior basins. In the western highlands, the soils are developed on basaltic or argillaceous rock, and are well drained with good moisture holding properties. The north- east part of the country is dominated by the slightly alkaline red-earth, sandy-loam and clay soils. Well-drained volcanic soils of high ash content are found in the northern rift zone and the volcanic areas in the northern highlands. These are heavy textured, moderate to well-drained soils, with moderate to high moisture holding capacity. Deeply weathered soils, susceptible to erosion, occur on hill and mountain slopes and in the central highlands.

2.5 Hydrology

There are four distinct hydrological basins. These are:

- The Indian Ocean with major river systems including rivers Pangani, Wami, Ruvu, Rufiji and its tributaries as well as Ruvuma.
- The westward drainage system, including the Moyowosi, Ugalla and Malagarasi Systems, which drain into Lake Tanganyika.
- The Lake Victoria basin with such rivers as Kagera, Mara and a number of small rivers and lakes.
- The internal drainage system, including Lakes Eyasi, Natron and Manyara in the north, Rukwa in the south - west and many other small lakes and rivers.

2.6 Natural Endowments

Tanzania is endowed with vast natural resources (forests, water, agricultural land, wildlife, rangelands, aquatic, mineral resources) and biological diversity.

Agricultural land resource

Agriculture is the mainstay of the economy. About 55% of the total land area is potentially good for agriculture, although only 6% is currently under cultivation. Major crops include coffee, cotton, cashew-nuts, sisal, tobacco and tea as cash crops, and maize, rice, sorghum, bananas, cassava, potatoes, beans groundnut, cocoyams and yams as food crops. There is high potential for irrigated agriculture, although it has not been realised. The contribution of agriculture to GDP is about 46%, employing nearly 80% of the work force.

Forestry

Forestry resources comprise of forests, woodlands and grassland. Forests and woodlands occupy less than 50% of the total land surface of 883,500 km². It is estimated that the country's forest area (including closed forests, woodlands and mangrove forests) has declined from 44,300,000 hectares or 50% of total land area in 1938 to 33,096,000 hectares or 43% of total land area in 1987. Currently, forests and woodlands are estimated to cover 33.5 million ha. About 53% of the forest area is covered with closed high natural forests. Mangrove forests cover a stretch of about 1000km along the coast, mainly in brackish water. In addition to natural forests, there are about 150,000 ha of softwood and hardwood forest plantations in Tanzania. About 80,000 ha of these forests are owned by the Government while the rest are privately owned. Open woodlands, mainly of the Miombo (*Brachystegia – Julbernardia*) type, as well as grassland cover over 50% of the land surface.

Fuel-wood constitutes the largest and most important use of wood. It accounts for 97% of all wood consumption and 92% of the country's energy use. Economically, Forestry generates about 10% of the countries registered exports. The recorded contribution to the GDP is 1 to 2%. However, this is gross underestimation as most of the wood consumed locally in rural communities is unrecorded.

Rangelands resources

Rangelands provide pasture for livestock and wildlife, and it is estimated that they occupy about 51% of the country's total land area. They supply over 90% of the feed requirement of the ruminant livestock. However, because of low nutritional value of pastures, inadequate water supplies, high incidences of diseases, widespread tsetse - fly infestation and land tenure systems, only 10% of the land support nearly 60% of all livestock in the country.

Wildlife resources

Tanzania is rich in wildlife resources. The protected area network that harbours most of these resources covers about 38.8% of the country's total area, and is comprised of 12 National Parks, 28 Game Reserves, 38 Game Controlled Areas and the Ngorongoro Conservation Area. Wildlife resources have both consumptive and non-consumptive values. The latter includes tourism, education and research. The protected areas are potential generators of national income from tourism, hunting/fishing and other resources. Most communities living in close proximity to these protected areas, however, have not benefited much from the wildlife industry.

Tanzania is also a custodian of world heritage. The Ngorongoro Conservation Area, Serengeti and Kilimanjaro National Parks, Selous Game Reserve, Kilwa-Kisiwani and Songo Mnara ruins are important World Heritage Sites because of their biological, cultural or socio-economic

values. Serengeti and Lake Manyara National Parks have also been designated as Biosphere Reserves.

Aquatic resources

Aquatic resources for Tanzania include marine and fresh water ecosystems, rivers and wetlands. These resources provide the livelihood for a significant part of the population. They are an important food source and contribute to the national economy. Fishing is the most important activity associated with aquatic resources, with fresh water fisheries accounting for over 80% of total fish catches.

Biological diversity

The extensive National parks, the 'Eastern Arc' mountains, wetlands, coastal forests, marine and fresh water systems are outstanding reservoirs of plant and animal species, and make Tanzania one of the world's greatest reservoirs of biological diversity. Nearly 11,000 plant species out of 15,000 higher plants recorded in East Africa are in Tanzania. Out of these 11,000 species, over a quarter are endemic.

Tanzania is also home to about 8270 species of marine invertebrates and well over 1000 species of fish within her waters. Over 855 species of fish are found in fresh water bodies of Tanzania mainland. Out of these, over 773 species are found in the three big lakes. About 1.3% (7) of the fish species are endemic to Tanzania or adjacent regional waters. Records also show that there are 31 endemic amphibians, 18 endemic species of lizards, 9 species of snakes, 10 bird species, 40% of the world's wild coffee varieties, and about 80% of the famous African violet flowers.

2.7 Population Trends

In 1995 the population of Tanzania was estimated to be 28.9 million. This is an increase of about 25.1% from the 1988 population of 23.1 million. The population has more than doubled since 1967 when the population was 12.3 million. The current population growth is 2.8%. However, there are marked regional variations, with Dar es Salaam, Rukwa, Arusha, Ruvuma and Mbeya having growth rates higher than 3.0% per year.

The population Density is about 26 persons per square kilometer. The highest densities are found in the Lake Victoria Basin, the North-eastern Highlands, the Southern Highlands and Dar es Salaam. Nearly 90% of the population lives in the rural areas. Rural-urban migration is increasing as a result of poor economic opportunities in the rural areas.

2.8 Environmental Problems in Tanzania

The current state of the environment in Tanzania is a matter of urgent concern. Natural resources are being depleted, with major developmental and environmental implications. A national analysis has identified six major problems for immediate attention. These are:

- Land degradation;
- Lack of accessible, good quality water for both urban and rural inhabitants;

- Environmental pollution;
- Loss of wildlife habitats and biological diversity;
- Deterioration of aquatic systems; and
- Deforestation.

Land degradation

Land degradation is a phenomenon resulting from a mixture of natural and human processes. It is a progressive process that starts with a loss of vegetative cover, exposing soil surfaces to the erosive power of wind and rain. However, the processes of land degradation are varied and may not be easily detected or measured. Its severity can be assessed from the red-brown colour of streams and in floods as the top - soil is washed away from upland areas. Other manifestations of land degradation include loss of fertility, bareness of the top - soil in many fields, and silting of dams and reservoirs. The productivity of the soil has been considerably reduced in many parts of the country.

Although soil erosion is, to some extent, a natural process, it has been greatly accelerated by human activities, including poor cultivation practices. Vertical ploughing across steep slopes, failure to adopt crop rotation, failure to maintain adequate vegetative cover, inadequate use of organic fertilizer and lack of sufficient conservation measures, particularly on hill slopes and marginal lands, have all led to declining soil productivity and crop yields.

However, all these factors are deeply rooted in the socio-economic development of the people, and their access to land as well as knowledge, among others. Factors like poverty, insecurity of tenure, and loss of traditional conservation practices and of indigenous resource knowledge, in general, all underlie the whole process of land degradation. In a poor country like Tanzania, the limited opportunities for socio-economic development put pressure on the agricultural sector and the poverty of farmers forces them to look for ways to obtain quick returns from resource exploitation. Poverty generally discourages investments in measures that protect the long-term productivity of the land.

Lack of accessible, good quality water for both urban and rural inhabitants

Tanzania is endowed with large water bodies, many rivers and moderate to good rainfall. However, the rainfall is seasonal and during the rain season, water is scarce. Despite considerable national effort to supply domestic water, over half of the people in towns and in the countryside do not have access to good quality water for washing, cooking, drinking and bathing. In the semi-arid areas like Dodoma, majority of the people depend on water from hand-dug wells and traditional sand river dams, the quality of which leaves a lot to be desired. Consequently, incidences of water-related diseases are very common. While in the rural areas people use untreated water, in urban areas the water is poorly treated, and contamination by poorly treated industrial discharges and sewage is not uncommon.

