Sierra Leone Government

GOVERNMENT OF SIERRA LEONE
MINISTRY OF TRANSPORT AND AVIATION

National Adaptation programme of Action (NAPA)

Final Report
December, 2007

Foreword

The Government of Sierra Leone has recognised that climate change related disasters such as flooding, drought, coastal erosion, deforestation and biodiversity loss etc. are natural phenomena aggravated by human activities including the emission of green house gases. Damage and losses from such disasters are however the consequence of human action.

The National Adaptation Programme of Action (NAPA) for Sierra Leone has been prepared by the Ministry of Transport and Aviation (MTA), as a response to the decision of the Seventh Session of the Conference of the Parties (COP7) of the United Nations Framework Convention on Climate Change (UNFCCC). The preparation process has followed the generic guiding principles outlined in the NAPA annotated Guideline according to the project coordinator. The whole preparation process was guided by the high powered Project Steering Committee headed by the Chairman, Director of the Environment, of the Ministry of Lands, Country Planning and the Environment. The basic approach to NAPA preparation was in consonance with the sustainable development goals and objectives of the country where it has recognized the necessity of addressing environmental issues and natural resource management with the participation of stakeholders.

The NAPA document drew on other multilateral environmental agreements prominent amongst which are:

The United Nations Convention on Biological Diversity (UNCBD)
The United Nations Conventions to Combat Desertification (UNCCD)
The United Nations Framework Convention on Climate Change (UNFCCC), all of which Sierra Leone is a party.

The NAPA document also benefited from a number of studies conducted throughout the country in order to obtain information on poor people's experiences with disasters such as flooding, coastal erosion, drought/dry spells etc. These studies helped to identify coping mechanisms by vulnerable communities and to identify institutions that provide assistance in cases of such natural disasters and suggest ways by which affected people can be assisted as well as strategies that can be adopted in order to adapt to the adverse effects of climate change.

The NAPA document has been prepared with the main objective of identifying the urgent and immediate adaptation needs of Sierra Leone to adapt to the adverse effects of climate change.

It is a pleasure for the Government and people of Sierra Leone to submit this document to the United Nations Framework Convention on Climate Change (UNFCCC) for funding and expects that the implementation of the projects which has been identified in the NAPA document will commence soon.

Minister
Ministry of Lands, Country Planning and the Environment

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Ministry of Lands and Country Planning
Ministry of Agriculture and Food Security
Ministry of Energy and Power
Ministry of Health and Sanitation
Ministry of Education, Science and Technology
Ministry of Marine Resources
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Holy Rosery Secondary School
Ahmadiyya Secondary School
Department of Forestry
Department of the Environment
Local Unit Police Commander
Representatives of the Private Sector
Representative of NGOs
Representative of CBOs

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ACRONYMS AND ABBREVIATIONS

APF	UNDP-GEF'S Adaptation Policy Framework
CHECSIL	College of Human Ecology in Sierra Leone
GDP	Gross Domestic Product
GEF	Global Environment Facility
IMBO	Institute of Marine Biology and Oceanography
IPCC	International Panel on Climate Change
IST	Interdisciplinary Sector Team
LDC	Least-Developed Countries
LEG	LDC Expert Group
MDGs	Millennium Development Goals
MEA	Multilateral Environmental Agreements
MLCPE	Ministry of Lands, Country Planning & Environment
MW	Megawatts
NaCEF	National Commission for Environment and Forestry
NAPA	National Adaptation Programme of Action
NBSAP	National Biodiversity Strategy and Action Plan
NCSA	National Capacity Self-Assessment
NCSU	National Communication Support Unit
NEAP	National Environnemental Action Plan
NEPB	National Environnemental Protection Board
NGO	Non-Governmental Organization
NPC	National Project Coordinator
POP	Persistent Organic Pollutants
PSC	Project Steering Committee
TAR	Third Assessment Report
UNDP	United Nations Development Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention for Climate Change
UNICEF	United Nations Children's Fund
V&A	Vulnerability and Adaptation

EP	Eastern Polytechnic
EPA	Environmental Protection Act.
SLAJ	Sierra Leone Association of Journalist
ABC/TV	Africa Broadcasting Cooperation Television
SLMB	Sierra Leone Muslim Brotherhood
HRSS	Holy Rosary Secondary School
MMCET	Milton Margai College of Education and Technology
F.B.C.	Fourah Bay College
SLBS	Sierra Leone Broadcasting Service

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Executive Summary

The UNFCCC Process recognizes the specific situation of the LDCs in Paragraph 9 of article 4 of the United Nations Framework Convention on Climate Change (UNFCCC). Moreover, decision 5th of the 7th Conference of the Parties (5/CP.7) recognizes that LDCs do not have the necessary means to deal with problems associated with adaptation to climate change. Finally, Decision 28/CP.7 sets guidelines for the National Adaptation Programmes of Action (NAPAs). These NAPAs will allow LDCs to set priority activities to be undertaken to meet their immediate needs and respond to their most urgent concerns with regards to adaptation to the adverse effects of climate change.

This report contains Sierra Leone's communications on the National Adaptation Programme of Action (NAPA) Project which is a response to the decision of the 7th session of the Conference of Parties.

In the first chapter a background to the National Adaptation programme of Action (NAPA) is provided. It highlights the role of the United Nations Framework Convention on Climate Change UNFCCC process as it relates to Least Developed Countries and to the development of NAPAs. The chapter also outlines the rationale for developing the NAPA and the objective of the NAPA.

The Second chapter contains a description of the Framework for the adaptation programme. It also deals with sectors vulnerable to climate change, climate variability, observed and projected climate change as well as associated actual and potential adverse impacts of climate change. This chapter also looks at the contribution of NAPA to overall sustainable development goals, objective, and strategies.

The third chapter deals with the identification of key adaptation needs. It focuses on the past and present adaptation practices to climate change and climate variability. It also provides a summary of hazards posed by climate and climate change and a summary of vulnerability based on past studies and or from stakeholder contributions. It also highlights the NAPA target sectors and explains their relevance to adaptation plans as well as the process of identifying the key adaptation needs for each of the six sectors.

The fourth chapter addresses the issue of selection of priority activities. **It contains the criteria selection and prioritization of NAPA priority activities, methodology** for scoring each option against a criterion, standardization of scores and weighting of criteria.

The fifth chapter lists the identified sector based priority activities for urgent and immediate adaptation.

The sixth chapter contains project profiles developed from the identified sector based priority activities for urgent and immediate adaptation.

The NAPA preparation process was carried out by synthesizing the vulnerability of the major economic sectors identified by the INC vulnerability and adaptation activities, International, National and local development policies and strategies which include;

Agenda 21, Multilateral Environmental Agreements (MEAs), National Biodiversity Strategy and Action Plan (NBSAP), Vision 2025, Poverty Reduction Strategy Paper (PRSP), National Environmental Policy (NEP), National Environmental Action Plan (NEAP) and the Millennium Development Goals (MDGs) were consulted. Further, Sectoral Action Plans were also consulted. This process involved wide consultations with various stakeholders in the public and private sector organizations, including Local Leaders, Religious and Faith Groups, Academicians, Non-governmental Organizations (NGOs), Civil Society, and highly vulnerable rural communities throughout the country, The identified short list of urgent and immediate needs for adaptation was ranked using multi-criteria (MCA) to arrive at priority adaptation options that require urgent attention in the following sectors: meteorology, agriculture, water, human health, fisheries, coastal and forestry. The suggested urgent and immediate adaptation needs or strategies are as follows:

1 Establishment of National Early Warning System

2 Rehabilitation & Reconstruction of meteorological/climate Monitoring stations throughout the country

3 Capacity building of the Meteorological Department through training of personnel for the country's adaptation to climate change

4 Sensitization and awareness raising campaigns on climate change impacts on women relating to the three conventions of biodiversity, desertification and UNFCCC

5 Development of Inland Valley Swamps for Rice Production in the Moyamba District.

6 Development of an Integrated Natural Resources and Environmental Management programme for Sierra Leone.

7 Development of Irrigation and drainage systems for agricultural production in the Bombali District.

8 Promotion of the use of renewable energy (Solar Energy) in Sierra Leone and improvement of energy efficiency and conservation of energy resources.

9 Establishment of new Forest Reserves, Protected Areas and National Parks in Sierra Leone.

10 Management and Protection of Forest Reserves and Catchment areas in Sierra Leone including Wetlands.

11. Institutional Strengthening of the Water Resources Sector in Sierra Leone.

12 Improvement of energy Efficiency and conservation in order to reduce dependence on firewood and charcoal.

13 Promotion of Rain Water Harvesting and Development of An Integrated Management System for Fresh Water Bodies

14 Development of an Integrated Coastal Zone Management Plan for Sierra Leone.

15 Rehabilitation of degraded coastal habitats in the Northern Province/Kambia district.

16 Development and enactment of appropriate policies and regulations relevant to the development of coastal communities, urban growth planning, and critical coastal ecosystems preservation

17 Establishment of a National Sea-Level Observing System in Sierra Leone

18 Establishment of a Permanent Study Programme of the Multi Species Fisheries in Sierra Leone

19 Delineation and Restoration of Vulnerable Habitats and Ecosystems in the Western Area of Sierra Leone.

20 Improvement in the Quality of Fisheries Related Data and Research

21 Monitoring and control of malaria in the Moyamba district of Southern Sierra Leone.

22 Development of appropriate water and Sanitation program activities in the slum areas of the Western Area of Sierra Leone.

23 Monitoring and control of HIV/AIDS prevention activities in the Koinadugu district, northern Sierra Leone

24. Monitoring, evaluation and control of water and sanitation activities in slum areas of Freetown, the capital city of Sierra Leone.

1.0 Introduction and Setting

1.1 Background

Sierra Leone has been ranked at the bottom of the UNDP's Human Development Index in spite of its rich endowment of resources. The Human Development and social indicators, including illiteracy, primary school enrolments, life expectancy, maternal deaths, and malnutrition and child mortality rates are the worst in the World. The infant Mortality rate is about 182/1000, while life expectancy at birth is 38 years compared to 45 years of sub-Saharan. Africa The adult literacy rate is estimated at 30%, while the population with access to safe drinking water is 34%. Endemic diseases, especially malaria and HIV/AIDS, loom as a menace. Nearly four-fifth of the population lives in absolute poverty, with expenditures below 1US$ a day.

The level of scientific and technological development in Sierra Leone is extremely low when compared with other developed countries. The many advances in S & T have had little or no impact on the pressing problems of the country. The country's development primarily depends on the quality of its man-power which is acquired through education and training at all levels and the ability of the country's capacities to motivate that manpower achieve optimal in terms of quality performance.

The decade old rebel war has had a devastating impact on all facets of the economy, destroying Government's ability to adequately meet the needs of the nation. Against this background, the development of human and natural resources is proving a daunting task without adequate financial support especially in the light of the negative impacts of climate change.

The government of Sierra Leone has adopted short-term development plans based on the Millennium Development Goals (MDGs), the Poverty Reduction Strategy Paper (PRSP), the vision 2025 Sierra Leone document and a series of action plans which are project (short-term) driven. These development (sectoral) plans constitute baseline development strategies which have not taken onboard stresses that can be created by climate change. These stresses or shocks that may result in the rupture in developmental trends are what are being catered for by the NAPA project. This report also contains priority activities and projects which are to be undertaken to enable Sierra Leone meet its immediate needs and respond to her most urgent concerns with regards to adaptation to the adverse effects of climate change.

Sierra Leone has been identified by the United Nations as one of the fifty Least Developed Countries (LDCs). Her economic and social development factor poses a major challenge to development and makes the country vulnerable to many national and international pressures efforts to improve the quality of life of its people have been hampered by extreme poverty, structural weakness in the economy, civil conflict and the lack of capacity weaknesses related to growth and development. All these can be further aggravated by the negative impacts of climate change.

The UNFCCC Process recognizes the specific situation of the LDCs in Paragraph 9 of article 4 of the United Nations Framework Convention on Climate Change (UNFCCC). Moreover, decision 5^{th} of the 7^{th} conference of the parties (5/CP.7) recognizes that LDCs do not have the necessary means to deal with problems associated with adaptation to climate change. Finally,

Decision 28/CP.7 sets guidelines for the National Adaptation Programmes of Action (NAPAs). These NAPAs will allow LDCs to set priority activities to be undertaken to meet their immediate needs and respond to their most urgent concerns with regards to adaptation to the adverse effects of climate change.

1.2 Location of Sierra Leone in Africa

Sierra Leone has an area of 72,325 km^2 between latitudes $6^0$55' and $10^0$00' North and between longitudes $10^0$14' and $13^0$17' West. The coastal zone of Sierra Leone extends for a distance of about 465 km. The configuration of the coastline and international boundaries of Sierra Leone encloses a very compact country. Sierra Leone is bordered in the northeast by the Republic of Guinea, in the south and southeast by the Republic of Liberia and in the west by the North Atlantic Ocean (Fig.1.1).

Figure 1 Location of Sierra Leone in Africa

1.3 Climate

Sierra Leone has a tropical climate with two distinct seasons. The Dry Season (December to April) is dominated by winds from the northeast (i.e. the North-east trades), and the rainy season (May to November). Both seasons may have some variations in the commencement and duration. The temperature is characterized by high temperatures with an average monthly temperature of between 26 – 28^{o}c from June to October with a maximum temperature of 32^{o}c. Temperatures of up to 36^{o}c have been recorded during the month of March. A minimum temperature of 20^{o}c has also been recorded high solar radiation and long sunshine hours throughout the year are also characteristics of the regime.

Air humidity as high as 80-90% is observed during the dry season and decreased to 70 – 80% during the rest of the year.

The visibility is obstructed by mist ad haze, the frequency of occurrence is from December to February during the harmattan season. For most part of the year the evaporation is high excepted during the months of July, August and September.

1.4 Demographic Situation

The population of the country is about 4,976,872 based on the 2004 national census. Growth of Sierra Leone's population has been positive although a decline is recorded between 1974 – 1985.

At national level the sex ratios over the years have revealed a dominance of females. Results of the 2004 census indicate the percentage of female reached 52.9 percent since the national census in 1963. This suggests that the male population accounted for 47.1%.

The urban population has grown from 31.0% in 1974 to an estimated 39% in 2003 suggesting that about sixty percent of the population still live in the rural areas. The current estimate of the Crude Birth Rate is 42 births per thousand population.

The current Total Fertility Rate (TFR) of 6.1 children per woman, is based on the 2004 census. The fertility level is high and unacceptable as it has a lot of implications for the provision of social services.

With respect to mortality Sierra Leone has a crude death rate of about 20 percent per thousand which is about the highest rate in Africa. With an under 5 mortality rate of 297 for males and 271 for females the country records the highest in Sub-Saharan Africa and the life expectancy at birth according to the 2004 census is about 48.4 years.

1.5 Socio-economic Activities

Sierra Leone is a small open economy that has suffered prolonged deterioration and an accompanying low standard of living of the vast majority of the population despite its significant resource endowments.

Agriculture and associated activities is the dominant sector of the economy which sustains about two thirds of the population. The mining sector which is largely export oriented is the next largest productive resource in the economy and provides about 20 percent of the GDP. The manufacturing sector is small with mostly import – substituting industries that employ about 2 percent of the labour force. The service sector accounts on average for about 15 percent of the GDP. This sector comprises mainly, Transport, communication, insurance, finance and Government services. As a result of the Rebel war this led to devastation of the economy and social infrastructure of the country. The production in the Agricultural, mining and industrial sectors was badly disrupted. This reflected in the country's GDP and it dropped from US$380 in 1980 to US$277 in 1990 and US$142 in 2000. There is a steady rise in growth rates from 2001 – 2004 this has reflected in an increase in GDP per capita rising from US$142 in 2000 to US$160 in 2002 and to US$210 in 2004. Sierra Leone because of her poor economic status is categorized as one of the Least Developed Countries (LDC) in the world.

1.6 Environmental Stresses

Sierra Leone also now faces an array of formidable environmental problems, including land degradation, deforestation, loss of biological diversity, pollution of fresh water resources and coastal area degradation which are a consequence of over-exploitation of the natural resources; soil, water, forest, mineral, and marine resources. The already unsatisfactory situation has been worsened by the Rebel war. As the country is struggling to restore its socio-economic functionality, the threat of climate change and its associated problems has the potential to undermine the country's efforts.

1.7 Rationale for developing the NAPA

The rational for developing the Sierra Leone NAPA resides in her inability to adapt to climatic shocks as well as to man-made disasters, which renders the need of immediate and urgent support to start adapting to current and projected adverse effects to climate change

1.8 Objective of the NAPA

The National adaptation programmes of action will serve as simplified and direct channels of communication for information relating to the urgent and immediate adaptation needs of Sierra Leone caused by climate change and extreme weather events.

2.0 Framework for Adaptation Programme

2.1 Sectors Vulnerable to Climate Change

Sierra Leone's economy is heavily dependent on its natural resources and is therefore vulnerable to climate change. The Initial National Communication (INC) of Sierra Leone on climate change is currently being prepared through enabling activity UNDP/GEF SIL/02/G32. It started in February 2003 with anticipated project duration of two years. As recognized by the least developed countries Expert Group (LEG) at their NAPA training workshop in Addis Ababa, Ethiopia, in June 2003, NAPA activities in Sierra Leone will thus be concurrently conducted with INC preparation.

Sectors where adverse effects of climate change are anticipated as identified by the INC vulnerability and adaptation activities, include:

- Agriculture, Fishery and Food Security;
- Water Resources;
- Forests and Natural Resources;
- Land Erosion and Human Settlement;
- Coastal Region, and
- Human Health.

The NAPA document is a compendium of the public consultation with various stakeholders' particularly vulnerable populations on coping and adaptation strategies to climate change effects, and the consensus reached on forging ahead with sound development programmes.

The purpose of the NAPA document is to enable Sierra Leone develop simplified and direct channels of communication for information relating to the urgent and immediate adaptation

needs arising from disasters caused by climate change and extreme weather events.. Specifically, the document aims at: (i) identifying a list of priority activities, (ii) formulating priority adaptation options, (iii) building capacity for adapting to longer-term climate change and variability, and (iv) raising public awareness on the urgency to adapt to the adverse effects of extreme weather events.

2.2 Climate Variability

Report of studies relating to climate change and National Adaptation Programme of Action carried out in recent times as well as NAPA regional workshop reports have revealed that rainfall and temperature patterns of the country have been changing.

During the dry season, the harmattan (dry dusty cool air) causes lowest daily country average temperature of 16^{o}C with a range of between 10^{o}C and 22^{o}C. However, the harmattan period in recent times has been warmer than usual. It was also observed that the pre-monsoon period which runs from April to June is now associated with stronger winds and more frequent rain/storms causing greater damage to lives and property. Calmer and dryer weather now appears to be associated with the September/November period which was usually characterized by frequent thunder and lightening and short but heavy rainfall.

The wet or monsoon season runs from July to September with a country average rainfall of about 2746 millimeters (mm) varies from 3659 mm in Bonthe in the South, 2979 mm in Lungi (Freetown) in the West and 2618 mm at Kabala and Bo in the north and central parts of the country. This period has recently been periods of delays in the rains and associated water shortages particularly in Freetown in recent times. Heavy rainfall accompanying such dry spells often results in extensive flooding throughout the country. The effects of these unusual temperature and rainfall patterns on agriculture, water supply and sanitation are evident in various parts of Sierra Leone.

2.3 Observed and Projected Climate Change

It had long been perceived that Sierra Leone, blessed with its luxuriant forests, high rainfall, well-drained landscape etc. would continue to enjoy nature's bounty of good weather for ever. But recent events as evidenced by the erratic behaviour of the weather such as fog in places where they did not occur before during the dry season, flash floods, cyclone and severe storms, scarcity of fresh water due to less rain, higher evapo-transpiration in the dry season, frequent prolonged and wide spread drought/dry spells have suggested that some major changes are occurring.

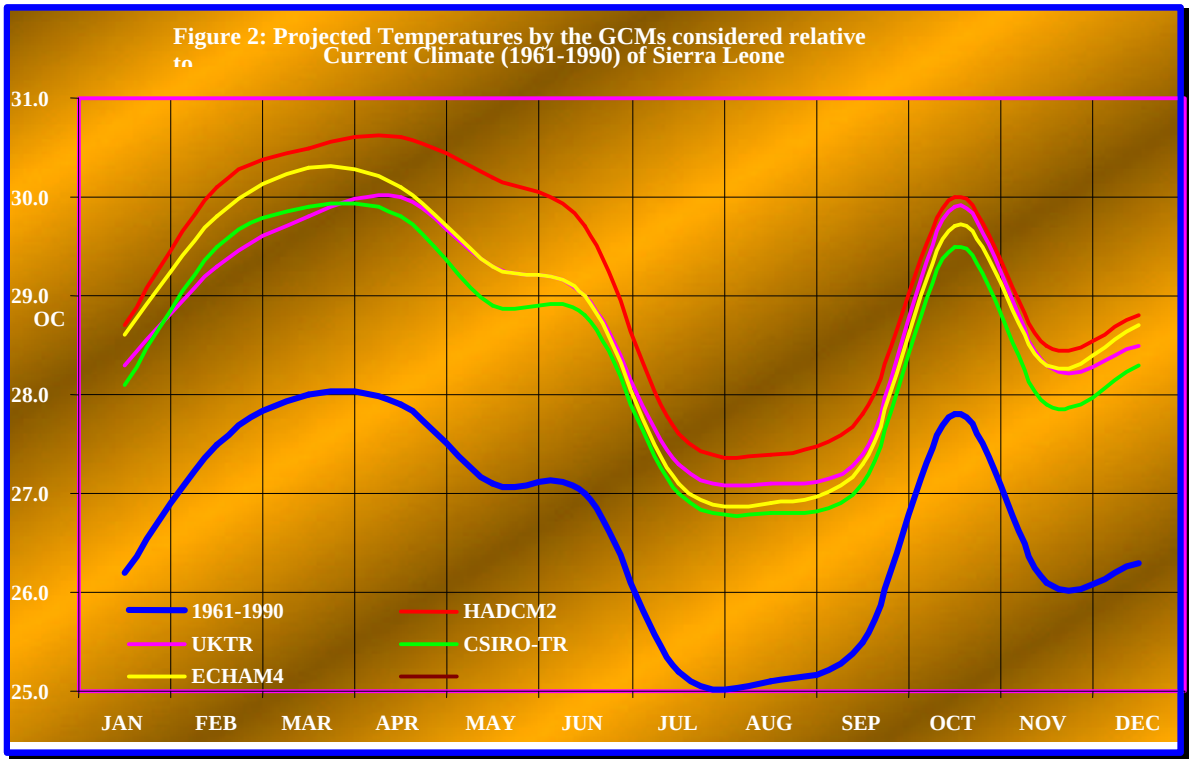
2.3.1 Temperature scenarios

Sierra Leone has observed trends and variability in climate derived from long term climate data from 1961 to 1990. The average annual temperature for this period from the metrological stations is about 26.7°C (see table below).