Environmental pollution

Pollution in towns and the countryside is a major problem in Tanzania. It is seriously affecting the health of many people, and has lowered the productivity of the environment. Pollution

problems in Tanzania are related to water and land and emanate from industries, agricultural activities and urban development. Many industries in Tanzania do not have facilities to recycle or treat their wastes in the form of organic matter, heavy metals and waste oils. Untreated liquid and solid wastes from industries are discharged directly into rivers, streams, lakes and oceans polluting the water bodies which are also sources of water for drinking and other purposes. The rivers, lakes and sea estuaries located in industrialized, mainly urban areas are seriously polluted by industrial water borne effluents. Industrial wastes are also haphazardly deposited on the land surface in dumping sites causing serious environmental hazards, including the production of run-offs which contaminate ground and surface waters.

Urban pollution is a result of poor sanitation, inadequate solid waste disposal, poor domestic and industrial effluent discharge and treatment, poor disposal and lack of treatment of industrial wastes, as well as emissions from industries. The rapid growth of urban areas in Tanzania, estimated at 6.8% per annum, has put tremendous pressure on government to provide adequate services and amenities. This rapid and uncontrolled urbanization process has had unexpected, far-reaching and mostly negative results affecting all people living in urban areas.

Environmental pollution in agriculture is mainly due to the use of agro-chemicals, and fertilizers. The use of pesticides and toxic chemicals in Tanzania has been increasing over the past 10-15 years. Their improper handling and over-use as well as use of banned chemicals have been significant sources of pollution, particularly in cotton and coffee growing areas. Moreover, chemical containers are improperly disposed, and an increasing amount of expired pesticides are improperly stored in various parts of the country. These chemicals are mainly stored in open areas and pose a serious threat to land and water quality, as well as human health in their immediate vicinity.

Loss of wildlife habitats and biological diversity

National parks, with their wildlife, flora and landscape, are the remaining pieces of the biosphere that mirror the quality of life on earth. However, the demands placed on them and wildlife by increasing population pressures and exploitation, threaten their very existence. Conflicts between wildlife and increasing human populations, as well as poaching are major problems that have resulted in loss of wildlife and its habitats. Human pressure is mounting on buffer zones, corridors and migration routes that are critical to the continued survival of protected areas. Poor land use practices are leading to forest depletion and destruction of wildlife habitats. The traditional methods of policing and protecting wildlife have antagonized rural communities who are increasingly encroaching on national parks and game reserves. All these threats have resulted in loss of biological diversity, with some species having become extinct while others are endangered even within unsettled protected areas.

Deterioration of aquatic systems

There is concern over deterioration of aquatic resources in Tanzania because of increased human activities that degrade the marine and freshwater ecosystems. Poor management of the resources and pollution are reducing the productivity of lake, river, and marine waters. Such practices as environmentally destructive fishing using dynamite, excessive trawling, chemical poisoning, and use of small mesh size nets are not only destroying the habitats but are also leading to loss or decline of important fish species. Dynamite fishing is increasingly destroying coral reefs that are critical habitats for marine organisms. Beach erosion, coastal pollution from oil spillage and sewage, and uncontrolled felling of mangroves are also a major threat.

The contaminants which pose the greatest threat to the aquatic environment are sewage, nutrients, synthetic organic compounds, sediments, litter, plastic, metals and oil/hydrocarbons. Many of these substances, particularly those originating from land-based sources, exhibit toxicity, persistence and bio-accumulation in the food chain.

Tanzania is faced with the problem of infestation of water hyacinth (*Eichornia crassipes*) in the Pangani River and in Lake Victoria because of increased input of nutrients from agricultural runoff in rural areas and industrial as well as municipal discharge from urban areas. The plant has deleterious effects on fresh water fishing as it blocks the entry of light to the water underneath and reduces oxygen, temperature and pH, all of which affect aquatic life.

Deforestation

Removal of woody vegetation in Tanzania is increasingly becoming a major threat to the environment. Although there are no reliable estimates on the rate of deforestation, it may be in the range of 300,000 to 400,000 ha/yr. Such a high rate of deforestation has reduced the extent of forest and woodland coverage from 44,300,000 hectares or 50% of total land area in 1938 to about 33.5 million ha at present.

The main causes of deforestation are clearance for agriculture, especially the massive clearance of land for cultivation of cash crops such as cotton and tobacco, increasing demand for forest products, including woodfuel and timber, small scale mining and bush fires. All these factors have created an unsustainable demand and supply situation, with the rate of removal being higher than the rate of replacement. Consequently, forests and woodlands are being reduced year after year, resulting in the degradation of the land. There is evidence for reduced water flows, soil erosion and declining productivity in many parts of the country as a result of deforestation.

Deforestation has not only been on non-reserved land. Even Forest Reserves have suffered because of over-harvesting, illegal harvesting, encroachment for cultivation and fuel-wood, settlement and excessive fire. Some Forest Reserves have been purposefully degazetted in the favour of political demand/pressure for land with disastrous consequences as is the case in Mlalo in ushoto District, Tanga region.

Recently, the problem of refugees has added another dimension to the deforestation problem. For many years, Tanzania has been host to refugees from neighboring countries. The large concentrations of refugees from Rwanda, Burundi and Democratic republic of Congo (Zaire) in Kigoma and Kagera Regions have led to uncontrolled tree felling for woodfuel and construction, as well as massive clearance of forests and woodlands for agriculture.

2.9 Environmental Legislation and Institutional Framework

There are several pieces of legislation pertaining to the environment and regulating the use and management of natural resources. Many of these laws have direct influence/effects on the management, conservation and utilization of bio-diversity, including those for the establishment of institutions and institutional framework for bio-diversity management. Examples of such laws include, among others:

- Wildlife Conservation Act No. 12 Of 1974

- Protected Places and Areas Act No. 38 of 1969
- National Parks Ordinance Cap.412, Supp. 59
- Ngorongoro Conservation Area Ordinance Cap 413
- Water Utilization and Control Act No. 42, 1974
- Land Ordinance Cap. 113
- Marine Parks and Reserves Act No. 29, 1994
- Plant Protection Ordinance Cap. 133, Supp. 60
- Serengeti Wildlife Research Institute Act No. 4, 1980
- Tanzania Forestry Research Institute Act No. 5, 1980
- Forestry Ordinance Cap 389.

However, these laws have evolved along sectoral lines, and many of them are either weak and/or outdated and/or lack cross-sectoral linkages. They lack an umbrella/framework in order to operate in an integrated manner, and they, in many cases, do not support cooperative and joint management between central government and local authorities and their local communities, necessary for the management and sustainable utilization of the resources. Some laws, while listing prohibitions, do not specify mode of enforcement, nor do some of those creating environmental agencies adequately or clearly demarcate responsibilities and functions. Sometimes, they do not even specifically empower the agencies to do many of the functions listed as their responsibility. Enforcement of legislation is weak, as the civil service has lost the capacity to do so. The government is currently revising all laws that have a bearing on the environment. The formulation of the environmental protection law, currently at an advanced stage will be instrumental in the conservation of Bio-diversity.

Because of the complexity of environmental problems, many sectors of the government and society are involved in actions to address them. At national level, the Office of the Vice President, through the Division of Environment is responsible for the environment. The office is responsible for the development of policy options, and coordination of the broad-based environmental programs and projects. In particular, the office is charged with the duties and responsibilities of environmental research, environmental policy making, environmental planning and monitoring as well as environmental coordination of both national and international environmental issues.

The National Environmental Management Council, established by an Act of Parliament in 1983, is responsible for advising Government in the field of environment. It is also responsible for environmental information generation, assembly and exchange. The actual management of environment and bio-diversity issues at national level, however, falls under different line ministries and many other institutions and organizations.

Management of forestry, wildlife and fisheries resources is the responsibility of the Ministry of Tourism and Natural Resources. However, there are separate departments for each of the

resource category. Wildlife management, for example, is the responsibility of the Wildlife Department. The Department regulates and coordinates matters pertaining to wildlife conservation and management through such activities as licensing, anti-poaching programs, gazettement of wildlife protected areas and prosecution of wildlife peddlers. There are other organizations that also deal with wildlife management and conservation. These include:

- Tanzania National Parks (TANAPA) whose role is mainly protection of bio-diversity and other resources within the national parks;
- Tanzania Wildlife Corporation (TAWICO) which plays regulatory role and carries out business,
- Ngorongoro Conservation Area Authority (NCAA) whose mandate is to conserve the natural and cultural heritage in the Ngorongoro Conservation Area.