Based on global model simulations for a wide range of scenarios, the average temperature for the period 1961 – 1990 is projected to increase by about 7% to 9% above this average temperature by the year 2100 as shown in table below.

Table 1: Current climate (1961-1990) and projected climate change temperature scenarios at 2100													
Scenario	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**ANN**
1961-1990	**26.2**	**27.5**	**28.0**	**27.9**	**27.1**	**27.0**	**25.2**	**25.1**	**25.5**	**27.8**	**26.1**	**26.3**	**26.7**
HADCM2	28.7	30.1	30.5	30.6	30.2	29.7	27.6	27.4	27.8	30.0	28.5	28.8	29.2
UKTR	28.3	29.3	29.8	30.0	29.3	29.0	27.3	27.1	27.4	29.9	28.3	28.5	28.7
CSIRO-TR	28.1	29.5	29.9	29.8	28.9	28.8	27.0	26.8	27.1	29.5	27.9	28.3	28.5
ECHAM4	28.6	29.8	30.3	30.1	29.3	29.0	27.1	26.9	27.3	29.7	28.3	28.7	28.8

Source: V&A Scenario Report 2006



Source: V&A Scenario Report 2006

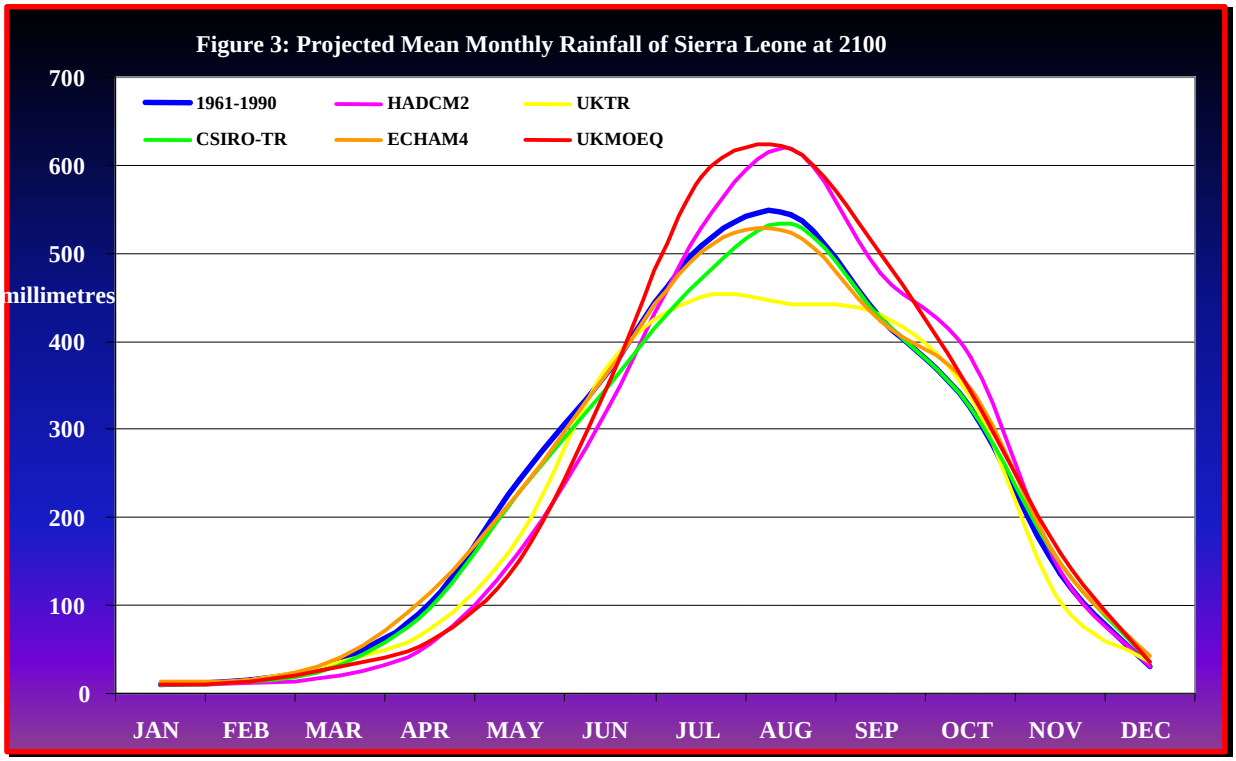
2.3.2 Precipitation scenarios

The projected rainfall from 1961 – 1990 to 2100 under the General Circulation Models (GCM) output show an increase in rainfall by about 3% and 10% below current monthly and annual rainfall values respectively.

Because the maximum temperatures have increased (by about 0.67°C and 0.18°C respectively) with a corresponding interesting trend in the decrease in precipitation levels by 50.28mm, it is projected that Sierra Leone will continue to experience an increase in temperature as well as drought/dry spells.

The climate models (HADCM2, UKTR, CSIRO, ECHAM and UKMOEQ) indicate steady increase in temperature for Sierra Leone with little inter-model variance. With regards to rainfall an increase or decrease under climate change scenario is a critical factor in estimating how climate change will affect Sierra Leone, given the country's extreme vulnerability to water related problems.

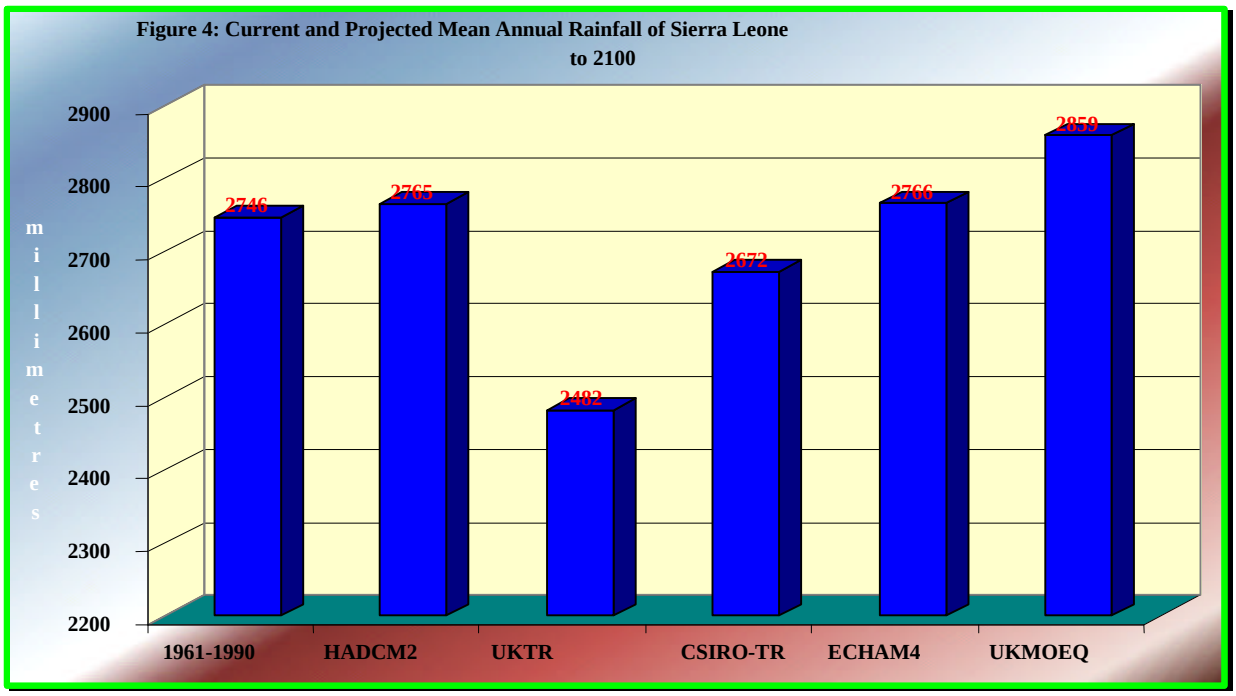
Analysis carried out on local rainfall data and inter-annual variability projections linked more firmly to drier conditions in the near future.



Source: V&A Scenario Report 2006

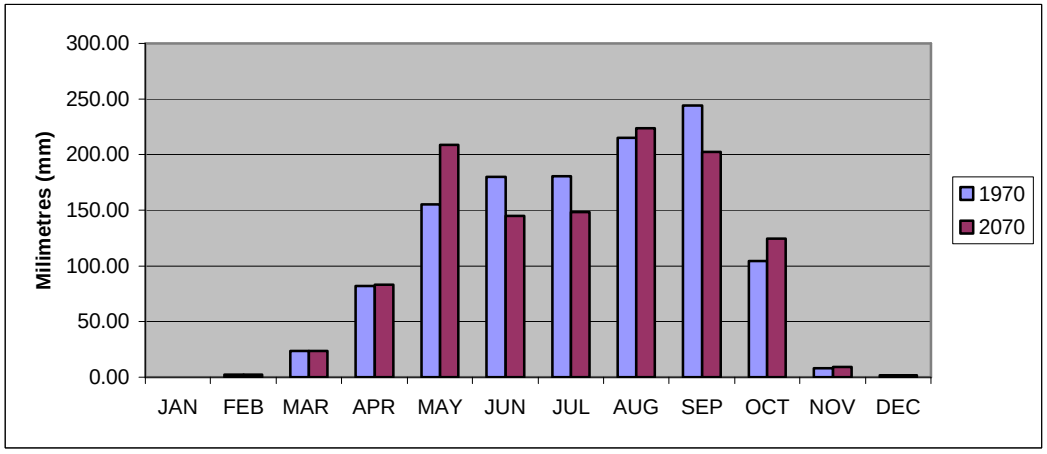
2.3.3 Evaporation

Mean monthly evaporation for current climate (1961-1990) and projected values at 2100 by all the GCMs except for the ECHAM4 model show that during the period from January to May monthly evaporation values under current climate are higher than all projections to 2100. The ECHAM4 model shows a higher projection for both the current climate values as well as projections by all other GCMs used in this study.



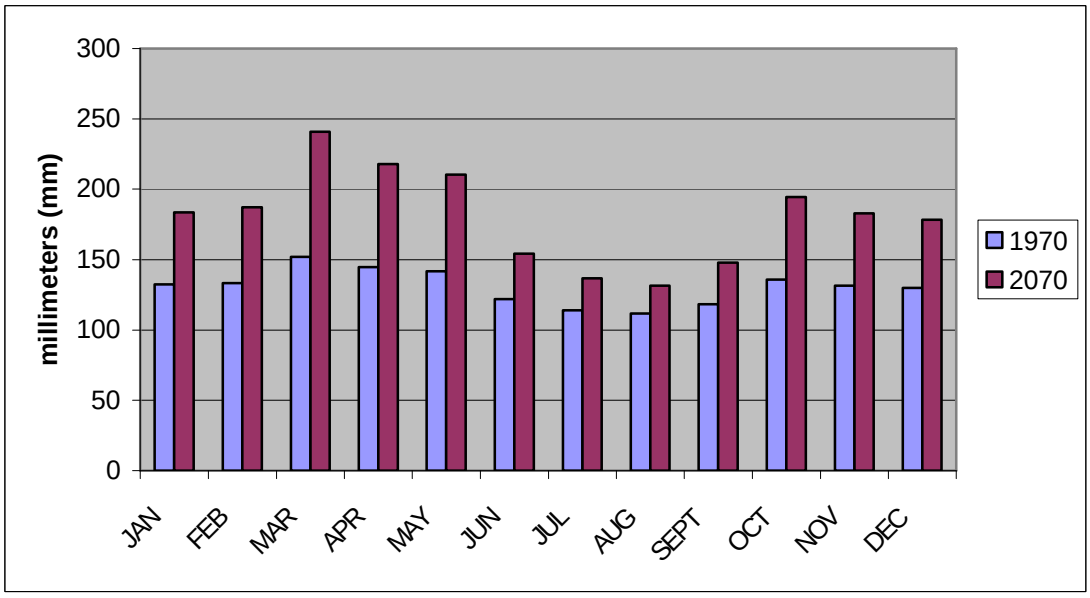
Source: V&A Scenario Report 2006

Figure 5: Projected Decrease in Precipitation



Source: V&A Forestry Report 2006

Figure 6: Increase in Potential Evapo-transpiration rate



Source: V&A Forestry Report 2006

2.4 Associated actual and potential adverse impact of climate change

According to the published report of the Initial National Communication on climate change, Sierra Leone is vulnerable to climate change and extreme weather events. The Vulnerability and Adaptation Assessment Report and the Climate Variability Report of the NAPA Project have clearly indicated that Sierra Leone is experiencing a variety of climatic hazards which include seasonal drought, strong winds, thunderstorms, landslides, heat waves, floods, intense seasonal rain fall, shifting rainfall patterns amongst others.

In some parts of the country, notably the north and South-eastern provinces (Gbondapi, Pujehun), as well as in the Freetown area poor communities have suffered from floods and seasonal drought which have destroyed their crops and hampered their food production capabilities. Strong winds have also destroyed houses, damaged energy transmission lines and obstructed communications to remote areas of the country. Thunderstorms and heavy rain have disrupted flight schedules and caused a number of accidents at sea.

Shifting rainfall patterns recently caused water shortage in Freetown and its environs. The changes in rainfall and temperature patterns have been causing current cropping patterns to become unsuitable to emerging climate conditions. Livestock is already experiencing greater stress due to the above climatic variability and pest and disease outbreaks are becoming more pronounced. These changes have adversely affected the ability of the rural poor to maintain their existing livelihoods and have limited the ability of Sierra Leone to maintain export earnings and pay for the importation of food. Inadequate staff and poor facilities for weather forecasting and related activities have undermined the ability of the meteorological department to provide adequate support information to other sectors of the economy so that they can better adapt to the impact of climate change.

2.4.1 Impact of Climate Change on Health Sector

Climate change is already affecting the health of the people of Sierra Leone through an increased incidence of cold and cough as well as water and other air-borne diseases. This situation has been aggravated by the prevalence of HIV/AIDS that has negatively impacted on communities both rural and urban and jeopardizes their efforts in achieving food security and improved livelihood because of the burden of increased number of dependent orphans.

2.4.2 Impact of Climate Change on Agriculture and Food Security Sector

A critical look at the profile of the agriculture and food security sector indicates that the sector is highly vulnerable to climate change and climatic variability. The potentials for vulnerability lie in the following prevailing constraints and issues:

- The almost total dependence of the sector on rain fed conditions.
- The numerous environmental constraints:

(i) The traditional bush fallow system, and changes to it especially land/vegetation degradation due to the shortening of the fallow period to as low as 5 – 7 years.
(ii) The increasing demands for forest products and other natural resources such as minerals, fuel wood, medicines,
(iii) Unregulated livestock production
(iv) Modern approaches to wetland development
(v) Bush fires of poorly organized and poorly co-ordinated mechanization practices fires.

- Poorly organized and supported crops, livestock and fisheries production sectors
- Socio-economic constraints within the sectors.
- Institutional and support services constraints.
- Policy and legislative and human resources constraints.

Figure 7: Soils map of Sierra Leone

In assessing the vulnerability and impact of climate change on the agriculture and food security sector in Sierra Leone, it has become clear that three key areas could be affected negatively (i) Land Management, (ii) Crops and Livestock Husbandry and (iii) Socio-economic Aspects of Agricultural Production.

2.4.3 Impact of Climate Change on Forestry Sector

Despite their large extent, rapid growth and increasing importance at the local, national and regional levels for the products and service they provide, forest are not afforded adequate prominence in forest policy, planning and research. There is a general lack of policies regulating and encouraging forest management, use and conservation. Ecological, silvicultural, and socio-economic knowledge regarding forests exists to a certain extent, and there is an increasing volume of research regarding restoration, rehabilitation and management.

Several factors and implementation constraints still render the sector vulnerable to climate change. Prominent among these are:- institutional constraints, land situation,
agriculture activities, un-coordinated rural programmes, rural community needs, poverty and ignorance, disregard for traditional culture/values, inconsistent legislation and policies, mineral exploitation and the nearly ten (10) years of civil conflict

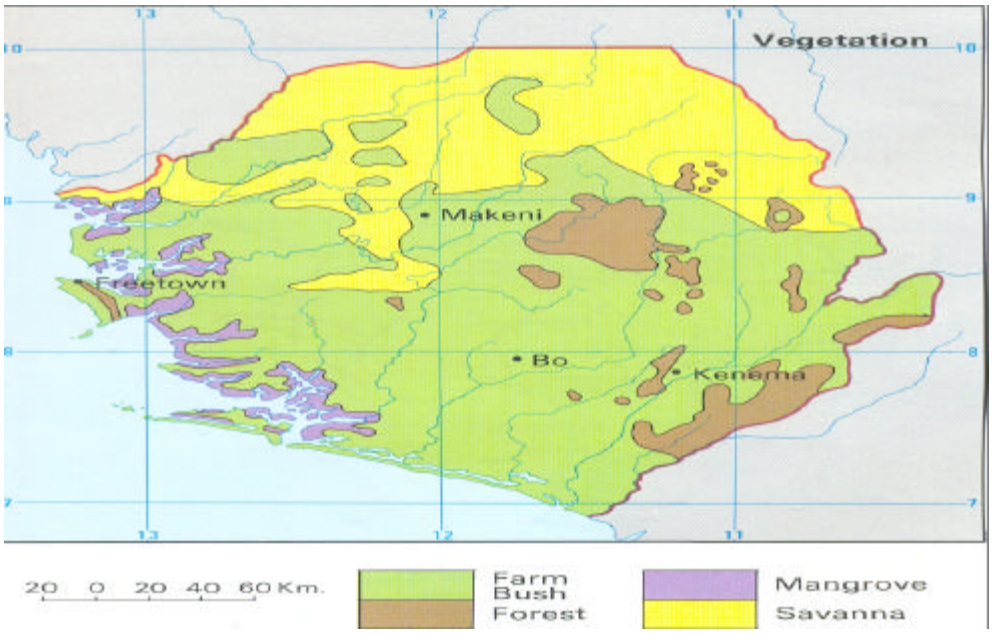


Figure8: Current distribution of vegetation in Sierra Leone

2.4.4 Impact of Climate Change on Coastal Habitats and Biodiversity

The collateral impacts of rising sea levels on the coastal zone will include, shoreline recession, increased flood frequency probabilities, inundation of coastal lands and wetlands, and the salinization of surface waters and ground-waters. These impacts will in turn affect coastal habitats and biodiversity. In Sierra Leone, the retreat of the shoreline will result in significant loss of the mangroves of the Kambia district and elsewhere, strand vegetation, coastal swamps

and the habitat of marine biodiversity (turtles, snails etc). The species of mangrove vegetation of risk from flooding and shoreline retreat includes conocarpus erectus.

The most vulnerable wetlands are those of the Kambia district and areas of the Western area (Freetown) i.e. Aberdeen creek which is one of the Ramsar sites in Sierra Leone.

The loss of beach will adversely affect the survival of intertidal organisms and those that make use of the sandy beaches at some stage of their life cycle e.g. the semi-terrestrial ghost crabs, ocypoda cursor and O. Africana. The marine turtles that could be impacted on are the leather back (Dermochelys coiacea), the hawsbill (Erectmochelys imbricata), green turtle (Chelonia myda), the loggerhead (caretta carretta) and the most abundant of all olive ridley (lepidochelys olivacea).

It is against this background that Sierra Leone has developed and is developing policies and strategies to deal with the negative impacts of climate change on the production of food, health of the population and vulnerable ecosystems.

2.4.5 Climate Change Impact on Fisheries and Marine Life

Marine life like life on the entire earth depends on a stable climate and any change in climate will be reflected in the species composition and location of the various marine communities. The current distribution of marine plant and animal communities is a reflection of how different species and ecosystems have adapted to past climates. Future climate changes will affect the boundaries of ecosystems and the mix of species that inhabit them. This will have major implications for human activities particularly in fisheries and coastal formations such as mangroves and coral.

The main marine biological communities can be defined in relation to seawater temperature and salinity, which are directly dependent on such climatic variables as precipitation and evaporation. When past climatic was substantially different from the present, as in the glacial and warm interglacial periods, there were major shifts in the distribution of marine plant and animal communities.

2.4.6 Impact of Climate Change on Water Sector

The vulnerability of the water resources sector to climate change has been assessed in the Vulnerability and Adaptation Report contained in Sierra Leone's First National Communications on Climate Change. It is evident from the report that water resources will be affected by climate change if and when it happens. Various General Circulation Models (GCMs) have been used in developing climate change scenarios for Sierra Leone. The models predict an increase in temperature of about 5 °C by 2100. The increase in temperature will increase the amount and intensity of precipitation. An increase in rainfall could lead to an increase in surface runoff, resulting in flooding. On the other hand a decrease in the amount and intensity of rainfall may lead to drought.