Fisheries management is under the Fisheries Department while forestry is under the Forestry Department. The Ministry of Agriculture and Food Security, on the other hand, handles matters related to agriculture and food, while management of water resources and livestock falls under the Ministry of Water and Livestock Development.

Other environmental related organizations include the National Plant Genetic Resources Center under the Ministry of Agriculture and Food Security and various research and training institutes. The latter include:

- Tanzania Forestry Research Institute (TAFORI)
- Tanzania Fisheries Research Institute (TAFIRI)
- Serengeti Wildlife Research Institute (SWRI)
- Tanzania Pesticides Research Institute (TPRI)
- Institute of Marine Sciences (IMS) under the University of Dar es Salaam
- College of African Wildlife Mweka (CAWM)
- Commission for Science and Technology (COSTECH)
- University of Dar es Salaam and Sokoine University of Agriculture.

There are also a number of non-governmental organizations (NGOs) that have an interest in one way or the other and are working towards the conservation of environment and bio-diversity. These are both local and international organizations and include AGENDA for Environment and responsible Development, Wildlife Conservation Society of Tanzania (WCST), Centre for Energy, Environment, Science and Technology (CEEST), World Wide Fund for Nature (WWF), African Wildlife Foundation, AFRICARE, Tanzania Forest Conservation Group, Journalists Environmental Association of Tanzania (JET), Lawyers' Environmental Action Team and many others. These play a very important role in managing the environment and spearheading community-based programs. However, most of them lack the necessary capacity to manage their activities. Their capacity needs to be built and strengthened.

3.0 Status of Biological Diversity in Tanzania

Tanzania has a rich and diverse fauna and flora, including a wide variety of endemic species and sub-species, and unique habitats. In terms of species and sub-species, the diversity and high degree of endemism is clear for plants (about 11,000 species), primates (20 species), antelopes (34 species) birds (1060 species), fish (over 1,000 species), reptiles (290 species), invertebrates and many others. However, there are likely to be a number of species that are still not known, and further research is needed to discover them.

Besides the diversity and high degree of endemism of her fauna and flora, Tanzania also possesses important populations of species that are threatened but more widespread across Africa. These include the endangered wild dog, black rhinoceros, slender – snouted crocodile and the vulnerable chimpanzee, cheetah and African elephant. In addition, Tanzania is also rich in agricultural and genetic diversity. This includes about 20 species of coffee and some wild species of coffee.

This rich biological diversity is not evenly distributed in all natural communities and areas of Tanzania. Some areas are much richer than others. There are six biological hot spots that have value as centres of high species diversity, high level of endemism and contain high proportion of world's total population. These areas are:

- The Eastern Arc old block mountain forests (encompassing Usambara, Nguru, Ukaguru, Uluguru and Udzungwa Mountains),
- The coastal forests (e.g. Pugu and Rondo),
- The great lakes for Cichlid (*Haplochromine*) fishes,
- The ecosystems of the alkaline Rift Valley lakes,
- The grassland savannas for large mammals (e.g. Serengeti plains).

3.1 Terrestrial Bio-diversity Habitats and Ecosystems

Tanzania has a biologically diverse range of ecosystems and habitats that support some of the greatest concentrations of large mammals in the world as well as species diversity and endemism. Ecologically, these ecosystems are divided into six zones:

- | | | |
|-----|---|--|
| I | - | The moist forest mosaic |
| II | - | Coastal forest and thicket |
| III | - | Afro-montane forest |
| IV | - | <i>Acacia</i> savanna grassland |
| V | - | <i>Acacia</i> – <i>Commiphora</i> thorn bush |
| VI | - | <i>Brachystegia</i> – <i>Julbernardia</i> savannah |

The moist forest mosaic

This zone represents the Lake Victoria Phytochorion and comprises of the Lake Victoria basin. The vegetation in this zone is basically lowland forest. Similar lowland forests occur along Lake Tanganyika, particularly in Gombe and Mahale Mountains National Parks. This zone is one of the richest parts of Africa as far as bird diversity is concern. About 15% of passerine birds are found in the area and are mostly endemic to the zone. The zone is also rich in butterflies (about 270 species), and contains the black Mangabey monkey that occurs abundantly in Minziro and nowhere else in Tanzania. There is also a species of tree hyrax that is only found in Minziro and not anywhere else in the country, and is different from three other hyraxes found in Tanzania. The zone is, however, generally poor in endemic plant species.

Much of this zone is not protected. Only 12 % of the land is within the protected area network. Out of this, 9.24% is wildlife - protected land (including Ibanda/Rumanyika and Burigi Game Reserves as well as Rubondo Island national Park). Existing information indicate that about 2.75% of the land in Tanzania is forest reserves.

Coastal forests and thickets

This zone comprises the Zanzibar-Inhambane Phytochorion, and it extends from Kenya and Southern Somalia in the north to the Limpopo River in Mozambique. The forests occur as isolated small patches limited to hill-tops and off-shore islands, and are remnants of the once extensive lowland forests of East Africa covering about 59,000 km². In Tanzania, the remaining coastal forests and thickets cover an area of only 350 km² (less than 1% of the original area). They are found mostly at the foot of the 'Eastern Arc' mountain ranges of the Usambara, Nguru, Uluguru and Udzungwa. The coastal deltas are mostly covered by mangrove forests that extend from Rufiji delta to Kilwa, with important remnants distributed along the far north and south of the Tanzania coast.

These coastal lowland forests support many of the rare and endemic taxa, species and sub-species, including the rare African Violet (*Saintpaulia spp.*). It supports approximately 500-600 endemic species of various biological groups (Table 1).

Table 1: Provisional Assessment of Endemism in the Various Biological Groups in Coastal Forests of Tanzania

Biological groups	No. of endemic species	Percentage
Plants	400	80.8
Mammals	5	1.01
Birds	5	1.01
Reptiles	20	4.04
Frogs	5	1.01
Butterflies	40	8.08
Millipedes	20	4.04

There are about 3,000 species of flowering plants of which nearly 40% are endemic to the region. A few animals, including the African elephant (*Loxodonta africana*) and black Rhinoceros are still found in some of the forests. However, being rare and endangered species, these animals are more likely to succumb to exploitation by human beings or by induced changes in the environment.

About 75% of these forests are forest reserves, including Pande, Pugu, and Kiono forests near Dar es Salaam, and Kichi Hills, the Matumbi Hills, Kiwengoma forests and Rondo Plateau south of Dar es Salaam. However, the forest reserve status of conservation does not provide for adequate protection of bio-diversity because the forests can be subjected to resource exploitation and/or be manipulated. Only small portions of the zone are protected as they fall under Udzungwa National Park and Selous as well as Sadani Game Reserves.

Afro-montane forest zone

This zone comprises high altitude areas of about 2000m above sea level, and is estimated to cover more than 15,000 km². It comprises the 'Eastern Arc' mountains extending from south Pare Mountains to the edge of the Southern Highlands, and includes the Usambaras, Uluguru, and Udzungwa, which are the most important mountains in terms of bio-diversity. Other montane forests outside this arc are on Mount Kilimanjaro, Meru, Ngorongoro, Rungwe, Hanang, Mahenge and Matengo highlands, Mahale Mountains and Ufipa Plateau.

This phytochorion is the richest in terms of endemic species. Over 60% of all Tanzania's endemic plant species are in the 'Eastern Arc'. The zone consists of at least 4000 plant species, with 3000 species (75% of the species) being endemic. About one fifth of the tree genera are also endemic. It is one of the "hot spots" in Tanzania.

The region is also fairly rich in species of mammals, but endemism is high among those animal groups that are poor dispersers, such as amphibians and invertebrates. Of the 133 known species of amphibians, 39 species are montane forest endemics, with 34 species restricted in the Eastern Arc Mountains. The Usambara Mountains constitute one of richest biological communities in Africa in terms of total species endemism. The percentage of endemic taxa in the Usambara ranges from 2% in mammals to 95% for millipedes. It also supports about 87 of the Eastern Arc endemic amphibians (Table 2).

Table 2: Amphibian and Reptile Endemics in the Eastern Arc

Forest	No forest Species	% E. Arc Endemics	% Strict Endemics
Usambara	A 23	87	25
	R 29	55	38
Uluguru	A 26	70	26
	R 24	89	33
Udzungwa	A 19	95	17
	R 16	88	21

A = Amphibians, R = Reptiles

Other important endemic species include the Uhehe red Colobus monkey which is endemic to the southern and eastern escarpments of the Udzungwa Mountains, the swallow-tail butterfly endemic on the slopes of Mount Kilimanjaro, Meru, Ngorongoro Crater and Mbulu Highlands, and various endemic shrews on Uluguru and Usambara mountains.