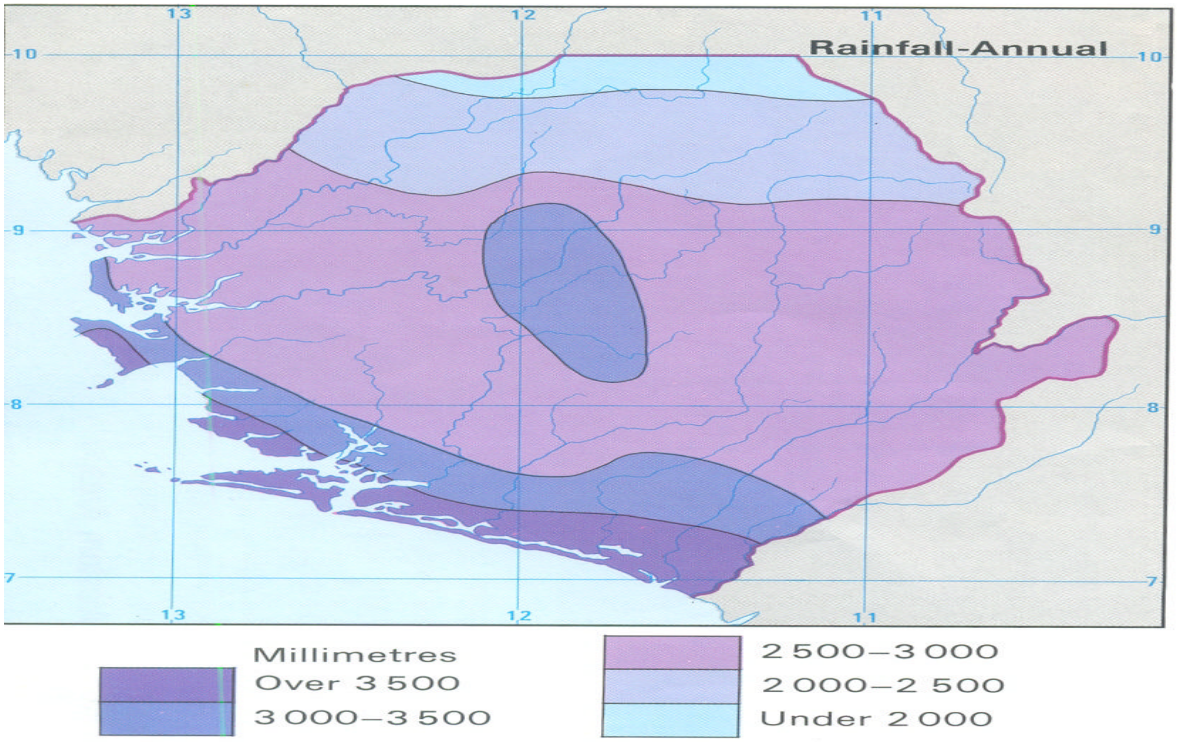


Figure9: Annual rainfall in Sierra Leone

2.4.7 Impact on Climate Change on Biodiversity

Sierra Leone's biological diversity is prone to drought, dry spells, temperature fluctuations and changes in precipitation patterns leading to changes in habitat. The status of wild life in our National Parks and Game Sanctuaries shows that many forest birds and game animals have declined in numbers even to the extent that some species have been decimated.

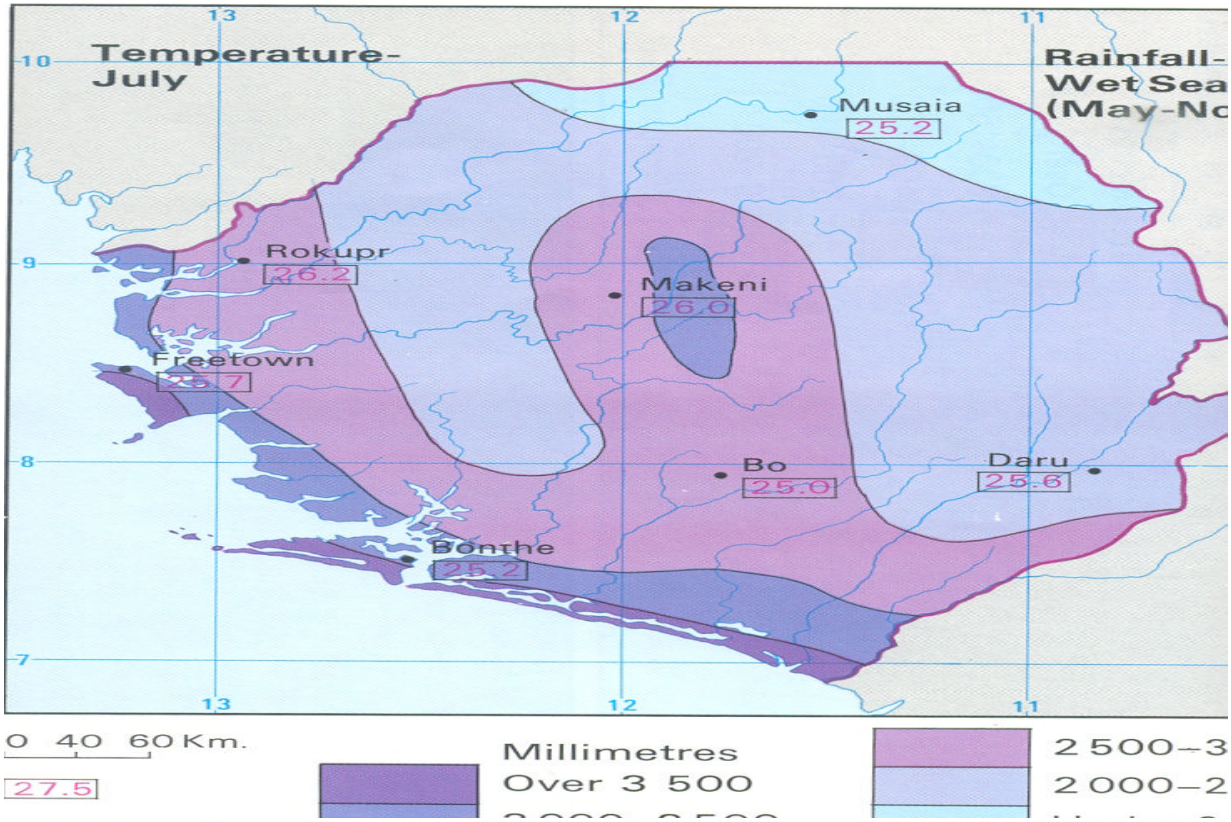


Figure10: Temperature and rainfall map in Sierra Leone

The terrestrial and aquatic areas of the country support a large number of diverse biological populations, both plants and animals. Notwithstanding insufficient baseline information on biological resources, it is believed that uncontrolled exploitation and mismanagement have caused a significant depletion of terrestrial and aquatic species diversity. Over-exploitation of some very common and endangered species in an unwise manner has led to their being reduced to a vulnerable and endangered status.

2.5 Contribution to overall sustainable development goals, objectives and strategies

The NAPA document, prepared was based upon the goals and objectives of 2004 MDGs and the PRSP of Sierra Leone. Against this background, the NAPA process will contribute to the overall development process of Sierra Leone by addressing the following: serving as a channel of communication for information relating to urgent and immediate adaptation needs of Sierra Leone; identifying lists of projects which are integrated into other activities, capacity building and policy reforms; and formulating priority projects for adaptation; building capacity to adapt to long term climate change; and to raising awareness about the urgency to adapt to adverse effects of climate and climate change.

The major outputs of the NAPA document will be integrated into the country's sustainable development plans, policies and programmes that will reverse the loss of environmental resources. The implementation of the NAPA document will ensure an increase in population with access to sustained economic development and social services that will improve

livelihoods. These expected outputs of the NAPA are inconformity with the 2004 MDGs of Sierra Leone.

In reality, the NAPA document, in compliance with the PRSP (Poverty Reduction Strategy Paper) of Sierra Leone transitional strategy for the environment is aimed at improving environmental issues relating to human health, protection of endangered species, and overall environmental protection, that will ensure sustainable development. In light of the above, the implementation of the NAPA document will not only ensure compliance with the PRSP and 2004 MDGs of Sierra Leone, but will also contribute immensely to the overall sustainable development goals, objectives and strategies of Sierra Leone.

2.5.1 National vision

In line with its commitment to environmental protection, Sierra Leone signed a number of United Nations Conventions that include but not limited to: the Convention on Biodiversity, United Nations Framework Convention on Climate Change (UNFCCC), Convention to Combat Desertification (CCD), Convention on International Trade in Endangered Species of Wild Flora and Fauna, as well as non UN Conventions, Ramsar Convention on Wetlands and World Heritage Convention. In efforts to comply with environmental sustainability, some goals were set by the Government of Sierra Leone (GOSL). These goals are: a) integration of the principles of sustainable development into country policies and programmes to reverse the loss of environmental resources; b)reduce by half the proportion of population without access to sustainable safe drinking water; achieve significant improvement in the lives of 1.5 million slum dwellers, including displaced persons.

As part of the task to meet the national and international environmental protection needs of Sierra Leone, some targets have been set to include the following: a) to maintain the proportion of land area covered by forest (initially 4.1 million ha in1992) from 3.4 in 2001/2002 to at least 3.4 million ha by 2015; b) to increase the percentage of population with sustained access to improved water sources, from 26% (1999/2000) to 63% by 2015; c) to increase the percentage of people with access to improved sanitation from 26% (1999/2000) to 67.9% by 2015; d)to increase the percentage of people with access to secure tenure from 54.3 (1999/2000) to 91.8% by 2015; e) to increase the land area protected to increase biological diversity from 0.192 million ha in2003 (initially 0.129 between 1982 and 2002) to 0.534 million ha by 2015.

The achievement of these targets is Herculean because practical efforts to ensure an integrated approach to environmental protection began following the establishment of the Department of Environment (DOE) in December 2000. Consequently, there is a complete lack of requisite capacity and policy measures to initiate relevant and economically motivated mitigation process for negative environmental degradation, including negative climate change activities. However, the implementation of urgent and immediate activities for the achievement of these targets is paramount to the reduction of deforestation, erosion and soil infertility that affects food production.

2.5.2 National Plans

The PRSP, which remains the only strategic framework between 2005- 2009, focuses on the following:

1) Environmental issues related to health such as inadequacy of freshwater, sanitation and waste management services, which poses serious risks to human health and environmental quality.
2) Identification of environmental "danger zones" including but not limited to:
   a. the harbour (with sunken vessels and extensive fuel leakage/ wastage);
   b. the defunct oil refinery and associated pipelines that pollute the environment; and
   c. the "defecation" field in major urban centres, unmanaged latrine pits and septic tanks, industrial sites/wastes, former landfills and areas of uncontrolled dumping, etc.
3) Environmental governance: current associated institutional framework highlights environmental issues, including the Environmental Protection Act (EPA), and a National Environmental Policy (NEP).

There are national development priorities (as indicated in the NBSAP and the NCSA) for the environment as follows:

- strengthening the capacity of Department of the Environment (DOE) for advocacy, data collection, analysis, monitoring and evaluation;
- environmental management and sustainable use of renewable natural resources;
- enhancing environmental awareness and active involvement of NGOs and local communities in environmental protection and management programmes, including poverty reduction strategies /activities;
- rehabilitation and management of electricity and water supply facilities in urban and rural areas; greater involvement of the private sector in water and energy resources;
- provision of spare parts, communications equipment and logistics for the construction of wells with hands pumps and pit latrines/ sanitation for rural dwellers;
- create awareness to promote the benefits of sanitary pit latrines;
- Formulation of national housing policy; expansion of locally produced (low cost) building materials.

Other national priorities include:
The development of regulations (By-Laws) to the legislation for environmental protection and sustainable development, including control of deforestation, firewood collection, charcoal production; waste management; and promotion of appropriate technology, agro-diversity, water and soil conservation; and environmental impact assessment, biodiversity conservation and efficient energy use.

2.6 Potential barriers to implementation
Sierra Leone has identified a number of potential barriers to the smooth implementation of the proposed activities. These barriers have been presented in the matrix below in
table 2.

Table 2: Capacity constraints matrix

Priority Issues	Individual Capacity Constrained	Institutional Capacity Constraints	Systemic Capacity Constraints
Rehabilitation of climate change institutions with needed scientific technology to implement UNFCCC in Sierra Leone	Individual members of the national climate change committee (NCCC) are constrained by the poor working environment	The proposed NCCC Expertise Task Force and its collaborating institutions are constrained by financial resources with the appropriate scientific and technical assistant.	Limited or non-existence of an enabling environment is a constraint
Limited technology, technician, professional at the national level in the assessment of adaptation and mitigation option	Individual members of NCCC are constrained by lack of training to handle climate change issues	The NCCC to be set up by NAPA Project and its collaborating institution are constrained by financial resources with the appropriate scientific and technical expertise	Limited or existence of an enabling environment is a constraint.
Current policies, strategies and regulatory mechanism have limited in or no consideration of climate change issues.	Limited capacity of law officers to deal with environmental legislation.	NCCC and its collaborating institutions are constrained by human resources with the appropriate scientific and technical expertise.	Limited or nonexistence technical infrastructure and depleted expertise is a constraint.
Lack of trained manpower to manage climatological programmes	Individual NCC members have limited/ no capacity to manage climatological programmes	Inadequate institutional capacity to manage climatological programmes	Inadequate systemic capacity to manage climatological programmes
Public awareness	Individual remembers need adequate training to create results-focused awareness	Institutional capacity is inadequate to sustain multi-media public awareness	No public awareness system has been established for climate change sensitization
Lack of reliable/ updated of data	Individual NCCC members require adequate training for reliable data collection	No institutional capacity available for reliable data collection	Systemic capacity for data collection and updating is negligible
Financial support at all levels (international, regional and national levels)	Capacity of individual NCCC members have not been built to source financial support at all levels	Institutional capacity needs to be strengthen in order to increase/influence more financial support at all levels	Systemic capacity needs to be fortified in order to mobilise financial support at all levels

3.0 Identification Of Key Adaptation Needs

3.1 Past and present practices for adaptation to climate change and climate variability

In the past and presently, local people relied and continue to rely on stream water and on shallow dug-wells for water within and outside Freetown. Climate change can negatively affect the availability of fresh water to communities. On one hand Climate change could further decrease stream flow and ground water recharge. Reduced annual average rainfall and run off would aggravate desertification . On the other hand climate change can increase stream flow and ground water recharge. Increasing annual average rainfall and run off would aggravate flooding. Lack of surface water during the dry season limits the use of Low Lift Pumps. Presently, wells are dug deeper during this season because of the low level of the water table. In the Freetown area, crudely built Carts are used by children to transport water in (5) five gallon plastic containers. People also travel several kilometres outside the main city to fetch water. Very few people can afford water storage tanks in their homes.

Household activities regarding past and present practices for adaptation to climate change and variability in the agricultural sector include, seeking access to other sources of income that can provide reliable and relatively substantial income to assume the role of the main activity when agricultural production fails. These include charcoal production, petty trading etc. In non-household activities, farmers adapt by cultivating the swamps during extended dries and the upland during extensive rains. Other adaptation measures according to regional workshop findings include, switching crops in such a way so as to identify those that are most suitable to an agricultural land type during unfavourable climatic conditions.

In the forestry sector, past and present practices include switching to other forms of livelihood for example commercial (trading) activities. Past and present adaptation practices to climate change and climate variability in the coastal sector involve controlled abandonment of erosion devastated areas as well as those prone to coastal flooding and other hazards. Creation of set back is another approach often used in order to combat coastal hazards aggravated by climate change. However, in most cases, 'do nothing' is the popular option as coastal communities are poor and government lacks the resources to employ coastal adaptation technologies to help protect vulnerable portions of the coastline.

In the fisheries sector adaptation practices take on board fisheries management activities such as the discouragement of environmentally unfriendly fishing methods e.g. poisoning, use of explosives and inappropriate fishing gear. Local fishermen may also switch to other sources of income e.g. tailoring, trading and farming amongst others.

In the health sector, adaptation practices involve the improvement of health delivery services, water and sanitation, and the conservation of biodiversity which is critical to the sustainability of traditional medicine.

Studies on biodiversity have shown that uncontrolled exploitation and mismanagement have caused a significant depletion of terrestrial and aquatic species diversity. Over-exploitation of some very common and endangered species in an unwise manner has led to their being reduced to a vulnerable and endangered status. Past and present adaptation practices involve the establishment of conservation areas including: parks and reserves. It is hoped that in the future such practices will be expanded and also the establishment of gene banks.

3.2 Summary of hazards posed by climate and climate change

3.2.1 Sierra Leone's Vulnerability to Disaster

Sierra Leone is vulnerable to a number of climate change driven environmental hazards/disasters including floods, dry spells, thunderstorms and shifting rainfall patterns amongst others.

Disaster can be perceived as the result of an extreme weather event combined with vulnerability.

3.2.2 Thunderstorms

It has been observed that there is an increase in the frequency of thunderstorms, although there are no official records of disasters resulting from thunderstorms on the people and economy of Sierra Leone, there have been reports of thunderstorm related disaster consequences at local levels. A number of deaths have been recorded resulting from lightening strikes associated with thunderstorms. Thunderstorms and lightening have on a number of occasions disrupted transport and communications nationwide. Thunderstorms are often associated with heavy downpour of rain and high wind speeds. These in turn enhance flooding. Winds of high speeds have cause damage to dwelling houses, communication and power lines and agricultural plantations.

3.2.3 Shifting rainfall patterns

Shifting rainfall patterns have also been observed which have caused disruptions of planting seasons resulting in diminished agricultural production and poverty amongst farmers in particular. It has also created water supply problems resulting in decrease in water supply to consumers, reduced stream flow in rivers and streams and also health related problems associated with the outbreak of water-born disease.

3.2.3 Landslides

Landslides and rock falls have been causing disasters mainly in the Western area particularly Freetown. It has resulted in loss of lives and property. This has been enhanced by the construction of illegal housing units particularly in vulnerable areas such as water fronts and hill slopes as well as deforestation in hilly areas.

3.2.5 Floods

The World Health Organisation observes that floods pose the biggest threat to health, having longer lasting and more far-reaching effects on their victims than other climate related disasters. Floods increase the number of people exposed to water-borne diseases such as cholera, diarrhoeas and dysenteries, as the poor are forced to drink contaminated water when fleeing them; sanitation, storm-water drainage and sewage disposal systems are often disrupted, and flooded displaced communities, especially those with limited resources, are more likely to contract infectious diseases and spread them to new areas. Moreover, as the IPCC observes, 'Viral, bacterial and protozoan agents of diarrhoea can survive in water – especially in warmer waters – for long periods of time and thus spread at increased rates in rainfall periods'.

Flooding in Sierra Leone appears to be on the increase according to reports from studies undertaken recently by various institutions. Some recent documented flood disasters in Sierra Leone afford a good insight into the extent of flooding and flood-related problems in the city of Freetown.

In the flood event of 10th August, 2005, houses were destroyed, people lost their lives and property worth of millions of leones were lost. The flood waters also washed away lives stock vegetables,, destroying gardens and farmlands, which many roads in the city were rendered impassable. Homes and schools became pools of water after heavy downpour.

Floods resulting from heavy rainfall has been an annual event in the city between the months of May and October. Blocked drains have enhanced the overflow of flood waters into roads and into homes of residents. Sewage and litter could often be seen in various places creating an unsightly situation as well as polluting sources of drinking water for several days.

3.2.6 Droughts

Droughts have not been widely experienced in Sierra Leone. However long dry spells particularly in the north and in the western area of the country have disrupted agriculture and water supply resulting in negative health impacts. As water resources become scarcer and competition for water increases, polluted water may be used for drinking and bathing, and this spreads infectious diseases such as typhoid, cholera and gastroenteritis. These diseases particularly affect the urban poor. Moreover, decreased availability of water for irrigation food production heightens the risk of poor nutrition and increased susceptibility to disease.

3.3 Summary of vulnerability based on past studies and or from stakeholder consultations

3.3.1 Review of Past Studies

Past studies have revealed that agriculture is the dominant sector of the economy, representing 40% of the GDP and sustaining two-thirds of the population. In spite of abundant agriculture land, the country has yet to reach autonomy/food security in rice, the main staple food. Recent observations in Sierra Leone have reported noticeable rainfall variability (precipitation regime and pattern), especially in the northern regions, which adversely impacts water resources and

agricultural yields. The risks on food security of strictly rain-fed rice cultivation cannot be overlooked.

A sustained decrease in normal rainfall could alter the hydro graphic bearing of the country's streams and rivers. The IPCC's Third Assessment Report (TAR) reveals that current trends in major river basins in Africa indicate a decrease in runoff of about 17% over the past decade. The expected decrease of rainfall compounding the low conversion factor of precipitation to runoff will exacerbate the water resource shortfall.

Fish accounts for about 75% of total animal protein intake, for the supply of which Sierra Leone heavily relies on its marine resources. Ocean warming will modify ocean currents, with possible impacts on coastal marine fisheries.

The vulnerability of ecosystems and forest formation will depend on rainfall variability modulated by vegetation dynamics in the various geographical regions in Sierra Leone. Less rainfall and a potential increase in evapo-transpiration could affect the distribution of plant and animal species. Projected climate change is expected to alter frequency, intensity, and extent of vegetation fires. Potential increase in the frequency and severity of drought are likely to exacerbate desertification.

Sierra Leone presents a variety of ecosystems vulnerable to accelerated land erosion on unprotected hillsides. Land erosion and deforestation will exacerbate the risk of landslide for hillside settlements.

Sea-level rise, coastal erosion, saltwater intrusion, and flooding will have significant impacts for Sierra Leone coastline infrastructure, socio-economic activities and communities. Roads and buildings, substantial investments by governments, will particularly be at risk. With a higher sea level, sea front plains and estuaries, and mangroves could lose their agriculture and fisheries potentials. Affected drinking water sources and damaged sanitary infrastructure could prompt water-born epidemics and enteric diseases.

In Sierra Leone, climate-change induced human health issue could be associated to malnutrition and to the resurgence/spread/intensification of vector-born, water-born and enteric diseases: Malaria, Typhoid fever, Cholera, Dysentery, and Diarrhoea. The IPCC's TAR indicates that temperature increases will extend the habitats of vectors of disease such as Malaria. Droughts and flooding, where sanitary infrastructure is inadequate, will result in increased frequency of epidemics and enteric disease. Finally, increased temperature of coastal waters could set off cholera epidemics in coastal areas.