Most of the montane forest areas are forest reserves or catchment forests that cover more than 10,000 km². Only the Ngorongoro Conservation Area (NCA), Kilimanjaro National Park and Udzungwa National Park are wildlife-protected areas, and these cover about 6000km². Ngorongoro Conservation Area is unique as a multiple use area (wildlife, livestock and human beings co-exist).

Acacia – Savanna grassland and Acacia – Commiphora thorn-bush

These two ecological zones occur in close proximity and have similar characteristics. The *Acacia – savanna grassland*, however, cover a large proportion of land and is relatively wetter than the *Acacia – Commiphora thorn-bush*. The zones are found in the central and northern dry lowlands of Tanzania and fall mostly within the Somali – Masai phytochorion. The *Acacia – savanna grassland* is rich in flora and in mammal species, while the *Acacia – Commiphora thorn-bush* is very rich in flora, of which 50% are endemic. It is also rich in fauna although low in endemisms. There are 759 bird species, of which 14% are endemic. There are also 450 species of butterfly. Some of the endemic plant species include *Commiphora acuminata*, *Cordia densiflora*, *Euphorbia dumenticola* and *Erythrina greenwayi*.

The variety of habitat types (grassland and open woodland) in the *Acacia* – savanna grassland zone constitute the most famous conservation areas in the country, including the Serengeti National Park, the Ngorongoro Conservation Area, Maswa Game Reserve, the Ikongoro Game Reserve and Loliondo Game Controlled Area. Together, these areas constitute probably the greatest concentration of large mammals known anywhere in the world. Also included in this zone is the Masai steppe, with the largest concentration of wildlife found in Tarangire National Park, the Lolkisale, Simanjiro and Mkungunero Game Controlled Areas and a number of small isolated protected areas such as Lake Manyara and Arusha national parks as well as Saadani Game reserve. A small proportion of the Ruaha National Park also lies within the zone. The total protected land is 41%, with national parks constituting 11%.

The *Acacia* – *Commiphora* zone encompasses the Mkomazi and Uмба Game reserves that form an important south-ward extreme of the Tsavo National Park in Kenya. There are also a few game controlled areas, including Ruvu Sama, Ruvu Masai and Kalimawe. The protected areas cover 37% of the zone, of which 6% is under National Parks while Game Controlled Areas cover 27%. The rest is covered by game reserves.

Brachystegia – *Julbernardia savanna woodland*

This zone corresponds with the Zambebian phytochorion. It covers about 554,600 km² and is characterised by miombo forest/woodlands. The zone has the richest and most diverse flora. The Zambebian Regional Centre of endemism forms the major part of this zone and is estimated to contain around 8,500 species. However, only 54% of the species are endemic. The zone is also very rich in fauna, although it has relatively lower levels of endemism. There are a total of 748 species and sub-species of Passerine birds with 18% endemism. Mammal endemism is low, only 4%. About 450 known species of butterflies are also found in the area. Included in this zone also is the Guino – Congolian Regional Centre of endemism which covers only a small area west of Tanzania, mainly in the Mahale and Gombe National parks.

The zone has an extensive coverage of forest reserves (about 121,000 km²). Game Reserves cover 15% of the zone while National Parks cover only 2 %. Among the most important protected areas in the zone are the Selous game reserve and Mikumi National Park. A large part of the Ruaha National Park is also included. Other protected areas include Gombe Stream and Mahale Mountains National Park, the Rungwa and Kizigo/Muhesi Game Reserve together with associated game controlled areas, Katavi National Park and the Ugalla, Moyowosi/Kigosi and Biharamulo Game Reserves.

3.2 Protected Area Network

Tanzania has a very big area (38.8% of the total area) devoted to resource conservation under the protected area network. There are five categories of protected areas: National parks, Game reserves, the Ngorongoro Conservation Area, the Game Controlled Areas and partial Game Reserves. Until 1996, there were 12 national parks, 28 game reserves, a conservation area and 38 game controlled areas, covering a total of 240,000 km². Recently, two game controlled areas (Gurumeti and Ikorongo) have been elevated to game reserves.

The national parks are meant for total protection of nature and natural resources. However, activities such as site seeing, photography, camping and research also take place. The game

reserves, on the other hand, cater for licensed hunting, tourism and research. The game controlled areas act as buffer zones for the protected areas. They are also inhabited by people and cater for tourism, licensed hunting and research.

Forest reserves are 540 in total, covering an area of 132,000 km². Part of the reserved forest area (108,000 km²) is categorized as productive where harvesting is allowed. The rest is protective forest, covering an area of 26,000 km². Harvesting is not allowed in the latter. However, illegal activities are not very uncommon in many of the forest reserves. Included in the network also is the Mafia Island Marine Park, established in 1994 and several marine reserves, including Fungu, Yassin, Mbudya Island, Bongoyo Island, Pangavini Island, Chole Bay and Tutia Island.

The status of biological diversity in these areas has been covered in the preceding section. However, it is important to note that the wildlife - protected areas constitute a significant proportion of the *Acacia* – savanna grassland as well as the *Brachystegia* – *Julbernardia* savanna woodlands where the greatest concentration of large mammals is found. In addition, marine resources around Mafia Island are among the richest on the East African Coast. The area near the south – east corner of Mafia has in particular been recognized as a critical site for bio-diversity.

3.3 Aquatic bio-diversity

Wetlands cover about 10% of the country's total surface area, and are composed of fresh water, marine and coastal wetlands, including mangrove swamps, coral reefs, sea weeds and grasses, inter-tidal mud flats, inland wetland systems, rivers and inland flood plains, and artificial wetlands. In the marine environment, a total of 12 species of sea grasses and 287 species of sea - weeds have been listed. These include the red, green and brown algae that account for 59.6%, 22.6% and 17.8%, respectively. 250 species of phytoplankton have also been recorded, including diatoms, blue – green algae, green micro-algae and euglenoids that account for 92%, 5.6%, 1.6% and 0.8%, respectively.

The freshwater environments contain 238 species of aquatic angiosperms and 5 species of ferns. About 1119 species of phytoplankton have also been reported. Diatoms, green micro-algae, blue – green algae and euglenoids account for 54.7%, 25.5%, 14.5% and 5.5%, respectively. There are important plants that are confined to flood plains, such as *Trichlea ematica* common in ground water forests.

In addition to aquatic plants, there are about 8270 species of invertebrates reported in the marine environment, although only 976 species were encountered during the bio-diversity country study. Molluscs account for 73.6%, followed by echinoderms (10.9%), arthropods (6.5%), corals (5%) and sponges (4%). Over 532 species of marine animals of fisheries interest have also been listed. Of these, 1.3% (7 species) are endemic to Tanzania or regionally within the adjacent waters of Kenya and Mozambique.

About 785 species of invertebrates have been encountered in freshwaters. Aquatic insects account for 30.3% of all invertebrate species while arthropods account for about 16.2%. About 293 species (37.3%) of these invertebrates are endemic. A total of 1257 freshwater fish have also been recorded in 40 water bodies. Out of these, 773 species are found in Lakes Victoria, Nyasa and Tanganyika, with Cichlids being the most abundant. About 95% of the Cichlids found in the three lakes are endemic. Lake Tanganyika is a home to about 217 fish species that are unique to

that lake. Lake Nyasa has the most diverse fish species population (338 species) most of which are endemic. Lake Victoria, on the other hand, has about 178-208 fish species. A number of non-traditional species of fish, including *Oreochromis niloticus*, *O. leucosticus*, *Tilapia zillii* and *Lates niloticus*, have been introduced in the large lakes, for example Lake Victoria.

Major flood plains are also often inhabited by a variety of wildlife, such as crocodile, hippopotamus, elephant, antelopes and buffalo.

3.4 Agricultural and Genetic Diversity

Agricultural diversity includes cultivated crops, horticultural plants and domesticated animals while genetic diversity is the variation in the genetic composition of individuals within or among species. Tanzania has 47 plant species that are cultivated. These include 9 cereals, 11 legumes, 10 oil crops, 6 roots and tuber crops, 4 fibre crops, 3 beverage crops and 4 other crops. The most important cereals are maize, sorghum, millet and rice.