3.3.2 Stakeholder Consultations, Sensitisation/Awareness Creation, Reviews

The preparation of NAPA was guided by a participatory process involving stakeholders, particularly local communities. A multidisciplinary and complementary approach was applied, akin to the broader context of sustainable development. In conceptualizing the NAPA process in Sierra Leone, the Annotated Guidelines for the preparation of National Adaptation Programmes of Action and the Adaptation Policy Framework (APF) were used. The process was guided by the National Biodiversity Strategy (NBSAP) under the United Nations Convention on Biological Diversity, the 2004 Millennium Development Goals (MDGs), PRSP

(the poverty reduction strategy paper) and the design of the entire NAPA process was country-driven using participatory methods.

The following activities are associated with preparing the NAPA document. The first activity was the establishment of an institutional structure, through a set of administrative and oversight committees, to carry out the NAPA process. The initial activity of the NAPA process was the inception workshop. In this workshop, the NAPA project was launched and awareness raised (on adverse effect of climate change). The NAPA Project Steering Committee (PSC) was established; and a comprehensive work plan developed and finalized. The second major activity of the NAPA process involved the assembling of an Interdisciplinary Sector Team (IST). The team began operations following the completion of the terms of reference; the identification of the scope of work for each task; and the recruitment of experts and provision of contracts for each member of the team. The results of the work of the IST formed the basis for issues discussed in the NAPA document. The initial national stakeholders' consultation identified climate change related problems, traditional coping strategies and summarized the requisite adaptation needs and barriers for Sierra Leone. The final national stakeholders' consultation selected the priority action activities for Sierra Leone.

The other activities included four regional stakeholder consultative workshops in the Western Area and in each of the major headquarter towns of Sierra Leone's major provinces (North, East South). During these workshops principal stakeholder organisations had the opportunity to identify the key adaptation needs/options for each of the vulnerable sectors considered (table 4 to table 10).
Meetings were held and studies conducted on vulnerable groups in order to assess mechanisms that are used to cope with climate change related issues in the various sectors as well as in the local communities. Study interviews and meetings conducted were designed to achieve the following:

- To acquaint the people with details of the project
- To seek information on poor people's experience of living with natural disasters, vulnerability and changing climate,
- To investigate direct linkages between natural disasters and climate change,
- To obtain possible information on how poor people are adapting to natural disasters aggravated by climate change,
- To suggest ways on how these vulnerabilities to natural disasters can be tackled by various sectors.

The following groups were consulted: community leaders and government authorities, population centres (villages, towns), special interest groups (NGOs. CBOs, ADAs), etc. The mechanisms of consultation included: public meetings, personal discussions, and administration of questionnaires.

The local community leaders facilitated consultations with communities in their various regions.

Perceptions of the people about the environmental problems that are associated with climate change, centred on the following climatic risks:

- Flooding
- Dry spells
- Thunder storms
- Shifting the rainfall

Also sea level rise and its related impacts (e.g. coastal erosion) was also investigated.

People's perception of the impacts of the above problems and associated disasters related to the following.

- Impact on public health, income and services.
- Impact on provision of goods, services, and food security.
- Impact on management of natural resources

Other issues investigated as part of the meetings and studies related to the following:

- Government response to natural disasters
- People's response to natural disasters
- Possible solutions/identification of adaptation needs.

The NAPA document was subjected to a multi-media (print and electronic) sensitization/awareness creation exercise through the length and breadth of Sierra Leone. The NAPA document will be submitted to the Department of the Environment for final review, comments and approval. Following the approval of the Department of the Environment, the document will be taken to the National Climate Change Committee for review and approval. At the international level, the NAPA document will be sent to UNDP and the UNFCCC Secretariat for their contributions. The document will finally be sent go GEF for final comments and approval before its implementation. All of these stages of reviews and comments are indications that the Sierra Leone's NAPA document is transparent. Information on key sectors and vulnerabilities is given in table 3.

Table 3: **Information on key sectors and vulnerabilities**

Hazard	Occurrence	Impacts	Vulnerable areas	Vulnerable sector
Change in rainfall	current	Loss of crops and livestock	Northern and Eastern regions.	Agriculture, livestock, Water resources and Health
Flooding	future	Loss of life, crops, livestock, damage to infrastructure and settlement areas; disease outbreak	Western area Eastern, Southern, and Northern regions.	Agriculture, livestock, Water resources and Health
Dry spells	Current	Crop failure Fresh water Shortage, Disease out break, Increase in bush fire, Hydro power decline.	Northern, Eastern, Southern regions and Western Area.	Agriculture, Water resources, Fisheries, Forestry, Health, energy.
Sharp Temperature Increase	Future	Heat waves, Drought, frequent storms, crop failures, sea level rise, biodiversity.	Whole country	All Sectors
Sea Level rise, coastal flooding and Coastal Erosion	Current	Loss of property, Beaches Population displacements Coastal flooding	Northern, Southern, Eastern regions and the Western Area	Tourism, Fisheries, Agriculture.
Sea Level rise and salt intrusion	Current	Reduction in fresh water quality, fish migration, coastal area degradation	Northern and Eastern regions, Western Area	Tourism, Agriculture, Fisheries, Water resources.
Increase in storm wind activity	Current	Loss of life, property, air pollution and agricultural losses.	Whole country	All Sectors

3.3.3 Need for adaptation

The key adaptation needs of Sierra Leone are centred on the 6 main sectors: agriculture, forestry, fisheries, water resources (hydrology), meteorology, coastal zones and health. . These sectors are key to adaptation plans because of the following reasons:

a) The activities of these sectors play a crucial role in the socio-economic development of the country.
b) The activities of these sectors can contribute to poverty reduction and enhance food security.
c) A substantial proportion of the countries natural resources are controlled and managed

by these sectors.

d) Environmental degradation is associated with the above sector activities
e) These sectors are vulnerable to climate change related impacts.
f) The activities of these sectors mainly contribute to the concentration of GHGs in Sierra Leone.

Like the designing of the draft NAPA document, which went through the mainstreams of the Sierra Leonean Society (i.e. community, district, provincial and national levels) the draft NAPA document was taken to a prioritization workshop for inputs by principal stakeholders. During the prioritization process, principal stakeholder organizations had the opportunity to select the urgent and immediate priority adaptation options for each of the six (6) sectors Finally the NAPA document was taken to a validation workshop where various stakeholders had the opportunity to make inputs and comment on the document.

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4.0 Selecting Priority Activities

4.1 Criteria for selecting priority activities

In accordance with UNFCCC paragraph 15, of the UNFCCC summary decision 28/CP.7 the criteria below were applied to the options that were identified during the consultative process in order to select the priority adaptation activities. These include a set of locally driven criteria as follows:

a) Level or degree of adverse effects of climate change;
b) Poverty or degree of adverse adaptive capacity;
c) Synergy with other multilateral environmental agreements;
d) Cost-effectiveness.

These criteria for prioritization were considered in conjunction with the potential adverse impact of climate change on the following:

a) Loss of life and livelihood;
b) Human health;
c) Food security and agriculture;
d) Water availability, quality and accessibility;
e) Essential infrastructure;
f) Cultural heritage;
g) Biological diversity;
h) Land-use management and forestry;
i) Other environmental amenities;
j) Coastal zones, and associated loss of land.

Based on the above criteria the priority adaptation activities/options were selected .

4.2 Selection and Prioritization of NAPA priority activities

In order to select and prioritise the options from the list of identified adaptive options established earlier, the Multi – Criteria analysis method was used as recommended in the annotated guidelines for the preparation of national adaptation programmes of action.

4.3 Methodology for scoring each option against a criterion

Using the Multi-Criteria Analysis (MCA), as recommended in the Annotated Guidelines for the preparation of the NAPA, the IST established the scores from all options and criteria. The following criteria were used;

- Impact on vulnerable groups and resources
- Impact on economic growth rate of poor people
- Losses avoided by poor people
- MEA synergies
- Cost-effectiveness

Members of the IST having specific expertise in each sector took the lead during the exercise. The scoring scales were between 1 - 5 for impact on vulnerable groups and resources; 1% - 5% for impact on economic growth rate of poor people; 50 - 500 for losses avoided by poor people; 0 - 10 for MEA synergies; and from 1 - 100 for cost.

4.4 Standardization of scores

As indicated in stage (e) of the MCA, standardization of scores was done by applying Linear Interpolation. That is, plotting each criterion value on an axis, ranging from 0 – 1. Higher values correspond to advantages, while lower values correspond to disadvantages. This process was carried out for all options under each criterion. In essence, the MCA has an advantage of determining the sector with the highest/acceptable scores, which is normally the most probable choice for adaptation purpose. In standardizing the scores, each member of the IST independently marked each option against a corresponding criterion for each of the 8 selected sectors for adaptation.

4.5 Weighting of criteria

In the case of Sierra Leone, the IST gave equal importance to all of the 5 country-driven criteria. The Sierra Leone NAPA Team to considered and agreed on whether some of the criteria should be given higher weight or importance than others. The procedure is in accordance with the weighting and ranking principles of MCA that was used to weigh each of the seven sectors. The NAPA Team was engaged in constructive discussions in order to determine the full importance that should be given to each criterion, bearing in mind all of the important elements that are very essential in the weighting and ranking processes of each criterion. In light of the above standardization and weighting procedures, the data was then computed and ranked.

5.0 Identification of Priority Activities For Urgent And Immediate Adaptation/List of Priority Activities

The ranked adaptation options and results of the multi-criteria analysis simulations are shown in the tables below.

Table 4. Standardized scores on options/criteria for the Water/Hydrology sector

OPTIONS	Standardized Scores on Option/Criterion					MCA 1 Ave. Score (Ranking 1)
	Impact on vulnerable groups and resources	Impact on economic growth rate of poor people	Losses avoided by poor people	MEA synergies	Cost	
Option 1: Improvement of the efficiency of existing water supply systems in both urban rural areas	0.75	0.5	0.308	0.5	0.65	0.54 (2)
Option 2: Improve water research, monitoring and management	1.0	0.75	0.484	0.5	0.28	0.60 (1)
Option 3: Promote rain water harvesting and develop an integrated management system for fresh water bodies	0.5	0.5	0.506	0.4	0.61	0.50 (3)
Option 4: Development and utilization of better planning tools such as aquifer simulation model and predictive/operational salt water intrusion models	0.5	0.25	0.242	0.5	0.42	0.38 (6)
Option 5: Construction more wells/boreholes.	0.5	0.5	0.418	0.5	0.28	0.44 (4)
Option 6: raise awareness/sensitization on the importance of water resources	0.5	0.25	0.220	0.5	0.53	0.40 (5)

Table.5 Standardized scores on options/criteria for the Agriculture Sector

OPTIONS	Standardized Scores on Option/Criterion					MCA 1 Ave. Score (Ranking 1)
	Impact on vulnerable groups and resources	Impact on economic growth rate of poor people	Losses avoided by poor people	MEA synergies	Cost	
Option 1: Develop irrigation and land drainage system for agriculture.	0.75	1.0	0.594	0.5	0.51	0.67 (1)
Option 2: Cultivation of drought resistant crops.	0.75	0.5	0.462	0.6	0.61	0.58 (4)
Option 3: Develop and implement agricultural land-use and land cover management plans.	0.75	0.75	0.572	0.6	0.45	0.62 (2)
Option 4: Train/educate professional and technical staff including agricultural extension workers on climate change and agriculture	0.5	0.5	0.440	0.5	0.40	0.47 (7)
Option 5: Improve food storage facilities and establish seed banks.	0.75	0.5	0.462	0.5	0.30	0.50 (6)
Option 6. Promote swamp land farming	0.75	0.75	0.550	0.6	0.40	0.61 (3)

Table 6. Standardized Scores On Options/Criteria For The Fisheries Sector

OPTIONS	Standardized Scores on Option/Criterion					MCA 1 Ave. Score (Ranking 1)
	Impact on vulnerable groups and resources	Impact on economic growth rate of poor people	Losses avoided by poor people	MEA synergies	Cost	
Option 1: Monitor coastal ecosystems and processes	0.5	0.5	0.418	0.6	0.53	0.51 (5)
Option 2: Promote sustainable fishing practices and develop aquaculture	0.75	0.75	0.572	0.6	0.51	0.64 (1)
Option 3: Improve weather forecasting and develop marine meteorological services	0.75	0.75	0.418	0.5	0.55	0.59 (2)
Option 4: improve fisheries legislations and strengthen fisheries management policies and institutions	0.75	0.5	0.330	0.5	0.54	0.52 (4)
Option 5: Improve traditional fishing practices and community livelihood.	0.5	0.5	0.242	0.5	0.51	0.45 (7)
Option 6:. Preserve and restore essential habitats; promote conservation and environmental education	0.75	0.5	0.484	0.6	0.34	0.53 (3)
Option 7: Improve capacity in the fisheries sector.	0.5	0.25	0.220	0.6	0.40	0.39 (8)
Option 8: Foster international and	0.5	0.5	0.440	0.5	0.44	0.48

national cooperation						(6)

Table 7. Standardized Scores On Options/Criteria For The Forestry

OPTIONS	Standardized Scores on Option/Criterion					MCA 1 Ave. Score (Ranking 1)
	Impact on vulnerable groups and resources	Impact on economic growth rate of poor people	Losses avoided by poor people	MEA synergies	Cost	
Option 1: Management and protection of forests reserves and catchments areas including wetlands.	0.75	0.5	0.440	0.8	0.35	0.57 (3)
Option 2: Rehabilitation of degraded areas by afforestation/Reforestation	0.5	0.5	0.528	0.8	0.34	0.53 (6)
Option 3: Capacity building	0.5	0.25	0.440	0.6	0.36	0.43 (7)
Option 4: Establish forest reserves, protected Areas and National Park/Sanctuaries and redemarcate existing ones in order to maintain their integrity.	1.0	0.5	0.484	0.5	0.52	0.60 (2)
Option 5: Revise and update laws regulations and policies of the Environment, Forestry and Wildlife sectors.	0.75	0.75	0.440	0.5	0.29	0.55 (4)
Option 6: Initiate training sensitization and advocacy and awareness raising programmes for the general public on climate change and forestry.	0.5	0.5	0.682	0.6	0.43	0.54 (5)
Option 7: Promote the use of renewable energy (solar energy) and improve energy efficiency and conservation by retrofitting existing and future structures	0.75	0.75	0.484	0.7	0.51	0.64 (1)

Table 8. Standardized Scores On Options/Criteria For The Coastal Zone

OPTIONS	Standardized Scores on Option/Criterion					MCA 1 Ave. Score (Ranking 1)
	Impact on vulnerable groups and resources	Impact on economic growth rate of poor people	Losses avoided by poor people	MEA synergies	Cost	
Option 1: Management of sand bars, and sand splits along the Sierra Leone coastline	0.5	0.5	0.374	0.6	0.33	0.46 (4)
Option 2: Construction of coastal defence structures to protect settlements and wetlands from seasonal flooding and erosion	0.75	0.5	0.440	0.5	0.40	0.52 (2)
Option 3: Develop and enact appropriate policies and regulations relevant to the development of coastal communities, urban growth planning, and wetland preservation.	0.5	0.5	0.396	0.6	0.42	0.48 (3)
Option 4: Develop an Integrated Coastal Zone Management Plan	0.75	0.5	0.462	0.5	0.44	0.53 (1)
Option 5: Establish national sea level observing system	0.5	0.5	0.396	0.6	0.42	0.48 (3)
Option 6: Rehabilitate degraded coastal habitats	0.75	0.5	0.440	0.5	0.40	0.52 (2)

Table 9. Standardized Scores On Options/Criteria For The Health Sector

OPTIONS	Standardized Scores on Option/Criterion					MCA 1 Ave. Score (Ranking 1)
	Impact on vulnerable groups and resources	Impact on economic growth rate of poor people	Losses avoided by poor people	MEA synergies	Cost	
Option 1: Increase the use of insecticide treated materials (ITMs) as a key strategy in malaria control;	1.0	0.75	0.616	0.5	0.46	0.67 (1)
Option 2: Environmental health and sanitation.	1.0	0.5	0.462	0.7	0.51	0.63 (2)
Option 3: Support HIV/AIDs prevention activities;	0.5	0.5	0.396	0.4	0.48	0.46 (4)
Option 4: Capacity building.	0.5	0.5	0.330	0.4	0.51	0.45 (5)
Option 5: Develop appropriate sanitation programs	0.75	0.5	0.572	0.5	0.51	0.57 (3)

Table 10. Standardized Scores On Options/Criteria For The Meteorology Sector

OPTIONS	Standardized Scores on Option/Criterion					MCA1 Ave. Score (Ranking 1)
	Impact on vulnerable groups and resources	Impact on economic growth rate of poor people	Losses avoided by poor people	MEA synergies	Cost	
Establishment on National Early Warning Systems.	0.5	0.5	0.376	0.7	0.40	0.45 (5)
Option 2: Provide logistics and communication equipments to enable the meteorological department assist air and sea transport, agriculture, water, health, energy, fisheries and other sectors of the economy.	0.5	0.5	0.264	0.7	0.48	0.49 (6)
Option 3: Rehabilitate and upgrade meteorological and climatic stations.	0.5	0.5	0.374	0.8	0.36	0.51 (4)
Option 4: Educate meteorological department personnel to forecast and inform about particular dangerous or extreme events.	0.75	0.75	0.638	0.7	0.43	0.65 (1)
Option 5: Raise public awareness and mainstream gender perspectives into climate change issues	0.75	0.75	0.572	0.7	0.35	0.62 (2)
Option 6: Forster cooperation with International Conventions and Programmes	0.5	0.5	0.352	0.7	0.56	0.52 (3)

Based on the ranked adaptation options and results of the multi-criteria analysis simulations three (3) priority activities from each of the six (6) sectors (with the exception of the Meteorological Sector) were identified for urgent and immediate adaptation. These are given below:

Agriculture Sector

1. Develop irrigation and land drainage system for agriculture;
2. Develop and implement agricultural land-use and land cover management;
3. Promote swamp land farming.

Forestry Sector

1. Promote the use of renewable energy (solar energy) and improve energy efficiency and conservation by retrofitting existing and future structures;
2. Establish forest reserves, protected Areas and National Park/Sanctuaries and redemarcate existing ones in order to maintain their integrity;

3. Management and protection of forests reserves and catchments areas including wetlands and reduce dependence on firewood and charcoal by using liquid fuel (LPG) and bio fuels (ethanol/methane/oils).

Water/Hydrology Sector

1. Improve water research, monitoring and management;
2. Improvement of the efficiency of existing water supply systems in both urban rural areas;
3. Promote rain water harvesting and develop an integrated management system for fresh water bodies.

Coastal Zone

1. Develop an Integrated Coastal Zone Management Plan;
2. Rehabilitate degraded coastal habitats;
3. Develop and enact appropriate policies and regulations relevant to the development of coastal communities, urban growth planning, and wetland preservation.

Fisheries Sector

1. Promote sustainable fishing practices and develop aquaculture;
2. Improve weather forecasting and develop marine meteorological services;
3. Preserve and restore essential habitats; promote conservation and environmental education.

Health Sector

1. Increase the use of insecticide treated materials (ITMs) as a key strategy in malaria control;
2. Support HIV/AIDs prevention activities;
3. Develop appropriate sanitation programs.

Meteorology Sector

1. Establishment on National Early Warning System;
2. Improve research and weather forecasting capabilities and rehabilitate national weather stations as well as educate meteorological department personnel to forecast and inform about particular dangerous or extreme events;
3. Raise public awareness and mainstream gender perspectives into climate change issues;
4. Forster cooperation with International Conventions and Programmes.

6.0 PROJECT PROFILES

The Project presented in this report were derived from the twenty-three (23) priority activities/urgent needs for adaptation or options selected in the previous chapter. The project profiles were developed following the guidelines provided in the Annotated guidelines for the preparation of the NAPA. These project profiles are provided below:

Project No 1

Project Title: Develop an Early Warning System in Sierra Leone

Rational/Justification:

In the recent past, unprecedented and extreme weather and climate hazards have been observed around the world and their effects have been known to be devastating. Such weather and climate hazards have destroyed lives of people, properties and livelihood of large communities. The environment has also been affected by such climate and weather types which include hurricanes (tornadoes, tropical cyclones), thunderstorms, droughts and floods. Now that it has been well established that the climate is changing, hazardous weather types are likely to affect various parts of the world and Sierra Leone is no exception.

It is therefore necessary that the Sierra Leone Meteorological Department be capacitated in order to properly monitor the climate and weather systems in the sub-region and in particular to be in position to give Early Warnings of imminent hazardous weather or climate.

Climate Change is known to have adversely affected the environment, Agriculture, Food Security, and even the lives and livelihood of large communities. Fishermen are known to have lost their lives in storms and passenger boats have encountered weather-related accidents – even though some go unreported Flooding is known to have affected agriculture and habitats of people in Sierra Leone and their suffering aggravated by the attending health problems of water-borne diseases (typhoid dysentery cholera and diarrhea) due to lack of safe drinking water.

In the case of drought agriculture which the mainstay of many people in Sierra Leone will be disrupted, and so also is the early or delayed seasonal rains.

The Meteorological Department should be in position to give timely information on weather events likely to adversely affect the country and its people.

Having fore knowledge on future weather or climate events will help to minimize their negative effects on the people and the country.

Description
Objective

To build the capacity of the Sierra Leone Meteorological Department in order to enable it properly monitor the weather systems and climate and in particular to be in a position to provide Early Warning of Imminent Hazardous Weather or Climate.
To enable the Meteorological Department to give timely information on weather event that are likely to adversely affect the country and its people

Activities

The activities to be conducted will be geared towards putting back into operation the PUMA (preparation for the use of Meteorological satellite in Africa) station at the Lungi airport.

The PUMA station is the ground receiving station consisting of three dedicated computers with base programs to receive and process satellite cloud pictures, wind fields, water vapour content, ITD and other weather products for the purpose of detecting and monitoring weather systems for forecasting.