Apparently, none of the cultivated crops is endemic to Tanzania. However, while many of these crops, especially cereals and beverage crops, such as coffee and tea, are not indigenous, wild relatives of rice, finger millet, wheat, barley and coffee exist. Currently, 21 species of wild coffee are maintained in a field gene bank at Lyamungo Research Station. There is also greatest diversity of cashew - nuts, particularly within farmers' fields in southern Tanzania.

Horticultural plants consist of 79 indigenous plant species producing edible fruits, and are known to be growing in wild or semi-wild. There are also 48 different species of introduced fruit trees, 37 different species of exotic vegetables, 40 species of indigenous vegetable crops, 109 ornamental plants or having potential as ornamental plants, and 34 species of spice or herbal plants, such as clove, black pepper, zingiber and ginger. However, horticulture in Tanzania is not well developed. Lack of varieties that are environmentally adapted, high yielding and resistant to pests is an important limiting factor.

There is also a wide range of domesticated animal species. These include cattle, sheep, goats, pigs, rabbits, horses, donkeys and birds, such as chicken, ducks, geese, turkey and guinea fowls. There are also domesticated pets such as dogs and cats. Tanzania ranks high in Africa in livestock numbers. More than 90% of all stock are traditional, indigenous species of limited genetic potential in terms of meat or milk production. However, the numerous indigenous genotypes of cattle, chicken, sheep and goats represent gene pool with invariably a wide range of useful genetic attributes. A few exotic animal species, including water buffaloes and camels, have recently been introduced in Tanzania. Game ranching has also recently attracted interest. Crocodile farms have been started in Bagamoyo and Kilombero, while ostrich farming is practiced at Oldonyo Sambu in Arusha.

Information on genetic diversity is scanty. However, available record shows that there are varieties of livestock breeds, with cattle having 10 breeds, two of which are endangered (the Chagga and Mpwapwa cattle). There are also many varieties of crops and forage grasses. Many of these genetic materials are maintained at research stations either nationally or internationally. For example, there are about 21 wild coffee species, 89 accessions of coffee arabica and 1 accession of coffee robusta being maintained at Lyamungo Research Station. In 1988, there were about 164 accessions of rice germ plasm from Tanzania conserved at the International Rice

Germ-plasm Centre. Similarly, about 458 rice (*Oryza sativa*), three *O. glaberrima*, and 20 wild rice accessions from Tanzania were deposited in the genetic resources unit of the International Institute for Tropical Agriculture based in Nigeria.

The country is also rich in terms of forage germplasm. Unfortunately, only limited collection has been undertaken.

3.5 Threats to Bio-diversity

Tanzania's biological diversity is generally, threatened. Many of the people in Tanzania depend on biological resources, and the limited opportunities for socio-economic development have continuously put pressure on these resources. Human activities, especially agriculture, have destroyed many habitats and fragmented others, posing a serious threat to the survival of many species, including Annelids and Arthropods.

Human activities, such as agriculture and felling of trees for fish curing, fuel-wood and timber, are big threats to forests. Deforestation is on the increase, resulting in the decline of forest and woodland heritage. The Amani forest in eastern Usambara, for example, has been reduced to 50%. In the moist forest mosaic, the Busenyi forest, which has undergone extensive wood cutting, has been reduced to a stunted forest devoid of birds life, and containing only a few species of butterflies, most being open country species. The Kagera River forests though a part of the Ibanda/Rumanyika Game Reserve, are also under threat from wood fuel gathering and logging activities.

Coastal forests have also disappeared at an alarming rate, mainly as a result of agriculture, pit-sawing, charcoal production and mining of salt, limestone, beach sand and hydrocarbons. Large areas of mangrove forests have been cleared in preparation of salt pans, destroying fish breeding areas as well as other organisms, such as birds. Other activities, such as lime making and sand extraction, are not only destroying the breeding areas for marine species but are also causing beach erosion. The loss of coastal forests and their fragmentation has in turn led to the concentration of a variety of endemic species in a very restricted area. For example, the blue dwarf gecko (*Lygodactylus williamsi*) is found only on *Pandanus* stems in Kimboza Forest Reserve. The expanding settlements have been encroaching on wildlife habitats, reducing their size considerably, and threatening the existence of certain animals. For example, the African elephant and black rhinoceros, though still found in some coastal forests, are believed to be in danger of extinction.

Poaching of animals for meat and trophy, particularly in the protected areas and loss as well as fragmentation of wildlife habitats pose another major threat to biological diversity. Elephants and rhinoceros have, particularly, been very vulnerable to poaching. Consequently, the black rhinoceros has been reduced to less than 300 animals, mainly in Selous and Mikumi National Parks. Tanzania is also in danger of losing the elephant as a species of significant commercial value. Other threatened or endangered animal species include Ader's duiker which is restricted to eastern Zanzibar, the Abbot's duiker which occurs in the forests of Kilimanjaro and the Eastern Arc mountain chain, and some bird species, such as Uluguru bush shrike, Sokoke pipit, Sokoke scops owl and long-billed apalis. At least one species of antelope, the Ugandan kob, has become extinct in the area that it was found in Tanzania, but the species is found elsewhere.

Human activities are also threatening the aquatic resources. Dynamite fishing is not only destroying coral reefs, which are important breeding grounds for many fish and other marine species but is also destroying non-targeted fish species. Use of toxic agro-chemicals and beach seines in fishing have also contributed to the loss of bio-diversity, particularly in Lake Victoria. While the introduction of Nile perch, a piscivorous species in the lake has led to the disappearance of several indigenous species, the habit of some fishermen to catch fish at the river mouths has considerably affected the population of some species, such as *Labeo sp.*

The bio-diversity of wetlands is also threatened by pollution generated from industrial and domestic wastes as well as agro-chemicals from farmland. It is estimated that agriculture, industries, mining and settlement contribute to 70-80% of aquatic pollution and pose a major threat to bio-diversity. The loss of bio-diversity has recently been exacerbated by the infestation of the water hyacinth in Lake Victoria.

It is evident that many aspects of development in Tanzania pose a threat to the future existence of individual species and ecosystems. There is, therefore, an urgent need to implement measures to conserve bio-diversity. Tanzania has every reason to conserve her bio-diversity. Preserving genetic resources for both present and future use is both scientifically and economically important. In addition, many plants, animals and their habitats are the basis of the tourism industry, which has the potential of being the largest foreign exchange earner in the national economy. Also, many ecosystems have cultural values and represent part of the national heritage that is important to conserve for coming generations.

4.0 Implementation of the Convention on Biological Diversity in Tanzania

Tanzania has, for a long time, been committed to conserving her biological resources and the environment. Since colonial times protected areas, including national parks, game reserves and forest reserves were established for the protection of both plants and animals. Unfortunately, local people were prohibited from utilizing the resources in these areas. Various other measures were also implemented to conserve the environment, including soil and water conservation programs such as HADO, HASHI and SECAP.

The need to integrate environmental issues into the planning and decision-making process led to the establishment of the National Environment Management Council in 1983 as an advisory body to the government in environment matters. This was followed by the establishment of the Division of Environment in 1990 under the Ministry of Tourism, Natural Resources and the Environment, and later elevated to the Vice President's Office in 1995. In 1989, Tanzania prepared the Tanzania Forestry Action Plan (TFAP) as an important step in strengthening the country's efforts towards sustainable management of her natural resources. The TFAP addressed such issues as sustainable land husbandry, community and farm forestry, forest management, bio-energy development, forest industries, bee-keeping, wildlife management and conservation of ecosystems and bio-diversity.

Since the signing of the Convention in June 1992, Tanzania has taken various measures to implement the different Articles. Of particular importance is Article 6 of the Convention that calls on Contracting Parties to develop national strategies, plans and programs for the conservation and sustainable use of biological diversity, and for integration of conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programs and policies.

4.1 Article 6 General Measures for Conservation and Sustainable Use

These following measures have been undertaken to implement this article.

- developing a framework for integration of environment and development in decision making and conservation of the environment
- review of sectoral policies and legislation
- planning for protected area network and identification of priority areas for conservation.
- conservation strategies, plans and programs

4.1.1 Integration of Environment and Development in Decision Making

In order to integrate issues of environment and development in decision making and conservation of the environment, Tanzania has taken the following measures:

- **Department of Environment.**

The Department of Environment, formerly under the Ministry of Tourism, Natural Resources and Environment, was elevated to the Office of the Vice President. This has been done to

ensure that it performs its functions of environmental research, environmental policy making, environmental planning and monitoring, as well as environmental coordination of both national and international issues more effectively than before.