Before the installation of the PUMA station, a brief period of training of programme was conducted in South Africa for four operators of the PUMA equipment but due to low knowledge on computers the operation of the station has not been effective. Requests have been made for further training of operators and the upgrading of the system by the PUMA technicians but this exercise is yet to be addressed.

The activities to be conducted include the following:

1. Adequately train the system operators.
2. Invite the PUMA station technician(s) to re-visit the station and upgrade the system.
3. Recruit and train weather observers
4. Recruit and train weather forecasters
5. Procure modern weather observation equipment/instruments.

Input

Human, Material and Financial Resources

Short-term output

- Rehabilitation of PUMA station at Lungi
- Improvement in weather reporting for aviation purposes

Potential long-term outcomes

- Establishment of Early Warning System for hazardous weather at the Lungi airport
- Adequate number of trained and qualified weather observers and forecasters to man the Lungi Meteorological office on 24 – hour basis.

Implementation
Institution Arrangements

The Sierra Leone Meteorological Department will be the main executing agency. It will collaborate with other agencies such as the Sierra Leone Airport Authority (SLAA) the Sierra Leone Maritime Administration (SLMA), the Sierra Leone Ports Authority (SLPA), the Navy, the Environment and the Water Resources Departments, Sierra Leone roads Authority, the

Potential Regional/International partners will include the world Meteorological Organization (WM), Roberts field Flight Information Region (FIR), International Civil Aviation Organization (ICAO) and the European Meteorological Satellite (EUMETSAT) in Africa, Organization of National Security and Civil Aviation.

Risks and Barriers:

Another risk is the inability to retain government employees of the Meteorological Department at the airport. They might develop low morale due to low remuneration as compared to parastatal employees who earn higher pay at the airport. The sustainability of the project is certain because after the provision of the various components mentioned in the budget breakdown, the maintenance and daily administrative cost of the Lungi Meteorological Office will be met by the Department's annual allocation from the central government.

Monitoring and Evaluation

The project will be monitored by competent agencies especially the SLAA and Civil Aviation. A set of criteria will be developed to be used as tools for project evaluation.

Financial Resources: This project is estimated to cost US**$ 751,950**

Budget Breakdown

	Year 1	**Year 2**	**Year 3**
Invitation of PUMA technician (s) to upgrade the system	75,600	39,900	25,400
Further training of five (5) system operators	62,450	54,500	34,000
Installation of internet, fax and radio telecomns. equipment	25,000	15,000	15,000
Modern weather observation Equipment/Instruments	40,000	28,000	16,000
Training of six (6) weather forecasters	180,000	45,000	45,000
Training of nine (9) weather observers	34,000	11,400	5,700
Total	**417.050**	**193,800**	**141,100**

Project No. 2

Project Title: Rehabilitation &Reconstruction of meteorological/climate monitoring stations throughout the country

Rationale/Justification:

The Meteorological Department used to have eleven (11) synoptic stations, three (3) Agro Met stations and two (2) upper air stations all over the country for monitoring of the country's weather/climate phenomena. There were plans to open five (5) more synoptic stations in other to get an even distribution of stations in consonance with WMO improved standard of 1994.

However, during the war almost all of the existing stations were destroyed. At the moment only five (5) are operational (Lungi Air Port, Bonthe, Bo, Freetown and Makeni), with none of the upper air functional.

In order to fully monitor and contribute to the adaptive capability of the country to climate change, a good network of meteorological stations fully equipped to adequately monitor the parameters responsible for initiating and propagating the change is therefore very imperative. The Sierra Leone government is expected to establish the two upper air stations at Lungi and Daru as local contribution apart from the payment of the salaries of these staffs.

Objectives

The main objective of the Project is to rehabilitate and improve the Meteorological/Climatic data collection, data analysis and storage of the country in order for the department to carry out its obligations towards the NAPA project

To meet this objective, the following specific objectives will be achieved by the end of the project phase of two (2) years:

- The rehabilitation of six (6) meteorological stations at Daru, Sefadu, Yele, Kabala, Njala and Shenge:
- The establishment of five more stations at Nitty, Bakuma, Sulima, Kamakwie and Kailahun in order to give a full coverage of station network representative of WMO standard.
- The provision of adequate equipment and logistics for each of these stations to function properly.
- The provision the necessary tools and office logistics for the collection, analysis, storage and dissemination to end-users of weather/climate data and information.

Activities

There are three (3) Components to this project viz: (a) Rehabilitation of old Station and opening of new stations to meet WMO standard (b) The provision of tools and equipment for these stations and (c) provision of logistics for the running of the established stations which include those for: data analysis, dissemination to end users and data storage. The components involve are outlined in the detail budget.

Input

Human, Material and Financial Resources

Short-term output

Improvement of meteorological/climate data collection, storage and analysis

Potential long-term outcomes

Rehabilitations of existing meteorological stations and establishment of new ones.

Implementation
Institution Arrangements

The Meteorological Department of the Sierra Leone will the lead executing agency. It will collaborate with other agencies which include the
Water Resource Department, Environment Department, Faculty of Environmental Science, Njala University, Guma Valley Water Company, Sierra Leone Water Company (SLWACO). The Potential Regional/International Partners will include the World Meteorological Organization (WMO) United Nations Environmental Program (UNEP) and the Mano River Union Basin Organization.

Risks and Barriers:

Some of the risks involve are the remoteness of some of the stations which make them venerable to thieves. The involvement of the local people of the areas in the provision of security for the said stations will clear this risk. The sustainability of the project is certain as after the provision of the various components mentioned the simple task of maintenance and daily administrative cost of these stations could be met from that of the department's annual allocation from the central government.

Monitoring and Evaluation

The project will be monitored by competent national agencies. A set of criteria will be developed to be used as tools for project evaluation.

Financial Resources: The Total cost of the project is Five Hundred and fifty-six thousand, one hundred and sixty US Dollars ($ 556,160.00) only and will last for two (2) years

Financial Resources: This project is estimated to cost **US$ 1,231,651**

Budget Breakdown

	Year 1	**Year 2**	**Year 3**
Rehabilitation of 6 stations	111,600	122,760	135,036
Upgrading of existing operational stations	33,800	37,180	40,898
Establishment of 5 new stations	108,000	118,800	130,680
Cost of rainfall station equipments	39,000	42,900	47,190
Cost of office materials/logistics	54,700	60,170	66,187
Workshop instruments	25,000	27,500	30,250
Total	**372,100**	**409,310**	**450,241**

Project No. 3

Project Title: Capacity building of the MET Dept through training of personnel for the country's adaptation to climate change

Rationale/Justification:

The Meteorological Department used to have five (5) WMO Class I meteorologists, seven (7) Class II Meteorological forecasters, seven (7) Class III and sixty (60) Class IV observers manning the country's Climatic/Meteorological data monitoring and management. The Department lost most of these to the war or thought retirement from the service. At the moment we have only three (3) WMO Class I meteorologists, one (1) Class II forecaster, six (6) Class III MET Assistances/superintendents and Twenty (20) Class IV observers. This leaves the department in a very strenuous position which greatly limits it in meeting its obligations in NAPA. Thus the fast-track training of the various personnel to meet the formal level will therefore greatly enhance the Department. It is hoped that the extra training needs not included here will be provided by the government as local contribution.

Description
Objectives

The main objective of the Project is to recruit and/or train meteorological personnel at the various levels in order to capacitate the department in its National adaptation program of action of the perceived climate change effects.
To meet this objective, the following specific objectives will be achieved by the end of the project phase:

- The training of two (2) WMO Class I Meteorologists externally within the sub region
- The training of six (6) Class II Meteorological forecasters.
- The training of two (2) Class III personnel.
- The training of forty (40) meteorological observers and
- The training of four (4) instrument technicians.

Activities:

- The training of two (2) WMO Class I Meteorologists externally within the sub region
- The training of six (6) Class II Meteorological forecasters.
- The training of two (2) Class III personnel.
- The training of forty (40) meteorological observers and
- The training of four (4) instrument technicians

Input

Human, Material and Financial Resources

Short-term output

Improvement of meteorological/climate data collection, storage and analysis

Potential long-term outcomes

Meteorological staff recruited trained and capacitated to deal with climate change related issues. The expected outcome of the project is that by the end of the project phase, which is two (2) years, the department would have enough meteorological personnel for Climate/Meteorological data collection, analyses, storage or dissemination to end-users.

Implementation
Institution Arrangements

The Meteorological Department of the Sierra Leone will the lead executing agency. It will collaborate with other agencies which include the
Water Resource Department, Environment Department, Faculty of Environmental Science, Njala University, Guma Valley Water Company, Sierra Leone Water Company (SLWACO). The Potential Regional/International Partners will include the World Meteorological Organization (WMO) United Nations Environmental Program (UNEP) and the Mano River Union Basin Organization.

Risks and Barriers

Some of the risks involve are the remoteness of some of the stations where the observers will be based since there is a general drift of young people towards the cities. The recruitment of personnel from the station surroundings will remove this risk. The sustainability of the project is certain as after the provision of the various components mentioned, the simple task of running of these stations, salary payment to staff, maintenance and daily administration cost of these stations could be met from that of the department's annual allocation from the central government.

Monitoring and Evaluation

The project will be monitored by competent national agencies. A set of criteria will be developed to be used as tools for project evaluation.

Financial Resources

The Total cost of the project one hundred and sixty-eight thousand and eighty US dollars ($168,080.00) only and will last for two (2) years

Financial Resources: This project is estimated to cost **US$ 152,800**

Budget Breakdown

	Year 1	**Year 2**	**Year 3**
The training of two (2) WMO Class I Meteorologists	16,000	17,600	19,360
The training of six (6) Class II Meteorological forecasters	66,800	73,480	80,828
The training of two (2) Class III personnel	12,000	13,200	14,520
The training of forty (40) meteorological observers	39,000	42,900	47,190
The training of four (4) instrument technicians	19,000	20,900	22,990
Total	**152,800**	**168,080**	**184,888**

Project No. 4

Project Title: **Sensitization and awareness raising campaigns on climate change impacts on women relating to the three conventions of biodiversity, desertification and UNFCCC**.

Rationale/ Justification

It is accepted that anthropogenic activities of the lost hundred years have greatly contributed to global warming. This trend can be mitigated if the general public and establishments who are the contributors and or abettors are sensitized enough on using mitigating/adaptive options. The ignorance of individuals and groups/organizations on the various United Nations Conventions on (a) Climate Change, (b) Desertification, and (c) Biodiversity is also a contributing factor for there un due influence and activities contributing to climate change.
Women who are usually the most vulnerable in time of disasters needs special attention during such sensitizations and should be properly educated on adaptive and mitigative options and procedures in the implementation of the above conventions. In achieving this, various organizations/groups involving both governmental and non governmental, will be equally involved in caring out the project.

Description
Objectives:

The main objective of the Project is to make the public, especially the women and children aware of the three conventions on Climate Change, Desertification and Biodiversity and how to work together in meeting our obligation as enshrined in these conventions.
To meet this objective, the following specific objectives will be achieved by the end of the project phase of two (2) years:

- Educating the entire populace on the three conventions through: (a) various grass root organizations (CBOS) and NGOS, (b) Various government institutions and (c) individual in the form of expert advice and knowledge.
- The provision of public learning materials in the form of chart, demonstrations and seminar/workshop logistics etc during the sensitization process.
- The provision of simple information dissemination logistics such as TV/Radio air time, News paper columns etc
- The involvement of the project benefices especially the women and children on appropriate warning signs and signals together with actions required that they need to know or do to either adapt or mitigate the effect of climate change.
- The provision the necessary tools and office logistics for the collection, analysis, storage and dissemination to end-users of weather/climate data and information especially those needing urgent attentions.

Activities

There are three (3) Components to this project viz: (a) Education of the project benefices on the components of the three conventions (b) Identification (possibly in seminar/workshop) of venerable targets for special attention/address by the project. (c) Identification of adaptive procedures and option for the above venerable targets. (d) Identification of likely mitigative options with respect to the Provision of logistics for the above options. (e) Using the various information dissemination tools of radio, TV, News Paper, public Lectures etc to meet the objectives of the project.

Input

Human, Material and Financial Resources

Short-term output

Improvement of public knowledge and awareness on the conventions of biodiversity, desertification and climate change.

Potential long-term outcomes

Public educated on the conventions on biodiversity, desertification and climate change.

Implementation
Institution Arrangements

The Meteorological Department of the Sierra Leone will the lead executing agency. It will collaborate with other agencies which include the
Water Resource Department, Environment Department, Faculty of Environmental Science, Njala University, Guma Valley Water Company, Sierra Leone Water Company (SLWACO). The Potential Regional/International Partners will include the World Meteorological Organization (WMO) United Nations Environmental Program (UNEP) and the Mano River Union Basin Organization

Risks and Barriers:

Some of the risks involve are the remoteness of some of the rural areas especially the sea side and farming villages where most of the country's women/children are based. Also the high rate of illiteracy especially among the women makes information dissemination a bigger task. The involvement of women and children who are the most vulnerable will make the project sustainable since they make more than 80% of the population. The involvement of the local people of the areas in the identification of either vulnerable target or adaptive procedures will remove the risk of the area's remoteness. They involvement of the local communities in executing identified procedures of adaptation and mitigation will forester compliance of accept norm of the project. The sustainability of the project is certain as after the provision of the various components mentioned the simple task of maintenance and daily administrative cost of

the various components could be met from that of the department's annual allocation from the central government which will be accordingly adjusted to reflect the task adaptive and mitigative options of the project.

Financing Resources The Total cost of the project Nine hundred and fourteen million ,nine hundred and fifty-six thousand Leones only (Le 914,956,000,{ i.e. Three hundred and four thousand nine hundred and eighty-six Dollars ($304,986)}

Financial Resources: This project is estimated to cost **US$ 132,000**

Budget Breakdown

	Year 1	**Year 2**	**Year 3**
Educating the entire populace on the three conventions	20,000	22,000	24,200
The provision of public learning materials	60,000	66,000	72,600
Media sensitisation	12,000	13,200	14,520
Public meetings, conferences, workshops etc.	40,000	44,000	48,400
Total	**132,000**	**145,200**	**159,720**

Project No. 5

Project Title: Development of Inland Valley Swamps For Rice Production in the Moyamba District.

Rational/Justification:

- Of all the rice growing ecologies in Sierra Leone, the Inland Valley Swamps are now believed to have the right potentials for the achievement of self-sufficiency in rice production. According the most recent, agricultural sector Review (FAO, 2003), the IVS have the highest comparative advantage, for increased rice production.
- The IVS contribute approximately 20% of the food growing area in the country (NCU, 1990). They have an estimated potential of 690,000ha and are found in all the geographical regions of the country. The productivity potential is greater than that of the uplands due to higher organic matter content and a favourable water regime for a longer period during the year. Under improved water management practices, rice yields in the range 2-3.2 tons/ha have been reported. (FAO, 2005). The high organic matter content (fertility) and favourable moisture condition make worth developing to avoid drought conditions caused by adverse climate variability on the uplands.
- The Moyamba district has a great potential for the development of inland valley swamp for rice production. These swamps are however under utilized and efforts for effective development can be undermined by climate change.

Description of the Project

Overall Objectives: To increase the area under cultivation for increased rice production.

Specific Objectives

- To ensure all-year-round rice production through improved water management in the inland valley swamps.
- To minimize the negative impacts of climate variability/climate change on rice production.

Activities

- Selection of inland valleys suitable for development.
- Biophysical and socio-economic surveys of suitable inland valleys.
- Technical designing of water control structures of suitable IVS for development.
- Development of suitable IVS.
- Capacity building training of farmers in operation and maintenance of water control structures.
- Provision of inputs, tools, seeds, chemicals
- Provision of essential infrastructure (storage processing, marketing).

Inputs

- Trained engineers and technicians
- Basic survey equipment and tools and extension staff.
- Stationery and other materials (field note books duplicating papers, drawing pens, tracing papers etc.
- Camping equipment and other logistics
- Topographic map sheets of areas concerned
- Training materials
- Mobility (pick-up vans and/or motor bikes
- Fuel and oil
- Per diems and DSAs.

Outputs
Short term outputs

- Data base on suitable inland valleys
- Well developed swamps with proper water control structures
- Increased area for rice production
- Availability of trained self reliant farmers for trouble shooting.

Medium to long term outputs

- Well established and proper functioning inland valley swamps
- Increase rice yields ranging from 203 tons/ha
- High quality finished local rice products available and affordable on the markets

Implementation of the Project: This should be highly participatory.

Institutional Arrangements
Government (Local and Central): To provide:

- Trained manpower (Engineers, technicians, extension staff)
- Funds for survey equipment and logistic support (mobility, fuel and oil, camping facilities.
- Basic infrastructure: Improved road network, marketing centres, processing and storage facilities.

Private Sector: Involvement in the

- Importation of basic tools and equipment under favourable trade conditions.

- Swamp rice production
- Storage and processing as well as marketing.

The Community:

- Individual and farmers association to be directly involved in the formulation and implementation of IVS development projects.
- Provision of labour, and monitoring of all activities.

Risks and Barriers

- High initial costs involved
- Low labour availability for the various development operations
- Low level of funding that might adversely affects the provision of basic tools, machinery and other logistic support.
- The farming calendar: IVS development activities interfering with upland farm operations and annual social and cultural activities.

Monitoring and Evaluation

Monitoring and evaluation will be undertaken form a participatory approach:

- The land and Water Development Division (LWDD) will be responsible for the technical aspects of monitoring while the Project evaluation monitoring and statistics Division (PEMSD) of the Ministry of Agriculture will handle the socio economic aspects. At community level and agricultural unit of the district council, as well as community based organization such as farmer's organizations, agricultural business units (ABU) will also fully involved.

Financial Resources

The development of IVS will be undertaken in all Districts that have resourced number of large inland valleys worth developing. The operations will be spread over a period of five (5) years and will be undertaken in all districts at 5 ha per district, amounting to 65ha per year, and 325ha over 5 years. Within the 5 years period, the cost of development is estimated at 1,075, 00 USD.

Budget Breakdown for IVS Development in USD, ´000

Activity/Items	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
Inventory of suitable IVS	40	30	20	10	-
Mobilization of manpower, logistic support, materials base maps, camping equipment.	30	30	20	20	-
Detailed bio-physical and socio-economic surveys of IVS	60	50	50	30	10
Designing of IVS, calculation of costs of development	20	10	10	10	-
Development of IVS	60	30	10	10	10
Capacity building training of technicians farmers and extension staff	20	20	20	20	20
Acquisition of basic survey equipment	50	50	50	-	-
Production input (farm tools, chemicals)	20	10	10	10	5
Monitoring and evaluation	10	10	10	10	10
	350,000	**280,000**	**240,000**	**140,000**	**65,000**

Project No. 6

Project Title: Development of an Integrated Natural Resources and Environmental Management System for Sierra Leone.

Rational/Justification:

- A judicious and carefully planned and implemented integrated management of the Natural environment and resources can contribute immensely to reduction of the impacts of climate change on agriculture and food security. It is also an initiative for poverty reduction.
- The current poor status of the country's natural resources is attributed to the following constraints:

    - Lack of financial, technical, institutional and other logistics support to community base organizational intervention. This has led to reduced productivity and consequent environmental degradation.

- **Some of the causes of land degradation are:**

    - Cultivation of steep slopes
    - Bush fallow cultivation with shortened fallow periods
    - Firewood and charcoal harvesting
    - Existence of bare soils, ponds, lakes and grasslands in mining areas previously covered with fertile soil and forests
    - Inadequate extension service and facilities
    - Lack of environment impact assessment in project planning and implementation. etc

- **The strategies of the project in Addressing the above issues will be as follows:**

    - Inventory and mapping of degraded lands
    - Participatory rapid Assessment (PRA) of socio-economic issues

- **Based on the outcomes of the above strategies the project will:**

    - Promote adoption of proper land husbandry and other resource management

Description of the Project objectives:

- To promote community based (CBO) approach in agricultural development and environmental management.
- To conduct a natural resources inventory and mapping of degraded areas.
- To promote capacity building

- To review existing environmental and resource use policies and regulation
- Off-farm land and natural resource management
- Promote protected area management activities

Activities

- Acquisition of sources of data and other resource materials
- Acquisition of survey equipment
- Acquisition of means of mobility
- Assembly of camping materials
- Recruitment of specialized staff and non specialized staff.
- Development of natural resource data bank
- Provision of storage facilities
- Conducting of capacity building
- Planning and implementing soil and conservation measure at National, Regional and farm levels
- Establishments of protected forestry areas, conducting wetland biodiversity assent and mapping.
- Rehabilitation of degraded areas.
- Conducting environment impact assessment for future development projects.
- Collaborative management and utilization of forest area.

Inputs

- Maps, aerial photos, satellite imagery
- Survey equipment
- Vehicles, motor bikes, bicycles
- Camping materials
- Specialized staff (consultant), casual labour).
- Storage facilities
- Training materials and equipment
- GIS hard and soft ware
- Trained forest guards
- Seeds and other planting materials

Outputs
Short-term outputs

- Employment for local communities
- Capacity building
- Social and economic life for communities improved increased incomes
- Food self sufficiency and energy production.
- Increased awareness about eh importance of natural resource preservation
- Reduced land degradation

Long term outputs

- Increased chance of adaptability to climate change
- Availability of a data base of Natural resources
- Well trained and motivated extension and technical staff
- Appropriate environmental protection policies which are effectively implemented.

Implementation
Institutional Arrangement

- The implementation will require total involvement of the whole nation with special emphasis on participatory approach.
- Total collaboration of researches with land users; mainly community based organizations.
- Government: to provide generous funding, formulate, enforce the implementation of policies.
- Government to encourage and promote the involvement of the private sector.
- Strengthening all national regional and local institution dealing with natural resource preservation.
- The ministry of Agriculture and NACFF to develop policies

Risks and Barriers

- The bush fallow systems/shifting cultivation
- Uncontrolled land use activities e.g. mining, logging, fuel wood and charcoal production
- Low level of funding
- Illiteracy amongst the rural population

Monitoring and Evaluation

- The ministry of agriculture and the national commission on environment and forestry will be lead agencies ensuring monitoring and evaluation of the natural resource development efforts, at all administrative levels.

Financial resources

Budget Breakdown for natural resource management project USD, ´000

Activity/Items	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
Inventory and survey of natural resource	60	40	30	10	10
Acquisition of resource materials and other logistics	60	20	20	20	-
Creation of data base on natural resources	50	25	25	10	10
Organization of community based organization	20	20	10	10	-
Capacity building training of community members and technicians equipment	50	50	50	25	25
Sensitization and awareness creation activities	10	10	5	5	5
Soil and water conservation activities	100	100	100	25	25
Monitoring and evaluation	210	10	5	5	-

Project No. 7

Project Title: Development of Irrigation and drainage systems for agricultural production in the Bombali District of Sierra Leone:

Project Rationale/Justification:

Agriculture in Sierra Leone is predominantly rain fed. This is especially so in the Bombali district where frequent dry spells are experienced. It is practiced on two main ecosystems. Low lands and uplands. In the lowlands, poor drainage is a major problem and water control is the key to successful rice and other crops production.

On the uplands, shifting cultivation is the dominant farming system. The uplands accounts for about 84% of the total land under rice production. The shifting cultivation practice under rain fed conditions has numerous problems which limit agricultural production and render the agricultural systems highly vulnerable to climate change.

- A critical analysis of the climate and water resources of Sierra Leone in relation to agriculture suggests that the abundant rainfall, sim-chine, surface and groundwater and carbon dioxide are not being harnessed sufficiently for agricultural production.
- The impacts of climate variability and possible climate change can be minimized and increased food production and food security ensured if irrigation systems are installed on the uplands and viable drainage and water control measures implemented in the lowlands.

Project description
Objectives: the overall objective is to develop irrigation and drainage systems in the vulnerable areas of the country for increased food production.

Specific Objectives:

- To increase food production all year round through irrigation and drainage.
- To extend the area under agricultural projection on the uplands
- To minimize the impacts of climate variability and climate change on food production

Activities

- Survey, evaluation, and classification of areas suitable for irrigation on the upland ecology.
- Survey, evaluation and design of irrigation and drainage systems for selected lowlands for crop production.
- Construction of appropriate irrigation and drainage systems.

- Capacity building and/or development within the land and water management institutions
- Building capacities amongst farmers and extension agents in the operation and management of irrigation and drainage systems.

Inputs

- Irrigation and drainage equipment, and materials
- Trained manpower (Engineers, technicians, extension staff and farmers)
- Basic farm tools
- Other farm inputs (fertilizers, seeds, chemicals, credit, and regular supervision).
- Processing, marketing and storage facilities, transportation
- Survey equipment (soil, hydrology)
- Camping equipment and other facilities
- Information on weather and climate

Short Term Outputs

- Irrigation and drainage system installed in selected areas in the country.
- Availability of well trained technicians extension agents and farmers.
- Improved monitoring and supervision
- Availability of essential irrigation and drainage equipment and farm tools.
- Increased yields
- Improved water control
- Improved processing and storage facilities

Potential Long term outputs

- Well established and functioning irrigation and drainage systems.
- All year road production of food.
- Gradual establishment of sedentary farming to replace rain fed farming
- Improved adaptation capacity to climate change
- Increase in farmers incomes, and poverty alleviation
- Improved storage processing and marketing of food.

Implementation: the implementation of irrigation projects shall be at small to medium levels on regional basis.

Institutional arrangement

- **Central Government**: to provide adequate funding from local and foreign sources
- Provide the enabling environment for private sector involvement in irrigation and drainage activities.

- **Live ministries**: the Land and Water Development Division of the Ministry of Agriculture and Food Security will be the key institution for planning, designing, technical implementation, monitoring and supervision of all irrigation and drainage projects.
- Local Governments, community based organizations will be encouraged to participate in the planning, implementation and monitoring of irrigation and drainage projects
- Farmers Associations shall be encourage to go into irrigation and drainage farming, processing, storage and marketing.
- Research institution shall be encouraged to conduct research in order to identify appropriate irrigation systems, machinery and practices.

Risk and Barriers

- High initial costs involved
- Increase in water borne diseases
- Low capital investment by government
- Difficulties in changing from rain fed agriculture to sunshine based (irrigation) agriculture.
- Low labour availability in the country side where irrigation and drainage will be implemented.
- Poor production infrastructure.

Monitoring and Evaluation

The land and Water Development Division will take the lead in technical monitoring and evaluation of the project, while project evaluation and monitoring and statistic.

Division (PEMSD) will monitor and evaluate the economic and social impact of the project. The local organizations shall be encouraged to participate in the process.

Financial Resources:

The irrigation and drainage projects shall be planned to cover 5-10 year cydes. The cost of the project with 5 years periods is estimated at 1,055,000 USD over a 5 year period. Implementation of irrigation and drainage projects will be the drier Northern districts (5 Districts). Koinadugu, Bombali, Tonkolili, Port Loko and Kambia.

Budget Breakdown (´000, USD)

Activity/Items	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
Inventory of Potential irrigation and drainage areas	30	20	10	5	-
Soil survey and land suitability evaluation of potential sites	50,000	30	20	10	-
Design of irrigation and drainage structures	10	10	5	5	5
Acquisition of irrigation and drainage equipment	200	120	40	20	10
Capacity building mainly training and recruitment	60	40	20	10	5
Construction of structures and installation of equipment	40	35	30	20	5
Basic farm tools and other inputs	10	10	5	5	-
Production activities	50	20	10	10	10
Operation and maintenance costs	10	10	10	5	5
Monitoring and evaluation	10	5	5	5	5
	465	**300**	**155**	**95**	**40**

Project No. 8

Project Title: **Promotion of the use of renewable energy (Solar Energy) and improvement of energy efficiency and conservation in Sierra Leone.**

Rationale/Justification:

At present direct solar radiation does not constitute a major form of energy in the country. It is only and mostly used in its natural form to dry and preserve several items including agricultural crops, fish, sawn timber, clothing etc.

Several major towns and villages far removed from the district capitals where national grid can be reached, and those outside the mining areas, are without electricity.

For almost twelve (12) years the rebel war had destroyed most of the energy infrastructures in the country. The worst hits are the villages and towns outside the district capitals.

Additionally:

- Nearly 80 - 90 % of the rural population in the country must burn wood to cook their food
- The same number of people do not have access to clean drinking water and many die because of un-boiled drinking water
- Wood for cooking purposes contributes to the hundreds of hectares of forest destroyed annually
- Thousands of people are exposed to indoor air pollution mainly as the result of burning solid fuels for cooking and heating
- Solar energy is environmentally friendly, economical, healthy, safe and convenient.

The essence of the proposal is to select at least one town and one village from each of the 12 districts as prototypes for implementation.

Description:

Objective:

i) The main objective is for the selected towns and villages to have community owned and controlled centres that will address their needs for. Example improved energy source for cooking and heating, coupled with better health, social, environmental and educational conditions of the community.

ii) The main objective of Government is the sustainable exploitation and the efficient use of the country's renewable energy resources and power production in order to improve the quality of life of the people.

iii) A further objective is to pursue only environmentally friendly policies and measures as part of Governments efforts to meet its obligations under the Climate Change Convention.

Activities:

The project will consist of three components

- The rehabilitation/renovation of existing buildings or construct new ones for the centre
- Training of local attendants
- Installation of the Solar-charging equipment.

As their own contribution the local community will provide masons, carpenters, painters and manual labour force that may be required.

Inputs:

The project will involve building a solar battery charging centre. Each centre will have one or two charging stations to service the batteries, a demonstration room consisting of one 50pW or 100pW solar panel at village and town levels respectively, controls, batteries, lights, a television, radio cassette recorder and an office/store room

Short-term outputs

:
- Employment for the local community
- Training afforded to attendants
- Direct benefit of improved lighting system for the community
- Social,, educational and health impact by affording the community the opportunity to view television and /or tune in to radio for general information and educational programmes.

Potential long-term outcomes:

- There is a constant source of power in the homes through recharged batteries
- Extended evening hours to complete tasks that require light for example tailoring, food preparation, washing, etc.
- Affords extra study hours for students

Implementation

Institutional arrangements

The role of Government will be on the provision of policy guidelines, strategy formulation and implementation of coordination. The role of private sector will be strengthened in manufacturing and marketing of utilization technologies.

The Ministry of Energy and Power will be responsible for continuous monitoring and data collection in collaboration and corporation with the Electrical Engineering Department of the University of Sierra Leone.

Private entrepreneurs and other potential consumer groups will be involved in research and development of energy technologies, participatory and consultative planning and implementation approach, particularly with wider involvement of end users.

Risks and barriers

The following are some of the risks and barriers:

- Needs the sun for effective performance
- Often slower than conventional lighting and cooking systems
- May not be suitable for all foods
- The question of whether it is culturally acceptable and adaptable
- It does not replace fire as a way of heating homes

Monitoring and evaluation

The Energy Development Agency of Government will be responsible for continuous monitoring and evaluation of data so collected in collaboration with research bodies i.e. University of Sierra Leone.

The information will be dissemination through monthly and annual reports.

Financial resources: The cost of the project is estimated at one million five hundred thousand dollars (1,500,000 USD) over a 4 year period.

Budget Breakdown (000 USD)

Items	Y 1	Y2	Y3	Y4
Rehabilitation/renovation of center	20	20	5	5
Purchase of solar panels and other equipment	500	500	200	-
Installation of equipment	50	30	20	-
Training of attendants and sensitization of community	10	20	10	10
Maintenance spares and repairs	5	20	35	40
Total	**585**	**590**	**270**	**55**

Project No. 9

Project Title Establishment of Forest Reserves, Protected Areas and National Parks/Sanctuaries in Sierra Leone.

Rationale/Justification

In Sierra Leone, forests are legally divided into two main categories. The first category is the forests that have been constituted and gazetted for protection/conservation and production purposes under approved management plan. The second category constitutes the forests on un-reserved lands which are not under any form of management and control.

The lack of planned management and control in un-reserved forests has led to illegal felling, shifting cultivation,, frequent wild fires and land degradation with severe erosion problems.

Several ecosystems in Sierra Leone are threatened by deforestation, land and environmental degradation mainly through illegal encroachment, over-utilization/exploitation of some species (both fauna and flora). The rate of such deforestation on un-reserved lands is between 6,000 ha. and 10,000ha per annum (FD records 1992)

.Because of its favourable climate, it is necessary for Sierra Leone to achieve a net forest growth to make a positive contribution to the reduction of global CO2 emissions. Furthermore any reduction in forest cover and degradation of forest land could reinforce the green house effect. Measures to significantly slow down the rate of deforestation through forest reservation will enhance CO^2 sequestration.

Description:

Objective*:* The main objectives are

- To exercise legal and effective control over the un-reserved forest lands by the establishment of Protected Areas, National Parks, Sanctuaries and Forest Reserves.
- The conservation of the country's unique ecosystems and their biological diversity
- To increase the forest area with the concomitant increase in the uptake of atmospheric CO2.
- To stem the rate of wanton destruction of the country's forest resources

Activities:

- Carry out survey of the lands (about 8 proposed sites amounting to 355,000 ha) and prepare accurate maps
- Undertake the reserve constitution process so that these areas are legally acquired and gazetted
- Re-demarcate existing Reserves, National Parks/sanctuaries and Protected Areas to maintain their integrity
- Prepare management plans for their effective management and control

Inputs:

- Survey equipment
- Vehicles, maintenance and running cost
- Photo - interpretation and mapping equipment
- Data processing equipment
- Field inventory equipment
- Stationery and supplies

Short –term outputs*:*

- Deforestation slowed down
- Reduction of human pressure on forest lands
- Employment provided for local population
- Net addition to the standing inventory of biomass carbon

Potential long-term outcomes:

- Increased surveillance of the hitherto unreserved forest lands to forestall deforestation and land degradation
- Protection of the biodiversity (fauna and flora) enhanced
- There is a net addition to the standing inventory of biomass carbon
- Effective participation in planning, development, management and subsequent utilization of the forest resources
- Eco-tourism is enhanced by the protection and effective management of National Parks, Protected Areas and Sanctuaries
- Provision of alternative livelihood for communities protecting and conserving currently unreserved forests that have now come under reservation/protection

Implementation:

Institutional arrangements*:*

The overall responsibility for implementation and coordination will remain with the Government agencies i.e. Forestry Division of NaCEF, Wildlife Conservation Branch, Tourism and Local Government.

Private entrepreneurs, external donors, NGOs and potential consumer groups will be involved in the development and protection of National Parks/Sanctuaries and Protected Areas.

Risks and barriers:

- The process of acquisition of communal lands for reservation can be a protracted affair
- Level of compensation in most cases varies from one part of the country to another and can cause delays and friction between land-owners and management
- Benefit sharing of revenue from Protected Areas and National Parks need to be looked into very carefully and harmonized to avoid conflict.

Monitoring and evaluation:

Monitoring and evaluation will be the responsibility of the Forestry Division of NaCEF. The implementation problems and progress will be made available through reports published monthly, quarterly or annually.

Financial resources: The project is estimated to cost about 2,500,000 USD over a 5 year period.

Budget breakdown (000 USD)

Items	**Y 1**	**Y 2**	**Y 3**	**Y 4**	**Y 5**
Survey of 8 potential sires	200	200	100	100	-
Field Inventory	100	100	50	100	100
Re-demarcation of existing Reserves/Parks	100	100	100	-	-
Interpretation, mapping and data processing	100	200	100	100	-
Reservation and Reserve settlement process	-	50	50	-	100
Preparation of Management Plans	-	-	150	200	100
Totals	**500**	**650**	**550**	**500**	**300**

Project NO. 10

Project Title: Management and Protection of Forest Reserves and Catchments areas including Wetlands in Sierra Leone.

Project Justification

In Sierra Leone, forests are legally divided into two main categories. The first category is the Forest Reserves that have been gazetted for protection/conservation and production purposes. The second is Forests on unreserved lands which are not managed and strictly controlled.

The lack of management and control in unreserved forests has led to illegal felling, shifting cultivation, frequent burning and land degradation with erosion problems. However, a reserve status is not a guarantee for protection or proper management. For example many gazetted closed high forest and mangroves are threatened by deforestation, the major causes being encroachment due to high population pressure and over-utilization. Wood harvesting in natural forests has concentrated on a few commercial species. Also harvesting in natural forests has opened up large areas for encroachment through road construction.

Management of Forests Reserves, for decades, has not been given sufficient attention because of limited funding support. It has been, sometimes, largely restricted to boundary protection and guarding against illegal harvesting. With external funding support there is the feasibility of achieving the objectives of the climate change convention through implementing the protective and management prescriptions.

Description
Objectives:

The objectives of the project are:

- To put all catchment forests of national importance under sustainable management for water, soil and ecosystem conservation, and multiple production of forest products and services,
- To place all mangroves and other wetlands of national importance under sustainable management and be substantially developed.
- To ensure that areas under forest management are substantially increased i.e. forest area under un-reserved status be reduced through reservation.
- To ensure that all Forests, both natural and artificial regeneration, are placed under effective protection against fire, pests and diseases.
- To motivate the local communities to participate in the conservation of forests and carry out silvicultural activities with a view to increasing their incomes, restoring biodiversity and increasing the forest vegetation cover
- To increase forest vegetation cover which is one of the proven ways to effectively increase the up-take of atmospheric CO2 by the biosphere.

- To reduce the dependence on firewood and charcoal by using liquid fuels (LPG) and other bio-fuels (ethanol/methane/oils)

Activities

Major activities will include:

- Reservation of un-reserved forest areas of national importance.
- Development and implementation of management plans for watershed of national importance.
- Preparation of management plans for reserves that require urgent attention.
- Training of both Central Government staff and local communities to improve their capacity.
- Establishment of technical support unit for the extension services.

Inputs:

- Forest survey and inventory tools
- Transport and operating cost
- Natural and artificial regeneration tools
- Camping equipment
- Stationery and administrative supplies
- Liquid fuel (LPG) and other bio-fuels (ethanol/methane/oils)

Short-term output

- Increased ground cover maintained
- Reduced run-off and soil erosion contained
- Deforestation slowed down by the reservation of un-reserved forest lands catchments areas
- Net addition to the standing inventory of biomass carbon
- Provision of alternative livelihood for communities protecting/conserving currently unreserved ecologically sensitive and culturally significant forests.

Potential long-term outcomes

- Reduction of human pressure on both reserved and un-reserved forest lands
- Improved forest management practices such as low-impact-logging will help to reduce damage to forest reserves, decrease erosion, increase biodiversity protection, and hence reduced forest land degradation.
- The project can help to reduce CO_2 emissions significantly.
- Increased surveillance of the protected/managed forests and the involvement of stakeholders, especially local communities in their protection
- Forest-dependant communities would have direct and effective participation in planning and decision-making in forestry development, management and subsequent utilization of the resource.

- The involvement of major stakeholders, especially the local communities, in the protection of the forest resources
- Reduced dependence on firewood and charcoal as liquid and bio-fuels become available

Implementation
Institutional arrangements

The project will be executed principally by the Forestry Division of NaCEF as the lead agency of Central Government and in collaboration with:

- Forest dependant communities, CBOs, NGOs
- Environmental protection and Donor agencies
- Energy and power agencies
- Local Government and Rural Development agencies
- Decision makers in Water-resources, Environment and Forestry Sectors as well as National Climate Change Committee.

Risk and Barriers

- Past policies completely eliminated community participation in forest management
- Forest fires area serious threats for the sustainable management of forest without the cooperation of local communities
- The absence of buffer zones around some forest reserves which have sizeable population in close proximity with these reserves may pose serious threat
- Lack of capacity for training and sensitization of local communities in woodlot management

Monitoring and Evaluation
The Forestry Division will supervise, monitor and evaluate the progress of the project through periodic assessment and reports but more particularly in its annual reports on the administration of the Forestry sector.

Financial Resources: The cost of the Project is estimated at 5 million USD over a five year period.

Budget Breakdown: **(000 USD)**

Items	Year 1	Year 2	Year 3	Year 4	Year 5
Intensive Management of (8) eight Forest ,Parks, PAs and Wetland estates	450	500	200	-	200
Preparation of management Plans for 7 (seven) forest Reserves, Parks and PAs	300	50	250	300	95
Management of (6)six major catchments of Hydro Dams and reservoirs	550	200	100	250	250
Training and sensitization of both Government staff and Local Communities	150	50	50	-	5
Establishment of Forest Extension Unit	50	200	300	250	250
Total million USD	**1,500**	**1,000**	**900**	**800**	**800**

Project No. 11

Project Title: Institutional Strengthening In the Water Resources Sector of Sierra Leone.

Rationale/Justification

The Water Resources Sector has played, and continues to play a crucial role in Sierra Leone's Development. Government, in collaboration with its local and international partners has invested huge capital in the water supply sector in the last two decades. Despite this massive injection of capital, the impacts this has created have been minimal, attributable to lack of coordinated research, monitoring, and control. A recent study, based on a multiple cluster indicator survey (UNICEF, 2003), indicates that on average only 22 % of the entire population of Sierra Leone has access to safe drinking water. The situation could deteriorate if changes in the hydrological regime following climate change happen more quickly than anticipated.

Water resources development has been slow and uncoordinated, with only three sub-sectors active in the implementation of major projects. The water supply sector has many players but too little services products. There has been a proliferation of urban and rural water supply projects, all aimed at reducing the proportion of people without access to safe and sustainable drinking water.

The development of water resources for hydroelectric power production is still in its infancy in the country with a single functioning plant located along the Dodo River, in the Kenema District. The Dodo scheme has a power output of 4 Megawatts, and serves the cities of Kenema and Bo in the east and south of the country, respectively. The first of four phases of the Bumbuna Hydroelectric Power project is nearing completion and is supposed to provide a total power output of 308 MW. When completed, this phase of the project would provide 50 Megawatts of electricity to the country's capital, Freetown, and other major towns in the northern region. Although there have been some achievements in this area, more has to be done in terms of research and monitoring.

Irrigation is yet to take off as a major water development activity in the country. However, the potential for irrigation remains high due to the dense network of permanent streams in the country.

The aim of the project is to strengthening existing institutions for effective management and control of water resources for sustainable development. The need to enhance human and institutional capacities is consistent with ensuring that realistic options aimed at minimizing the negative impacts of climate change are considered. The outcomes of the project would provide the impetus for government and other stakeholders to intensify efforts geared towards adapting successfully to climate change through monitoring and research.

Description

Objective
The overarching objective of the project is to build capacity in the water resources sector through institutional strengthening with a view to ensuring the effective delivery of hydrological services, predicated on the realization that workable options for adapting to climate change is consistent with collaborative research, monitoring, and efficient management of our finite resources.

Activities
The following activities will be undertaken:

(a) The setting up of a hydrological services unit with the express purpose of coordinating all water-related activities,
(b) Establishing regional resource centres for use by water managers and researchers,
© The installation of hydrometric and monitoring stations in the major river basins,
(c) Training of professionals on the measurement and monitoring of water-related impacts of climate change.

Inputs
The inputs required include financial resources, equipment, and technical expertise.

Short-term outputs
- All major rivers in the country will be equipped with gauges for measuring flow,
- Incidences of flooding will be forecast with sufficient accuracy,
- The methods of data collection will be unified ,
- Hydrological services products will be effectively utilized by the user communities

Potential long-term outputs
The user communities will benefit immensely from hydrological services products especially early warning signals of impending water-related disasters exacerbated by climate change.

Implementation
Institutional arrangements
The Ministry of Energy and Power will be the lead implementing agency with oversight provided by local councils, national and international non-governmental organizations, civil society, and other stakeholders in the water resources sector.