- **National Conservation Strategy for Sustainable Development (NCSSD).**

The National Conservation Strategy was formulated and approved by the government in 1994. The strategy is a framework for integrating development and conservation, bearing in mind that rational resource use will lead to sustainable development, and is multi-sectoral in nature. It seeks to involve government agencies, non-governmental organizations, private sector and the community at large in the management and conservation of the environment.

- **National Environmental Action Plan (NEAP).**

The plan, approved by the government in 1994, seeks, among other things, to:

- integrate the environmental policy and the conservation strategy into the planning process,
- involve stakeholders in environmental management,
- promote environmental education and public awareness
- promote research and technology initiatives
- evolve and strengthen a national environmental information system
- promote environmental impact assessments
- guide the development of a framework environmental legislation
- prepare a long term investment plan to address major environmental concerns.

- **National Environmental Policy.**

The policy, only recently approved by the government, provides a framework for making fundamental changes that are needed to bring environmental considerations into mainstream decision making in Tanzania. It also provides policy guidelines and plans, and gives guidance to the determination of priority actions for monitoring and regular review of policies, plans and programs. Furthermore, it provides for sectoral and cross-sectoral policy analysis, thus exploiting synergies among sectors and interest groups.

- **National Environmental Legislation**

A national workshop on the formulation of a framework environmental legislation and review of sectoral laws was held in September 1995. Already, the Division of Environment has begun work to prepare a comprehensive national environmental legislation.

4.1.2 Review of Sectoral Policies and Legislation

Initiatives have been undertaken by various sectoral ministries to review, up-date and revise their policies and laws and, where necessary, formulate new policies and laws in order to address issues of sustainability and environmental conservation. To-date, the following have been achieved:

- The Marine Parks and Reserves Act (No. 29) was enacted in 1994, which established the Mafia Island Marine Park. The Act aims *inter alia*, at the protection, conservation and restoration of species and genetic diversity of living and non-living marine resources and ecosystem processes of marine and coastal areas.

- Forestry sector review – the Forest Policy has been reviewed and a new Forest policy was produced in 1998. The overall goal of the revised policy is to enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of her natural resources for the benefit of present and future generations. Thus aspects of conservation of biological diversity have been incorporated. In addition, a Bee-keeping Policy has been prepared and it was also approved in 1998. The overall goal is similar to that of the revised Forest Policy. Furthermore, the Forest Ordinance Cap. 389 has been amended to include, among other things, reservation of key areas for biological conservation as strict nature reserves. This has led to the establishment of Amani Nature Reserve under the Forests Ordinance (Amani Nature Reserve Declaration) Order, 1997.
- Wildlife sector review – a comprehensive review of the sector was undertaken by the Wildlife Department with support from the World - Wide Fund for Nature (WWF) and completed in 1995. This led to the drafting of a Policy for Wildlife Conservation that was formerly approved in early 1998, and revising the National Policy on Tourism. The Wildlife policy addresses issues of conservation of biological diversity and, involving communities in the management of wildlife and sharing the benefits. In addition, The National Parks ordinance is being reviewed with technical assistance from the Food and Agriculture Organization (FAO).
- Land Management – the new Land Policy was formulated and adopted in 1995. The policy addresses the challenges facing the land-based environment like wetlands, valleys, wildlife migration corridors and buffer zones. The Ministry responsible for Lands is currently translating this policy into legislation.

4.1.3 Protected Area Network and Priority Areas for Conservation of Biological Diversity

The Convention on Biological Diversity states that planning for the conservation of natural (as opposed to agricultural bio-diversity) should have two broad requirements:

- a) planning for existing protected areas, to ensure that the biological diversity within them is not eroded and that any use is carried out sustainably;
- b) planning for additions to the protected area network to ensure that biological diversity not yet included within any category of protected area, becomes adequately represented.

Already work has been done in this area. A National Policy for National Parks has been formulated by Tanzania National Parks (TANAPA) and approved in 1994. The policy focuses on issues of planning, natural and cultural resources management, use of parks, outreach, extension and benefit sharing, tourism and concessions, public information, interpretation and education, and wilderness preservation among other things. TANAPA has also prepared and approved plans for specific protected areas, including Serengeti, Kilimanjaro and Tarangire National Parks. Those in advanced stages of preparation include Maswa, Ugalla and Selous Game reserves. The plans provide guidelines on how to manage the resources both within and outside the parks, and how benefits should be shared with the local communities around the parks.

Community Conservation Service Strategic Action Plans are also being prepared for all national parks to guide the sharing of benefits with local communities around the national parks. Plans

that have been completed are for Tarangire, Gombe Stream, Ruaha and Udzungwa national Parks. The Mikumi National Park plan is still in draft.

Planning for additions to the protected area network is underway. Already, there have been notable additions or upgrading of status in recent years, and others are in the offing. For example, Udzungwa Forest Reserve was upgraded to National Park status in 1992. Similarly, Pande Forest Reserve has been upgraded to a game reserve. Mafia Island National Park was added to the network in 1994.

Five ecologically sensitive areas have been identified nationally as areas that require proper management and protection. These include areas that provide critical habitats for breeding, feeding and protection of threatened or rare species, regulate and purify water flow, provide protection of steep slopes, have inherently low productivity, and are vulnerable and susceptible to damage. The identified areas are coastal forests, protected areas, semi-arid areas, catchments forests, wetlands and coral reefs.

4.1.4 Conservation Strategies, Plans and Programs

A number of strategies, plans and programs have been developed for the conservation of biological diversity in Tanzania. The bio-diversity conservation programs aim to meet one of the following objectives:

- Strengthening and improving the capacity to manage and conserve bio-diversity through research and training;
- Restructuring and/or rehabilitating depleted terrestrial or aquatic habitats;
- Creating and promoting general awareness about Tanzania's ecosystems, the species they contain and the benefits they bring;
- Enhancing participation of local people especially those living near ecosystems in the conservation program;
- Promoting sustainable utilization of natural resources.

Strategies and plans

Management plan for the Mangrove Ecosystem

The plan was formulated by the Forest and Bee-keeping Division. It addresses such issues as conservation values of the mangrove ecosystem, recognition of the close relationship between the mangroves and human communities, the need to control commercial exploitation for poles and salt production and the use of mangroves as fuel-wood. Other issues addressed are the negative practices of rice farming in the mangroves of the Rufiji Delta, the interdependence of the mangrove ecosystem on both inland and marine environments, and the value of clearly defined mangrove management zones with different uses and management strategies.

Strategy for the conservation of coastal biological diversity of mainland Tanzania.

A study on strategies for the Conservation of Coastal biological Diversity for Tanzania Mainland was done by the Center for Energy, Environment, Science and Technology under the auspices of the Division of the Environment and funded by the World Bank. Subsequent to that, a strategy was formulated to provide guidelines for the conservation coastal biological diversity. It identified such strategies as in-situ and ex-situ conservation, sustainable use of components of biological diversity, incentive measures, research and training, public education and awareness and lastly, monitoring and follow-up.

Conservation Programs

The following programs have so far been implemented:-

(i) Lake Victoria Environmental Management Program

The five-year program is a joint initiative of the three East African countries, that is Kenya, Uganda and Tanzania, for the environmental management of Lake Victoria. Its objective is to strengthen coordination in the management of the lake resources, including fisheries management, control of water hyacinth, management of water quality and land use, including wetlands. Formulation of the program was completed in December 1995. However, implementation started only in March 1997. This is the first phase of the program and is funded by World Bank and Global Environmental Facility (GEF). The allocated funds for the project in Tanzania are 30.9 million US dollars, which is 37% of the total project funds.

(ii) Lake Malawi/Nyasa Bio-diversity Project

This is joint program between Malawi and Tanzania and is financed by GEF and SADC. Its overall goal is to develop an integrated management plan for the management of Lake Malawi/Nyasa resources, involving protection of both the fisheries and of bio-diversity. The project also aims at capacity building.

(iii) Lake Tanganyika Bio-diversity and Pollution Control Project

The project started in August 1995, with the aim of controlling pollution and preventing the loss of the exceptional diversity of Lake Tanganyika. It is a five year project jointly executed by the riparian states of Burundi, Democratic Republic of Congo (Zaire), Tanzania and Zambia. The project is funded by UNDP/GEF to the tune of 10 million US dollars.