Risks and barriers

- Vandalisation and accidental destruction of equipment in the river basins,
- Delay in the release of funds
- Political instability
- Compatibility of equipment with the local climate

Monitoring and evaluation

The responsibility for monitoring will be borne by the relevant line ministries, while the Local Councils will evaluate the project. Both monitoring and evaluation shall be conducted according to the following schedules:

- Monthly narrative reports
- Financial reports
- Evaluation report of the local councils

Financial Resources

The estimated cost of the project is **$US 2.25 million**

Budget Breakdown

ACTIVITY	**COSTS**		
	Year 1	**Year 2**	**Year 3**
Coordination/Recruitment of personnel	20 000		
Training of managers, professionals, and technicians	200 000	100 000	100 000
Purchase of stream gauges and ancillary equipment	1 500 000	500 000	500 000
Installation and three year maintenance of equipment	50 000	25 000	30 000
Office equipment (Resource centre) and running cost for three years	100 000	50 000	75 000
Total	**1 870 000**	**675 000**	**705 000**

Project No. 12

Project Title: Improvement Of The Efficiency Of Existing Water Supply Systems In Both Urban And Rural Areas of Sierra Leone.

Rationale/Justification

Service delivery in the water resources sector in Sierra Leone is fraught with numerous constraints, not least the inefficiency of water supply systems. There is no reliable statistic on the amount of leakage taking place in piped water systems. However, guesstimates put the figure at 40 %, attributable to an ailing system designed in the 1960s.

The Guma Valley Water Company has the corporate responsibility of supplying treated pipe-borne surface water to residents in the capital, Freetown and its environs. Currently, the authority supplies 105 million gallons of water daily, which if accounted for will satisfy the drinking and other domestic requirements of about 90 % of consumers in the municipality. A rationing system now exists in which water is pumped into the distribution system at specific times during the day instead of the 24-hour service that the consumers were used to. Losses may be ascribed to leakage from old and damaged pipes that constitute the almost dilapidated network.

Rural water supply systems utilize groundwater abstracted from dug wells and boreholes distributed throughout Sierra Leone. The wastage experienced in groundwater supply systems is far less, both in frequency and in magnitude than in surface networks. Most public water supply systems that utilize groundwater make use of hand pumps as the water-lifting device.

This project aims at improving the efficiency of both rural and urban water supply systems by introducing measures geared towards reducing losses due to leakage from old and dilapidated networks as well as developing new pump designs for groundwater abstraction.

Description

Objectives

The objective of the project is to maximize the use of water resources for sustainable development by ensuring the efficient functioning of existing urban and rural water supply systems.

Activities

The activities will include:

- An inventory of existing water supply systems in both urban and rural settings
- Identifying sources of leakage in piped networks and improving the methods of abstraction of groundwater in rural areas
- Repair and/or reinstallation of water distribution networks
- Installation of improved designs of hand pumps in existing protected wells

- Water quality monitoring of surface and groundwater sources
- Effective regulation of water supply activities

Inputs
The inputs include:
Financial resources, equipment, water supply hardware, and technical expertise.

Short-term outputs
The short-term outputs include:

- Communities in target areas will receive more water from the systems for drinking and other domestic uses.
- There will be a drastic reduction in the incidences of water-related diseases such as cholera, dysentery and typhoid.
- The time saved by children in fetching water will be better utilized in school.
- Development will go on unhindered as more water will be available for running our industries.

Potential long-term outputs
The proportion of people without access to safe and sustainable water supply and sanitation will be reduced significantly in line with the Millennium Development Goals. It will also help water supply institutions generate more revenue needed for sustaining the schemes.

Implementation
Institutional Arrangements
The project will be implemented by the Ministry of Energy and Power in collaboration with other line ministries, with oversight being provided by the local councils in partnership with civil society and non-governmental organizations.

Risks and Barriers

- Poor quality materials may be used
- Delay in the disbursement of funds
- Reinstallation of networks could have environmental impacts
- Uncoordinated work involving different sectors could hinder project implementation

Monitoring and Evaluation
Monitoring will be done by the various line ministries while the local councils will evaluate the project through the following:

- Monthly reports
- Financial reports
- Evaluation of the project by the local councils and target beneficiaries.

Financial Resources

The estimated cost of the project is **US$ 2.95 Million**

Budget Breakdown

	COSTS		
ACTIVITY	**Year 1**	**Year 2**	**Year 3**
Inventory of existing water supply systems	200 000		
Rehabilitation of dilapidated network	500 000	500 000	500 000
Development of new pump designs	200 000		
Supply of hand pumps	300 000	300 000	300 000
Sensitisation of user communities	50 000	50 000	50 000
Total	**1 250 000**	**850 000**	**850 000**

Project No. 13

Project Title: Promotion of Rain Water Harvesting and Development of An Integrated Management System for Fresh Water Bodies

Rationale/Justification

Sierra Leone is among the countries in the world with mean annual precipitation, in excess of 2000 mm. Despite this higher than global average figure, the timing of the rainfall suggests that water supply for various purposes could only be guaranteed for six months only, unless steps are taken to collect and store the available water. There is increasing realization that surface water systems are too expensive to manage, especially so when treatment is unavoidable. The sustainability of surface water systems is under serious threat due to lack of investment, exacerbated by climate change. There is therefore the need to maximize the collection, storage, and use of available precipitation by adopting more efficient and affordable technologies. Rainwater harvesting can provide a long-term solution to our domestic water needs.

The promotion of rainwater harvesting technology could be justified in light of its seeming simplicity and affordability. In rainwater harvesting, rainfall is captured by the roof of a building and diverted to a gutter from where it is channelled into a storage facility. The expansion of the city has necessitated an increase in the supply of water for commercial and domestic use. Rainwater harvesting would ensure that every household is able to collect and store sufficient water for domestic use.

The management of water resources for sustainable development requires an integrated approach. This project aims at promoting rainwater harvesting within the framework of an integrated water management system for fresh water bodies. Against the backdrop of acute shortage in both the rural and urban areas, users of water in the domestic and commercial sectors will be encouraged to utilize the cheaper option of rainwater harvesting to increase supply and therefore reduces demand.

Description

Objectives

The objective of the project is to increase water availability for domestic and commercial use through sensitization of communities about the possibility of capturing, storing and utilizing rainwater.

Activities

The activities will include:

- A nationwide sensitization on the need to adapt to a reduction in the availability of water following climate change, by capturing, storing, and utilizing rainwater for domestic and commercial use.
- Executing a pilot project aimed at demonstrating the technology of rainwater harvesting.
- Extension services to peri-urban and rural areas of the country

- Installation of rainwater harvesting systems in hospitals and other key institutions

Inputs

The inputs include:

Financial resources, rainwater harvesting demonstration kit, and technical expertise.

Short-term outputs

The short-term outputs include:

- Communities in target areas will be encouraged to practice rainwater harvesting, given its immense advantages.
- The practice of rainwater harvesting will see a drastic reduction in the incidences of water-related diseases such as cholera, dysentery and typhoid, much as rainwater is almost pathogen-free.
- The time saved by children in fetching water from public standpipes and wells will be better utilized in school.
- Development will go on unhindered as more water will be available for running our industries.

Potential long-term outputs

Users of water will be able to access a variety of fresh water sources including the cheaper option of harvesting rainwater. The number of people without access to safe and sustainable water supply and sanitation will reduce significantly in line with the Millennium Development Goals. It will also help water supply institutions generate more revenue needed for sustaining the schemes.

Implementation

Institutional Arrangements

The Ministry of Energy and Power will be the key implementing agency in collaboration with other line ministries, with local councils providing oversight, in partnership with civil society and non-governmental organizations.

Risks and Barriers

- Installation of the system might be costly and beyond the reach of most people
- Poor quality materials may be used
- Delay in the disbursement of funds
- Utilisation of disused wells for storing rainwater could have environmental impacts
- Uncoordinated work involving different sectors could hinder project implementation

Monitoring and Evaluation

The relevant line ministries will be in charge of monitoring while the local councils will evaluate the project through the following:

- Monthly narrative reports
- Financial reports

- Evaluation

Financial Resources
The estimated cost of the project is **US$ 2.8 Million**

Budget Breakdown

	COSTS		
ACTIVITY	**Year 1**	**Year 2**	**Year 3**
Sensitisation	50 000		
Demonstration	500 000	250 000	100 000
Provision of rainwater harvesting facility in key institutions	1 000 000	500 000	400 000
Total	**1 550 000**	**750 000**	**500 000**

Project No. 14

Project Title - Establishment of a Permanent Study Programme of the Multi Species Fisheries in Sierra Leone

Rationale/Justification

In Sierra Leonean waters, there are over two hundred species of fish. Knowledge about the biology of the majority of these species is lacking. The level of exploitation of a good number of species has also not been established.

With climate in this area likely to undergo changes, the species composition of most important species i.e. the clupeids, carangids and scombrids, which are mainly migratory and are easily affected by fluctuations of the environmental conditions within the estuaries and near shore might also undergo changes. In such an event the offshore pelagies and demersal fish species might assume high commercial importance.

Assessment of the effects of environmental conditions on fishing habitats basically employs the species – specific approach which involves the development of Habitat Suitability Index (HSD) modes for individual species of concern.

The impact of climate change on the fishery can take decades, however, the gathering of the information requires and the work of the institutions to manage the fishery would be a slow process. It is therefore necessary that the establishment of the institutional study programmes be initiated now

Description
Objective

- To improve knowledge about the biology of the multi-species
- To generate species-specific habitat and physiology data
- To generate data on habitat characteristics
- To study the abundance, distribution and feeding habits of other fish species that have a high commercial potential value.
- To provide information on growth rates reproductive success and mortality of select species.

Activities

- Train researchers
- Provide equipments
- Provide logistics
- Conduct field works
- Analyse acquired/collected data
- Develop HIS models

Inputs:

- Human, Financial and physical resources

Short-term outputs

- Researchers trained equipments and logistics provided, field work conducted, and data analysed.

Potential Long-term outcome

- Research capacity of Institute of Marine Biology and Oceanography built.

Implementation/Institutional Arrangements
Following the work of various fishery experts under various programmes etc. It is suggested that the Institute of Marine Biology and Oceanography (IMBO), USL should be adequately staffed and equipped to carry out studies on the fishery of Sierra Leone.

The Board of IMBO which comprises of members from various government ministries, university and NGOs will supervise the project.

Risks and Barriers

- Inadequate human resources
- Insufficient financial resources
- Beaucratic barriers
-

Monitoring and evaluation

The Board of The Institute of Marine Biology (IMBO) will monitor and evaluate the project.

Financial Resources: **US$ 395,000**
Budget Breakdown

	Year 1	**Year 2**	**Year 3**
Train researchers	30,000	30,000	20,000
Provide equipments	80,000	40,000	20,000
Provide logistics	30,000	15,000	10,000
Conduct field works	30,000	15,000	15,000
Analyse acquired/collected data	20,000	10,000	10,000
Develop HIS models	-	-	20,000

Project No.15

Project Title - Delineation and Restoration Of Vulnerable Habitats And Ecosystems in The Western Area of Sierra Leone.

Rationale/Justification

Managing the fisheries sector of Sierra Leone in the environment of climate change will pose a great challenge. The rational utilization of the fish resources is essential. In order to reduce the possibility of decline in fishery productivity, strict monitoring of vulnerable habitats is essential. The level of destruction of coastal habitats in the Western Area of Sierra leone is high and these habitats will need to be restored to enable them perform their basic ecological functions.

Ponds and other inland water bodies for spawning are indispensable components of a balanced aquatic environment. During prolonged dry seasons, many of these ponds and inland waters dry out, leading to reductions in fish populations. Those that survive the dry periods are threatened with pollution (pesticide run-offs and plant discharges). In view of the importance of these ponds and water bodies in enhancing fish population, measures should be taken to safeguard the spawning sites, and stop the destruction of mangroves (fish nursery areas), and pollution along the coastline and the riverbanks. A study of the state of the mangroves will help facilitate these measures. Raising public awareness on the importance of the mangroves is also important.

Efficient management of the fisheries can only be achieved through the gathering of data to enable delineation of vulnerable habitats. Areas and fish species that could be affected by climate change would be included.

The ecosystems (water resources) affected by climate change need to be determined accurately to assist management process. There is need to produce accurate information on ecosystems that could be affected by climate change. These areas have to be delineated based on scenarios of climate change and historical data to determine future scenarios.

Description
Objectives

- To prevent or reduce the destruction of vulnerable fishing habitats
- To reduce the possibility of the decline of fishery productivity

Activities

- Identify and delineate vulnerable fishery habitats
- Sensitize local communities on the benefits of preserving vulnerable habitats.
- Study livelihood patterns of local communities associated with these habitats.
- Assess the potential for conservation of critical habitats

- Propose measures to minimize the degradation of vulnerable/critical habitats.
- Assess the impact of Climate Change on vulnerable ecosystems.
- Train researchers on ecosystems approach in biodiversity studies
- Provide equipments and logistics to facilitate field work.
- Develop management plans for vulnerable/critical habitats.

Inputs:

- Human, Financial and physical resources

Short-term outputs

- Researchers trained equipments and logistics provided, field work conducted, and data analysed.

Potential Long-term outcome

- Research capacity of Institute of Marine Biology and Oceanography built.

Implementation/Institutional Arrangements

Following the work of various fishery experts under various programmes etc. It is suggested that the Institute of Marine Biology and Oceanography (IMBO), USL should be adequately staffed and equipped to carry out studies on the fishery of Sierra Leone.

The Board of IMBO which comprises of members from various government ministries, university and NGOs will supervise the project.

Risks and Barriers

- Inadequate human resources
- Insufficient financial resources
- Beaucratic barriers
-

Monitoring and evaluation

The Board of The Institute of Marine Biology (IMBO) will monitor and evaluate the project.

Financial Resources **US $ 420,000**

Budget Breakdown

	Year 1	**Year 2**	**Year 3**
Identify and delineate vulnerable fishery habitats	20,000		
Sensitize local communities on the benefits of preserving vulnerable habitats.	10,000	10,000	5,000
Study livelihood patterns of local communities associated with these habitats.	10,000	10,000	10,000
Assess the potential for conservation of critical habitats	20,000		
Workshops on the degradation of vulnerable/critical habitats.	15,000	15,000	15,000
Assess the impact of Climate Change on vulnerable ecosystems.	30,000	30,000	30,000
Train researchers on ecosystems approach in biodiversity studies	20,000	20,000	20,000
Provide equipments and logistics to facilitate field work	30,000	30,000	30,000
Develop management plans for vulnerable/critical habitats.	20,000	20,000	20,000

Project No 16

Project Title – Improve On The Quality On Fisheries Related Data and Research

Rationale/Justification

Others conservation and protection of the resources; promotion of the development of a national fishing fleet; promotion of aquaculture and inland fisheries development; research, extension and training etc.

Production can be substantial. The artisanal fishing sector if expanded can employ more than 100,000 people. Inland fishery can be developed if adequate storage and transport systems are improved.

Capacity is low in terms of scientific research which at the moment is carried out at different levels both at the ministry and the Institute of Marine Biology Oceanography, Fourah Bay College, University of Sierra Leone.

The Ministry is basically concerned with the compilation and collation of data from surveys, catch data, and observer reports. Outputs are in the form of summaries and reports.

The IMBO carries out basic research through student research supervised by research fellows/lecturers using mainly information from the statistical unit of ministry.

Description
Objectives:

To improve on the quality of data and research for better understanding of the different types of ecosystems.

Activities

Data and research are required to improve the basic understanding of different types of ecosystems. Emphasis needs to be placed on studies of :

- Water movements;
- Seasonal cycles;
- Nutrient cycling;
- Sedimentology, geomorphology and cartography;
- Biological productivity;
- Physiology and behaviour of important organisms.

Inputs:

- Human, Financial and physical resources

Short-term outputs

- Researchers trained, equipments and logistics provided, field work conducted, and data analysed.

Potential Long-term outcome

- Research capacity of Institute of Marine Biology and Oceanography built.

Implementation/Institutional Arrangements

Following the work of various fishery experts under various programmes etc. It is suggested that the Institute of Marine Biology and Oceanography (IMBO), USL should be adequately staffed and equipped to carry out studies on the fishery of Sierra Leone.

The Board of IMBO which comprises of members from various government ministries, university and NGOs will supervise the project.

Risks and Barriers

- Inadequate human resources
- Insufficient financial resources
- Beaucratic barriers
-

Monitoring and evaluation

The Board of The Institute of Marine Biology (IMBO) will monitor and evaluate the project.

Financial Resources **US$455,000**

Budget Breakdown

	Year 1	**Year 2**	**Year 3**
Studies on water movements	30,000	20,000	15,000
Studies on Seasonal cycles	30,000	20,000	15,000
Studies on nutrient cycling;	30,000	20,000	15,000
Studies on Sedimentology, geomorphology	30,000	20,000	15,000
Studies on Biological productivity;	30,000	20,000	15,000
Studies on Physiology and behaviour of important organisms.	30,000	20,000	15,000
Update on cartographic information	30,000	20,000	15,000

Project No. 17

Project Title: Development of an Integrated Coastal Zone Management Plan for Sierra Leone.

Rationale/justification

Coastal zones are among the most resourceful areas on earth as regards production both from human and from natural biological activity. However, human activities and natural processes also exert major pressures. These zones provide a home to a large and increasing part of the global population. This gives rise to a deterioration of ecosystems, e.g. by pollution or infrastructural changes. On the other hand, natural physical factors such as waves, currents and floods put these areas under continuous pressure. An increase of this pressure as a result of global climate change has a huge potential impact.

In order to cope with these pressures, Sound Coastal Zone Management Planning, which takes full account of long term developments, is indispensable. The many issues involved and the complex links demand an integrated approach. This is the only way to ensure that the coastal zone will sustain both the economic development of the population and the preservation of ecosystems.

Institutional arrangements are of particular importance to the achievement of integrated coastal zone managements. Not only must the coordination of all agencies concerned be organized, it is also for vital importance to ensure that the local population is involved. In addition, a proper financing structure has to be established, particularly in those cases where costs are large compared to national regionally generated income.

Integrated Coastal Zone Management (ICZM) has been identified as the most appropriate approach to managing the resources and their coastal environment.

Description
Objectives: To develop an Integrated Coastal Zone Management Plan for Sierra Leone.

Activities

The most important issues to be addressed in the management of the coastal zone in Sierra Leone are presented below as well as recommendations for addressing these issues. The issues involve

- Delineation of flood and erosion hazard areas
- Improvement of the quality of topographic data
- Identify and assemble stakeholders
- Assemble data and information on current understanding of coastal processes in the country.
- Assemble data and information on current understanding of institutional arrangements for coastal zone management in the country.

- Hold stakeholder consultative meetings
- conduct inception to establish institutional arrangements
- Conduct workshop on ICZM plan development
- Conduct regional stakeholders workshops
- Conduct national validation workshop
- Carryout print and electronic media aided public education and sensitization
- Report writing and production

Inputs: Human, financial and physical resources will be required

Short term outputs:

- Institutional framework for ICZM established
- Stakeholders sensitized

Implementation

Institutional Arrangements

An interdisciplinary approach will be adopted.

Research, Collection and analysis of data and information on coastal processes and institutional arrangement will be undertaken by the Institute of Marine Biology and Oceanography (IMBO).

National Project Steering Committee will oversee the project. A project coordinator will be appointed to guide and implement the project. A project Director from government implementing agency will also be appointed to ensure government's commitment and mainstreaming activities. A project consultant will be appointed to provide technical guidance to the project.

Risks and Barriers

- Funds are expected to be adequate and released in timely manner.

Monitoring and Evaluation

Monitoring and evaluation will be carried out by the National Focal Point of the Interim Guinea current Commission, National Focal Point Institution or any other competent independent agency.

Financial resources

The estimated cost of the project is **US $ 90,000**

Budget Breakdown

	Year 1	Year 2	Year 3
Delineation of flood and erosion hazard areas	10,000	-	-
Update of topographic data	20,000	-	-
Assemble data and information on coastal processes in the country	10,000	-	-
Assemble information on current coastal zone management practices and institutional arrangements nationally.	10,000	-	-
Sensitization and Awareness raising	10,000	-	-
Technical workshops/meetings	20,000	-	-
Reporting	10,000	-	-

Project No. 18

Project Title: Rehabilitation of degraded coastal habitats in the Northern Region of Sierra Leone.

Rationale/Justification

Physical alteration of the coastal and marine environments can lead to changes in the ecosystem and hence the community structure. In some cases some species may be eliminated. Activities such as logging and construction of facilities and agriculture may affect the ecosystem.

Removing mangroves for fuel, salt rice production particularly in the Northern Region of the country makes the coast more vulnerable to erosion leading to siltation. FAO tree planting exercise at Orugu bridge in 1988 is an attempt to redress that situation. Sustainable utilization of mangrove swamps is possible up to 50% of the original area (Fomba, Pers. Com) (Plate Fig. 4.6)

In Sierra Leone, and elsewhere, shoreline structures are often constructed out of necessity without reference to current flow patterns, erosion and siltation. Shoreline structures may alter flow patterns of currents and may cause sediment accumulation. Both the Queen Elizabeth II Quay and Nitti harbours have to be constantly dredged to minimize siltation. At Bonthe navigation is only possible at hightide. Siltation can affect ecological productivity of the environment and foul the filtration systems of sessile organism including bivalves thereby causing mass mortalities among the latter.

Sand mining resuspends sediments and stresses the ecosystem. Digging deep holes on the beach can alter patterns of wave refraction thus contributing toward erosion. Some of the organism get dislodged or buried. Indiscriminate sand mining at Lakka and Hamilton has been of grave concern to Government. Dredging destroys both topography and the biota especially of suspension feeders and fish.

Description

Objectives

- Restore the ecological integrity and productivity of Coastal habitants.
- Restore source of livelihood for coastal dwellers.
- Ensure proper management of coastal habitats

Activities

- Identify degraded sites
- Map degraded coastal habitat sites
- Conduct a survey on livelihoods activities of coastal dwellers
- Conduct a survey on the environmental and socio-economic
- Impacts of degraded habitats
- Creation of tree nurseries

- Train youth from the local communities in tree nursery development and management
- Carryout restorative activities in partnership with local communities
- Review government plans and policies on restorative activities
- Investigate the role of central, local and traditional governments in the management of coastal habitats.

Inputs:

The project will require human, financial and physical resources.