(iv) GEF/UNDP Bio-diversity Project on Institutional Support for the Protection of East African Bio-diversity

This was a joint project with Kenya and Uganda, and it ran from 1992 to 1996. The aim of the project was to support institutions to develop their own capabilities for conservation of biological diversity in East Africa, in other words, capacity building. Under this project, the bio-diversity, wetlands and environmental information units were established within NEMC. A number of institutions, including the University of Dar es Salaam (Institute of Resource Assessment, Botany and Zoology Departments as well as the Library), Sokoine University of Agriculture, The Wildlife Conservation Society of Tanzania and NEMC also received support to undertake research on bio-diversity in coastal forests. Research projects undertaken focused on socio-economic aspects, mapping of resources and land use change, hydrological aspects and bio-diversity issues around Pugu hills and Kazimzumbwi forests. Support was also given to train 3 PhD and 3 Msc students in the departments of Zoology and Botany, respectively, and to establish a data-base for terrestrial vertebrate species in the Zoology Department.

(v) Bio-diversity Country Study

The country study was undertaken between 1995 and 1996 under financial support from UNEP and was coordinated by NEMC on behalf of the government. The overall goals of the project were:

- To gather and analyze biological, economic and social data that would provide a basis for preparing the national bio-diversity strategy and action plan
- Initiate a process for improved bio-diversity planning that would stimulate the necessary action at national level to implement the Convention on Biological Diversity

The project covered Tanzania Mainland only and the report is currently being revised.

(vi) Reducing Bio-diversity Loss at Cross – Border Sites in East Africa

This is a five – year project jointly undertaken by Kenya, Uganda and Tanzania. The project, which started in at the end of 1997 is being executed by NEMC. The primary goal of the project is to conserve biological diversity. However, the project also aims at capacity building and training. The project is being funded by GEF/UNDP at a total cost of 13.8 million US dollars, and is expected to cover Bukoba, Monduli and Same areas.

(vii) Conservation of Coastal Forest Bio-diversity in East Africa

This is a 2-3 months GEF/UNDP funded project being executed by NEMC in collaboration with the Forest and Bee-keeping Division, Ministry of Tourism and Natural Resources. The primary goal of the project is improved and sustainable conservation of East African coastal forests and empowering local people to have a greater stake in sustainable forest resource utilization. Specifically, the project would review the bio-diversity of the forests, examine the threats, review ongoing and planned conservation programs and consult with local communities. The project was expected to start at the end of 1997. Kenya and possibly Mozambique would also participate in the project.

(viii) NORAD/UNDP Capacity Building Project

This project is being implemented by the Vice President's Office, through the Division of Environment. Activities under the project include preparation of a national framework environmental legislation, preparation of Environmental Impact Assessment guidelines, training of personnel and follow-up activities in the implementation of international conventions, including the Convention on Biological Diversity.

(ix) Environmental Law and Institutions in Africa

The project is being implemented jointly by Kenya, Uganda and Tanzania under financial support from UNDP/UNEP. It aims at the review and harmonization of legislation related to forestry, wildlife, environmental impact assessment, management of Lake Victoria, management of hazardous wastes, and the formulation of environmental standards.

(x) Biological Diversity and Conservation in the Eastern Arc Mountains

This project started in 1996 with financial support from GEF. Its aim is to conserve bio-diversity in the Eastern Arc Mountains, particularly in Udzungwa Mountains, and capacity building. Various studies have been undertaken under this project by the Botany and Zoology Departments of the University of Dar es Salaam. Two PhD and six M.Sc. students from the two departments have been/are being trained by the project. Other institutions involved in the project are TAFORI, and the University of Copenhagen.

(xi) Participatory Environmental and Natural Resources Management Project

This project is implemented with financial support from the US Agency for International Development and it aims at strengthening local capacities in managing the environment. The five-year project (1997- 2000) was supposed to assist the government, NGOs, the private sector and individuals to identify and implement community – based natural resource management programs, based on indigenous knowledge, practices and experience.

Implementation of the project has started, and among the projects supported under this program are:

(a) Partnership for Bio-diversity

This is an initiative aimed at promoting bio-diversity conservation through the joint efforts of USAID, the US Department of the Interior and US Peace Corps. It is a three year project aimed at providing technical assistance and training to TANAPA and wildlife Division in order to strengthen protected area management, with a particular focus on improved law enforcement. The project focuses on Tarangire and Lake Manyara National Parks as well as Ugalla Game Reserve. Components of the project include assessment of law enforcement capacity, improvement of visitor services for Tarangire and Lake Manyara National Parks and demarcation of hunting concessions. Other institutions involved in this project are AFRICARE who undertake the lead in community-based issues in Ugalla Game Reserve, and African Wildlife Foundation (AWF) who are working on community-based issues in Lake Manyara.

(b) Coastal Management in Tanzania

This is a partnership project undertaken by NEMC and the University of Rhode Island Coastal Resources Centre, and is funded also by USAID. The aim of the project is to ensure sustainable use of coastal and marine resources. Four projects are currently being implemented. These are:

- Tanga Coastal Management Program - a pilot project working at the district and village levels to address critical coastal management issues, such as dynamite fishing and development of alternative sources of livelihood
- Kunduchi Integrated Coastal Area Management - this project has completed an extensive listening phase and has identified priority issues of concern. These include coastal tourism development, erosion and dynamite fishing
- Mafia Island Marine Park – the project aims at working with local communities to revise the park management plan and operationalise the park management council.
- Rural Integrated Project Support – the project is being implemented in Mtwara and Lindi and is working with coastal communities to reduce dynamite fishing and raise awareness about the importance of coastal resources.

(xii) Coastal Forest Project

The project is being implemented by the Wildlife Conservation Society of Tanzania with the aim of conserving threatened coastal forests. The project operates in Coast Region (Kisarawe and Bagamoyo) and Lindi Region. The Kisarawe project is financed by the European Union while the others are financed by the Swedish Society for Conservation of Nature. The Society is also involved in a two-year project (Birdlife International) aimed at identifying the important endemic bird areas of Tanzania within an Africa – wide program. This project is part of the Global Partnership for Bird Conservation.

(xiii) Community Conservation Service (CCS)

TANAPA is implementing a CCS program aiming at involving local communities around the national parks in conservation of resources within and outside the parks, and sharing benefits accrued from park use. Each park has a CCS unit established. Communities around the parks have already benefited from the project through, for example, water and health clinic/hospital projects that have been implemented by TANAPA. Since 1995, WWF has been assisting TANAPA to expand the CCS in Udzungwa National Park to further integrate local communities into park management systems. WWF is also supporting community agro-forestry program in the park.

(xiv) Conservation of Lowland Coastal Forests

The project is implemented by the Forestry Department. Since 1996, WWF has been supporting conservation of forests in Zaraninge, Vikindu, Kazimzumbwi and Matumbi Hills in Coast Region, and Mbola forest in Mafia Island. The aim of the project is to protect the forests and develop sustainable alternatives to the current over-exploitation of forest resources.

(xv) Environmental Education and Awareness

WWF has an environmental education program which aims to develop public awareness of environmental issues through formal and informal means, and to encourage people to take part in environmental conservation activities. The program is being implemented by various institutions within Tanzania, including schools, colleges, TANAPA, Wildlife Conservation Society and others, while WWF plays the role facilitating and coordinating.

TANAPA is implementing environmental education programs in Udzungwa and Tarangire National Parks, with the aim of sensitizing communities around the park on the need to conserve biological diversity. The Wildlife Conservation Society of Tanzania also runs a similar program to sensitize communities living around coastal forests on the need to conserve these forests.

AGENDA, in collaboration with the International Centre for Conservation Education based in UK are undertaking a two-year project to print low-cost bio-diversity education materials to help conserving protected areas and endangered species. In order to facilitate this, they have recently launched a Darwin Publishing Unit. The project is supported by UK Darwin Initiative.

(xvi) Catchment Forestry project

The first phase of the project, which started in 1988 did not address issues of bio-diversity. The second phase, however, has given priority to conservation of bio-diversity and benefit sharing. The overall objective of the phase two project is to improve the management of catchment forest cover and sustainable utilization of the forests. The project is being supported by NORAD, and it operates in Arusha, Morogoro, Tanga and Kilimanjaro Regions. Another component of the project is the Mangrove project that aims to protect and conserve the mangrove habitat with local people's participation, and sustainable utilization.

(xvii) Mafia Island Marine Park Project

This is a WWF supported project that seeks to conserve the resources and ensure sustainable utilization. It is a community-based project that works with Mafia communities to improve management practices and decision making links, strengthening participation of the Mafia community, consolidating infrastructure and staff, and providing a day-to-day management framework for the park. It aims to maintain ecosystem processes and bio-diversity for the benefit

of the people, and to develop economic activities to reduce pressure on the parks ecosystem, while ensuring that all natural resources within the park are used sustainably.

(xviii) Plant genetic Resources Centre

This is a project under the Ministry of Agriculture, responsible for conservation and utilization of plant germ - plasm of cultivated crops and wild plants. In response to the Convention on Biological Convention, the project is committed to explore ways of recognizing farmers' contribution to conservation, improve plant genetic resources and develop a system for exchange of plant genetic resources. The centre is part of the SADC Network of Plant genetic Resource Centre.

(xix) National Tree Seed Programme

The programme, based in Morogoro is involved with the establishment, management and improvement of important tree seed sources for production of high quality seed. It also deals with conservation of genetic materials of mainly indigenous trees. It has, since 1992, collected about 2500 kg of seeds from indigenous species, including endemic and threatened species, in the Eastern Arc Mountains.

(xx) Community – Based Conservation Project

The project was started in 1992 by the Tanzania Forest Conservation Group, an NGO registered since 1985. The aim of the project is conserve forests of high biological diversity. It is undertaken in three of the Eastern Arc Mountains in forest edge communities to promote community involvement in the management of the forests. The components of the project are: Kambai Forest Conservation Project, East Usambara Lowlands Lulanda Forest conservation Project, Southern Udzungwa Mountains Ngulwi Afforestation Project and West Usambara Mountains.

4.2 Implementation of Other Articles of the Convention

Article 5 Cooperation

This article calls upon each Contracting Party to cooperate with other Contracting Parties directly or through competent international organizations in respect of areas beyond national jurisdiction and on other matters of mutual interest, for the conservation and sustainable use of biological diversity. Tanzania is cooperating with Kenya and Uganda on the management of Lake Victoria. She is also implementing jointly with them various other bio-diversity programs and projects, such as Environmental Law and Institutions, Reducing Bio-diversity Loss at Cross Border Sites, Conservation of Coastal Forest Bio-diversity in East Africa, and Institutional Support for the Protection of East African Bio-diversity.

Another area of cooperation is the Lake Tanganyika Bio-diversity and Pollution Control Program that is jointly implemented by Tanzania, Burundi, Democratic Republic of Congo (Zaire) and Zambia. Tanzania is also working with Malawi on the Lake Malawi/Nyasa Bio-diversity Project, and has been collaborating with various international organizations, such as IPGRI, CIMMYT, ICRAF, ICRISAT, IITA and IRRI, in conservation of germplasm, research and training.

Article 8 In-situ Conservation

The article calls upon each Contracting Party to establish a system of protected areas or areas where special measure need to be taken to conserve biological diversity. It seeks to ensure conservation and sustainable use of bio-diversity to maintain viable populations of species in natural habitats.

Tanzania had, long before the Convention, established a Protected Area Network consisting of national parks, game reserves, game controlled areas and forest reserves for purposes of conserving natural resources and species conservation, including threatened and endangered species. In addition a number of institutions, such as the Forestry, Wildlife and Fisheries Departments in the Ministry of Tourism and Natural Resources, TANAPA, TAFIRI, TAFORI and the National Tree Seed Programme have also been involved with in-situ conservation of resources.

Tanzania has strived to use the existing institutions, including government departments, institutions, NGOs and private sector to implement this Article of the Convention. The protected area network is being expanded, policies and legislation are being reviewed in order to effectively address issues of bio-diversity conservation, and action plans and strategies are being formulated for the bio-diversity conservation.

Article 9 Ex-situ Conservation

The article calls for all Contracting Parties to adopt measures for the ex-situ conservation of components of biological diversity and establish as well as maintain facilities for ex-situ conservation of and research on plants, animals and microorganisms, in country of origin of genetic resources. Tanzania has established the Plant Genetic Resources Centre in order to conserve and utilize plant germplasm of cultivated crops and wild plants. There are a number of agricultural research stations, such as Lyamungo Coffee Research Station, Uyole, Mbeya and Ukiriguru Research Stations, among others, who undertake research on agricultural crops and are conserving various accessions of germplasm. The Department of Horticulture at Sokoine University of Agriculture has also established farms and gardens to protect different species from extinction. The department has also been active in collecting germplasm of, for example, indigenous vegetables, bananas and other annual plants. In relation to forestry, ex-situ conservation is done by the National Tree Seed Programme, TAFORI, the National Herbarium and other training and research institutions.

Article 12 Research and Training

The article calls for the establishment and maintenance of scientific training and research programs related to conservation and sustainable use of biological diversity and its components. There are a number of training and research institutions that are involved in the implementation of this article. These include, the University of Dar es Salaam (Institute of Resource Assessment, Geography, Botany and Zoology Departments, and the Institute of Marine Sciences), Sokoine University of Agriculture (Faculties of Forestry and nature Conservation and Agriculture), Commission for Science and Technology, College of African Wildlife Mweka, TAFORI, TAFIRI, Serengeti Wildlife Research Institute, and Tanzania Pesticides Research Institute. Many of these institutions, however need to be strengthened in terms of capacity building to enable them effectively fulfill their functions and responsibilities.

Studies related to bio-diversity conservation have been funded by DANIDA, the World Bank, FINNIDA, SIDA-SAREC, GEF/UNDP, NORAD, WWF, and many other international organizations. Some of the major bio-diversity research programs and projects include:

- **Ecology, Conservation and Natural Forests and Bio-diversity** with 7 different projects (TAFORI)
- **Bio-diversity Surveys of East Usambara Forests** (Frontier Tanzania, TAFORI, East Usambara Catchment Forest Project and the University of Dar es Salaam)
- **Inventories of Coastal Plant Communities** (Institute of Marine Sciences, University of Dar es Salaam.
- **Inter-linkages Between Eastern African Coastal Ecosystems** (IMS, Kenya Marine Sciences, Kenya Fisheries Research Institute, University of Eduardo Mondlane Mozambique, Stockholm University, Netherlands Institute of Ecology, Free University of Belgium and University of Portugal)
- **Biological Diversity and Conservation of Eastern Arc mountains** (University of Dar es Salaam, Danish Centre for Tropical Bio-diversity, University of Copenhagen).

Article 13 Public Education and Awareness

The article calls upon all Contracting Parties to promote and encourage understanding of the importance of conservation of biological diversity. WWF has been in the fore-front in supporting and coordinating environmental education programs in the country. Such programs are being implemented by such organizations as TANAPA, Wildlife Conservation Society of Tanzania, NEMC and AGENDA, among others. AGENDA is also currently collaborating with an international organization in developing educational materials for bio-diversity conservation.

Article 14 Impact Assessment and Minimizing Adverse Impacts

This article calls for introduction of appropriate procedures requiring environmental assessment of proposed projects that are likely to adversely affect biological diversity. The Vice President's Office, through the Division of Environment and NEMC are preparing Environmental Impact Assessment Guidelines that will be followed in assessing the environmental effects of various projects. The National Environmental Policy has also addressed itself to this requirement.

5.0 Concluding Remarks

Conservation and sustainable utilization of biological diversity is a major challenge to all countries of the world striving to achieve sustainable development. Bio-diversity is central to sustainable development. The earth's biological resources are vital to humanity's economic and social development. Bio-diversity is an asset of tremendous value to present and future generations.

Tanzania is aware of the inseparable relationship between conservation and economic development. She is aware that conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of her people. The survival of the nation very much depends on how well the biological resources are managed and utilized. Tanzania is, therefore, responding to the above challenge, and will continue with the process of integrating conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programs and policies. She will also continue to develop strategies, plans and programs for the conservation and sustainable use of bio-diversity in order to balance the long-term needs and short-term requirements of the nation.

Tanzania is, however, constrained by a number of factors as she strives to achieve the objectives of the Convention on Biological Diversity. Despite her efforts to implement policies, plans and programs geared towards conservation of bio-diversity, Tanzania is faced by a problem of enabling environment to achieve the desired goals. The country appreciates the GEF and other donor support she has been receiving for capacity building and implementation of the various conservation programs. There is, however, need for more support in the form of technology transfer and funding for capacity building to create a more enabling environment for bio-diversity conservation. The capacity of NGOs need to be built and strengthened, since they play an important role in managing the environment and spearheading community-based programs. Involvement of local communities in conservation of bio-diversity and benefit sharing is key to the success of Bio-diversity Convention.