Short term outputs:

- Youths trained in the creation and maintenance of tree nurseries
- Degraded coastal habitat sites identified and mapped.
- Survey on livelihood activities conducted
- Survey on the environmental and socio-economic impacts of coastal habitat degradation conducted.
- Some degraded coastal habitats rehabilitated
- Livelihood for coastal communities restored

Implementation
Institutional arrangements

The project will be executed by the various stakeholders with government playing a leading role (National Coastal Area Management Board.

Risks and Barriers

- Inadequate financial resources
- Inadequate trained personnel
- Inadequate institutional capacity

Monitoring and evaluation

Monitoring will be done by private institutions or by NGOs

Financial Resources: The project is estimated to cost **US$ 317,000**

Budget Breakdown

	Year 1	Year 2	Year 3
Mapping of degraded coastal sites	100,000	50,000	50,000
Training on tree nurseries development	20,000	10,000	10,000
Creation of tree nurseries	10,000	10,000	10,000
Conduct survey on the environmental and socio-economic impacts of degraded coastal habitats.	10,000	5,000	5,000
Technical workshops/Presentations on results	5,000	5,000	5,000
Reporting	4,000	4,000	4,000

Project No. 19

Project Title: Develop and enact appropriate policies and regulations relevant to the development of coastal communities, urban growth planning, and critical coastal ecosystems preservation.

Rationale/Justification

Regarding national coastal maritime legislation, Sierra Leone has a number of Acts. The fisheries Management and Development Act (1988) provides the framework for the regulation of fishing activities both coastal and marine.

There are also other legislations (Acts) which contains some elements relating to the management and protection of coastal resources. The Forestry Act Provides for the managements and development of all forest resources including coastal forests e.g. mangroves. The wildlife Conservation Act (1982) sets a legal framework for the protection of wildlife and creation of protected areas in the country. The Mining Act controls all land-based mining activities.

The Environment Protection Act (2000) makes reference to the coastal environment. An Environmental Impact Assessments (EIA) is mandatory for any scheduled development project falling within a certain category of projects in the zone.

The activities in the coastal zone of Sierra Leone are controlled by policies, legislations and institutions of the various sectors of the economy. There is no framework for coordination, planning and management of these activities on an integrated basis. This sectorally planned approach to the management and exploitation of coastal resources has created conflict in a number of instances. For example, mangrove forests fall under the jurisdiction of the Ministry of Agriculture, Forestry and the Environment. Agricultural and forestry activities are therefore carried out without taking cognizance of the effect of these activities on the fishing industry as mangroves play a vital role in supporting health stocks of coastal fisheries. There are numerous other such examples of conflict. It is therefore obvious that as developmental activities in the coastal zone continue to increase a policy and legislative framework will be necessary for effective management of the coastal resources as well as the coastal environment. However, for policies and legislations to be effective, a sound institutional framework to implement government policies is essential, Government needs the capacity not only to articulate clear policy and to set priorities, but also to coordinate and resolve conflicts. There is also the need to develop the capacity to regulate the exploitation of the resources and to enforce laws.

Description

Objectives: To development appropriate policies and regulations for planning growth and development of coastal community's critical coastal ecosystems preservation.

Activities

- Collect and compile information on the present situation regarding planning growth and development of coastal communities.
-
- Organize workshops to:
  (a) Present information on planning of coastal communities
  (b) Identity national goals on settlement planning
  © Outline the rational for the development of appropriate plans, policies and the enactment of relevant regulations for the preservation of critical coastal ecosystems.

  (d) To review present plans, policies and legislations

Short Term Outputs

- Information on present policies and plans relating to the development of the coastal zone collected and compiled,
- Present plans, policies and legislations reviewed.

Implementation

The project will be executed by the various stakeholders with government playing a leading role (National Coastal Area Management Board).

Risks and Barriers

- Inadequate financial resources
- Inadequate trained personnel
- Inadequate institutional capacity

Monitoring and Evaluation

Monitoring and evaluation will be carried out by any competent independent agency.

Financial Resources. US$ 60,000

Budget Breakdown

	Year 1	**Year 2**	**Year 3**
Stock taking, Inventory of available information, field visits, interviews	10000	-	-
Regional and National Workshops, Stakeholder consultations	30000	-	-
Review of present plans, policies and legislations	10000	-	-
Services of meetings (Technical and steering committees)	10000	-	-
Report preparation and dissemination of policy document	10000	-	-

Project No. 20

Project Title: Establishment of a National Sea-Level Observing System for Sierra Leone

Rationale/Justification

Sierra Leone us highly vulnerable to any rise in sea-level because of its low-lying coastal areas. Some of these areas are presently being lost to the sea.

Local people will be vulnerable to accelerated sea-level rise. Their livelihoods and socio-economic situation will be affected. Sea-level change will be an additional factor to the already scarce resources regime and environmental degradation and can increase the competition in resource use of the coastal area. Competition health will also be vulnerable as such a change will be reflected in the hydrological pattern of the area.

The establishment of a national permanent sea-level observing system is immense environmental importance. It is even now urgent to establish such a system considering the threats to our coastal and marine environment posed by accelerated sea-level rise which is the result of global climate and human induced changes.

The installation of an operational, permanent sea-level observing station in Sierra Leone will make possible the observation of long-term sea-level fluctuations to provide data for practical scientific purposes. It will support educational programmes, national research and part operational activities. It will also create employment for youth as well as facilitating development for national research capacity in climate change and reduce poverty. It will also help to provide scientific data to ensure meaningful management practices of the country's coastal and marine environment.

Information about sea-level will assist safe navigation of vessels in and out of the country's main ports unloading and offloading activities; planning and implementation of coastline associated projects; design and construction of hydro-technical structures, marine resources exploration and exploitation etc.

Description
Objectives:

- To have an operational permanent sea-level observing station for reporting monthly main averages to the national marine meteorological service.
- To collect, analyze and make available data products for practical and/or scientific applications.

Activities

- Survey of construction site

- Construction of support structure (pier or jetty)
- Construction of stilling well
- Installation of tide gauge
- Operation of the station
- Training of personnel (workshops on managing of tide gauges)
- Training personnel on data collecting and analysis

Short-Term output

- Tools for forecasting change in the coastal environment and socio-economic feedback.
- Mitigating measures for socio-economic problems arising from coastal ecosystem malfunctioning resulting from accelerated sea-level rise.

Implementation

Project will be overseen by a National Liaison (Project Management) Committee. Data collection and analysis will be undertaken by the University of Sierra Leone. Site station management will be the responsibility of the Ministry of Transport and Communications.

Risks and Barriers

- Inadequate financial resources
- Inadequate trained personnel
- Inadequate institutional capacity

Monitoring and Evaluation

Monitoring and evaluation will be carried outs by the a competent independent agency.

Financial Resources: US$ 180,000 (One hundred and Thirty Thousand Dollars)

Budget Breakdown

	Year 1	Year 2	Year 3
Site survey (bathymetry)	20,000	-	-
Building of support structure	30,000	-	-
Purchase of tide gauge	10,000	-	-
Purchase and construction of stilling well	20,000	-	-
Installation of the tide gauge	10,000	-	-
Operational costs for at least one year	60,000	-	-
Purchase of computer and accessories	20,000	-	-
Recruitment and training of a technician	10,000	-	-

Project No. 21

Project Title: Monitoring and control of malaria prevalence in the Moyamba District of Sierra Leone.

Rationale/Justification

Global malaria control strategies include early diagnosis and prompt treatment, selective and sustainable preventive measures; including vector control, early detection, and containment or prevention of epidemics. There is poor knowledge of the disease and its method of cure among members of the local communities in Sierra Leone. However, according to the national malaria control programme manager, Moyamba District has the least usage of insecticide treated bed-nets in Sierra Leone.

Local capacity building for basic and applied research is essential to allow the regular assessment of the malaria situation, particularly the ecological, social and economic determinants of the disease. However, because of poverty and poor economic performance, Sierra Leone lacks the capacity to effectively control malaria and provide prompt treatment to victims particularly in the rural areas due to poor road network, inadequate human resources and poor financial resources.

Poor urban and rural communities can be protected from vector-borne diseases by cost-effective interventions. Many poor people lack the financial resources to purchase anti-malaria drugs. They also lack access to prompt treatment in case of malaria infection. Traditional herbal sources treatment are been handicapped by deforestation and biodiversity loss. Communication in terms of road networks with the rural areas is poor. The capacity to control malaria epidemic nationally is weak. Therefore provisional accesses to insecticide treated materials such as bed-nets can be relatively effective in reducing the incidence of malaria amongst vulnerable groups in both the urban and rural communities in Moyamba District of Sierra Leone.

Project Description

1. **Objective**:

    1. To prevent and/or reduce malaria infection of vulnerable groups of Moyamba District's population.
    2. To increase the access of the population to insecticide treated bed-nets.

2. **Activities:**

    1. Promote the use of insecticide treated mosquito bed-nets,
    2. Conduct awareness raising programmes on sanitation issues,
    3. Expand the distribution of insecticide treated bed-net in the entire Moyamba District,
    4. Improve rural community infrastructures; e.g. feeder roads,

5. Provide anti-malaria drugs at affordable costs for the population,
6. Improve community involvement in planning and implementation of malaria control programme.
7. Monitor and evaluate project activities.

3. Inputs:

- Human, financial and physical resources

4. Short- term outputs

- Malaria infection of the Moyamba population reduced,
- Increased access of the population to Insecticide Treated Bed-nets.

5. Potential long-term outcomes

- Population better equipped to control malaria,
- Healthier nation with increased productive potential.

6. Implementation

6.1 Institutional Arrangements:

- Malaria Control Programme is under the recently created Directorate of Disease Control and Prevention in the Ministry of health and Sanitation,
- The District Medical Officer (**DMO**) heads the District Health Management Team (**DHMT**) to ensure effective health care delivery and service development,
- Various Programme Managers have been appointed who with the **DMOs** will focus on particular aspects of health promotion and disease prevention and control,
- Bed-net committees have been established within local area development committees.

6.2 Risks and Barriers

- Inadequate human resources,
- Insufficient financial resources,
- Poor rural infrastructure (feeder roads),
- In Sierra Leone, and cultural barriers to the use of seasonal forecast information remains a problem, decision makers should be educated or encouraged to use scientific information that may lead to reductions in losses from natural disasters.

7. Monitoring and Evaluation

This will be carried out by a competent independent agency.

8. Financial Resources: US$ 520,000

Budget Breakdown

	Year 1	Year 2	Year 3
1. Promote the use of insecticide treated mosquito bed-nets	20,000	10,000	10,000
2. Conduct awareness raising programmes on sanitation issues	20,000	10,000	10,000
3. Expand the distribution of ITMs in the entire District	20,000	10,000	10,000
4. Improve rural community infrastructures; e.g. feeder roads.	50,000	50,000	50,000
5. Provide anti-malaria drugs at affordable costs for rural poor	20,000	20,000	20,000
6. Improve community involvement in planning and implementation of malaria control programme.	20,000	10,000	10,000
7. Monitor and evaluate project activities	50,000	50,000	50,000
ANNUAL TOTALS =	**200,000**	**160,000**	**160,000**

Project No. 22
Project Title: Monitoring and control water and sanitation activities in the Koinadugu District of Sierra Leone.

Rationale/Justification
Climate Change is expected to have wide-range consequences for human health as a consequence of existing poor sanitation in Sierra Leone. These could include but not limited to the reduction of available water for drinking and washing, lowering of the efficiency of local sewer systems, leading to higher concentrations of bacteria and other micro-organisms in raw water supplies. The water scarcity may force people to use poorer quality sources of fresh water, such as rivers, which are often contaminated. Inadequate facilities for waste collection and disposal could also contribute to the incidence of communicable diseases. All of these factors could result in an increased incidence of diarrhoeal diseases.

According to the Sierra Leone Water Company (SLAWCO) sources, Koinadugu District is the least covered district in terms of water and sanitation facilities.

Project Description

1. **Objective:**

   - To improve the existing unsanitary conditions and develop appropriate water and sanitation projects

2. **Activities:**

   1. Improve housing conditions and toilet facilities,
   2. Increase access to safe drinking water,
   3. Construct appropriate low cost water supply systems,
   4. Intensify sanitary inspections,
   5. Intensify vector control measures,
   6. Rehabilitate roads and bridges and improve Urban-Rural communication,
   7. Promote environmental health and community participation and involvement in sanitation issues,
   8. Improve waste collection and disposal facilities.

3. **Inputs:**
   - Human, financial and physical resources

4. **Short-term output**
   - Improved wastewater drainage and toilet facilities
   - Improved access to safe drinking water
5. **Potential long-term outcomes**

- Improved national health and sanitation conditions
- Improved communication infrastructure
- Reduction in the incidence and transmission of communicable diseases.

6. Institutional Arrangement

- There is a Directorate of Disease Control and Prevention in the Ministry of Health and Sanitation.
- District Council have also established sanitation unit.
- Each district has a District medical Officer (DMO) who heads a District health Team to ensure effective health care delivery and service development.
- Various Programme Managers have been appointed who with the DMOs will focus on particular aspects of health promotion and disease prevention and control.
- New manpower training schools have been established and the old ones have been strengthened.
- In-service training has been continuing to update the skills of serving personnel in all areas of the medical service and
- Rehabilitation of the health facilities is now a priority.

7. Risks and Barriers

- Inadequate human resources,
- Insufficient financial resources,
- Poor rural infrastructure (feeder roads),
- In Sierra Leone, and cultural barriers to the use of seasonal forecast information remains, decision makers should be educated or encouraged to use scientific information that may lead to reductions in losses from natural disasters.

8. Financial Resources: US $ 1,680,000

Budget Breakdown

Activity	**Year 1**	**Year 2**	**Year 3**
1. Improve housing conditions and toilet facilities	100,000	100,000	100,000
2. Construct low cost wells and water supply systems	200,000	200,000	200,000
3. Intensify sanitary inspections	20,000	20,000	20,000
4. Intensify vector control measures	20,000	20,000	20,000
5. Rehabilitate roads and bridges and improve Urban-Rural communication	100,000	100,000	100,000
6. Promote community involvement and active participation in water and sanitation issues.	20,000	20,000	20,000
7. Improve waste collection and disposal facilities	50,000	50,000	50,000
8. Monitor and evaluate project activities	50,000	50,000	50,000
Annual Totals =	**560,000**	**560,000**	**560,000**

Project No. 23

Project Title: Monitoring and control of HIV/AIDS prevalence in Koinadugu District of Sierra Leone

Rationale/Justification

The ten-year old conflict (1991 to 2001) has been accompanied by a deterioration of the health status of majority of Sierra Leoneans. The Human Development Report, July2000, estimates a life expectancy of 37.9 years. Sierra Leone ranks last in the world in quality of life with a per capita income of US$448.

The healthcare delivery system is divided into National, District, and Chiefdom levels. The epidemiological picture is characterized by a high prevalence of communicable diseases like malaria, respiratory tract and skin infections. There is an explosion of sexually transmitted infections, and data trends suggest an emerging epidemic of HIV/AIDS. According to Ministry of Health and Sanitation sources, over half the healthcare facilities country-wide do not function fully due to a variety of reasons that include damaged infrastructure, lack of staff, lack of drugs, and medical supplies. Large and small healthcare facilities, home healthcare, drug users, as well as research will need to be improved.

The Sierra Leone HIV/AIDS Response Project (SHARP) is design to assist the Government of Sierra Leone organise a response to the growing Human Immunodeficiency Virus (HIV) which causes the Acquired Immune Deficiency Syndrome (AIDS), in short HIV/AIDS. In accordance with the main goal of the SHARP the development objectives of this four-year project in Sierra Leone are to (a) contribute to reducing HIV/AIDS prevalence and (b) mitigate the impact of HIV/AIDS on persons infected or affected by HIV/AIDS. It will do so through a multi-sector approach, facilitating activities undertaken in various sectors by public and private organisations, and by communities in the fight against HIV/AIDS. Project-supported activities will complement government, donor, and private sector initiatives. These activities will vary by sector and the specific partner, but will be consistent with the national policy against HIV/AIDS, and premised on the development and expansion of local responses to the epidemic.

In collaboration with other members of the International Partnership against AIDS in Africa (IPAA), the project will help step up and mainstream the national response against HIV/AIDS, and an array of related infections, including sexually transmitted infections (STIs), Tuberculosis (TB), and other opportunistic infections. The Government of Sierra Leone (Ministry of Development and Economic Planning), UN Theme Group on HIV/AIDS and regional officials of UNAIDS worked closely in the development of this effort and see it as an integral part of the common effort. Thus the project will address HIV/AIDS prevention, care, and support, as well as impact mitigation at the national and sub-national levels. Emphasis will be on prevention among youth, women of child-bearing age, orphans and other vulnerable children, and groups that are particularly

vulnerable to HIV/AIDS, including sex workers, the military and ex-combatants, internally displaced people, and refugees.

The proposed project will finance the full spectrum of HIV/AIDS activities including prevention, care, support, and impact mitigation over a four-year period. It will have four components: (1) capacity building, policy coordination and refugee activities; (2) multi-sector responses to HIV/AIDS prevention and care; (3) health-sector responses to HIV/AIDS, STI/TB and other opportunistic infection management, including prevention, care, and support; and (4) civil society initiatives (including communities, NGOs, religious groups and the private sector). These activities will take into account the existing conditions and level of capacity at each administrative structure (national, regional, district, and chiefdoms).

However, information about HIV/AIDS has still not reached people living mainly in the rural areas of the country. Regional offices have not been established due to lack of funding, trained personnel to educate the communities on the issue are lacking. Counselling and guidance institutions and their activities are limited to the Capital Freetown and perhaps to some district headquarter towns. The availability and access to drugs are restricted. Stigmatization is restricting control and prevention programmes. Climate Change and its attendant negative impacts will hinder the nation's effort to control and prevent HIV/AIDS by destabilizing and weakening existing services.

According to the Director of the National AIDS Secretariat, Koinadugu District has the highest prevalence of HIV/AIDS in Sierra Leone.

Project Description

1. **Objective**
    - To galvanise support for HIV/AIDS prevention activities,
    - To improve the community's capability to control and prevent HIV/AIDS,
    - To reduce climate change related stress on HIV/AIDS control and prevention activities.

2. **Activities:**
    1. Promote awareness raising programmes on HIV/AIDS
    2. Expand the access and availability of drugs to infected persons,
    3. Promote de-stigmatisation programmes,
    4. Improve community involvement in the planning and implementation of HIV/AIDS control programmes,
    5. Establish guidance and counselling centres,
    6. Improve health and sanitation facilities as well as community infrastructure to reduce climate change negative impacts.

3. **Inputs:**
    - Human, Financial and Physical resources

4. **Short-term outputs**
    - The community sensitised on the prevention and control HIV/AIDS,
    - Voluntary Counselling and Testing Centres established

5. **Potential long-term outcomes**
    - Voluntary Cancelling and Testing Centres on HIV/AIDS established and functions,
    - The prevalence of HIV/AIDS reduced,
    - HIV/AIDS stigmatisation eliminated/reduced.

6. **Risks and Barriers**
    - Inadequate trained personnel to tackle HIV/AIDS related issues,
    - Inadequate financial resources,
    - Inadequate physical resources,
    - Poor knowledge about HIV/AIDS.

7. **Financial Resources: US$ 1,200,000**

Budget Breakdown

Activity	**Year 1**	**Year 2**	**Year 3**
1. Promote awareness raising programmes on HIV/AIDS	50,000	50,000	50,000
2. Expand the access and availability of drugs to infected persons	100,000	100,000	100,000
3. Promote de-stigmatisation programmes	50,000	50,000	50,000
4. Improve community involvement in the planning and implementation of HIV/AIDS control programmes	50,000	50,000	50,000
5. Establish guidance and counselling centres	50,000	50,000	50,000
6. Improve health and sanitation facilities as well as community infrastructure to reduce climate change negative impacts.	100,000	100,000	100,000
Annual Totals =	**400,000**	**400,000**	**400,000**

Project No. 24

Project Title: Monitoring, evaluation and control of water and sanitation activities in slum areas of Freetown, the capital city of Sierra Leone.

Rationale/Justification

Climate Change is expected to have wide-range consequences for human health as a consequence of existing poor sanitation in Sierra Leone. These could include but not limited to the reduction of available water for drinking and washing, lowering of the efficiency of local sewer systems, leading to higher concentrations of bacteria and other micro-organisms in raw water supplies. The water scarcity may force people to use poorer quality sources of fresh water, such as rivers, which are often contaminated. Inadequate facilities for waste collection and disposal could also contribute to the incidence of communicable diseases. All of these factors could result in an increased incidence of diarrhoeal diseases.

According to the Environmental Health Manager, urban slum within the city require urgent attention to improve human health particularly in the areas of water and sanitation activities.

Project Description

1. **Objective:**

   - To improve the existing unsanitary conditions and develop appropriate water and sanitation projects for urban slums in Freetown.

2. **Activities:**
   1. Improve housing conditions and toilet facilities,
   2. Increase access to safe drinking water and sanitation,
   3. Construct appropriate low cost water supply and sanitary systems,
   4. Intensify sanitary inspections,
   5. Intensify vector control measures,
   6. Rehabilitate roads and bridges and improve communication,
   7. Promote community involvement and active participation project activities,
   8. Improve waste collection and disposal facilities,
   9. Monitor and evaluate project activities.

3. **Inputs:**
   - Human, financial and physical resources

4. **Short-term output**
   - Improved wastewater drainage and toilet facilities

- Improved access to safe drinking water

5. Potential long-term outcomes

- Improved national health and sanitation conditions
- Improved communication infrastructure
- Reduction in the incidence and transmission of communicable diseases.

6. Institutional Arrangement

- There is an Environmental Health Programme in the Ministry of Health and Sanitation.
- The Freetown City Council has also established a sanitation unit.
- The District medical Officer (DMO) heads a District health Team to ensure effective health care delivery and service development.
- The Freetown City Council, the Environmental Health Programme Manager and The DMO collaborate on particular aspects of health promotion and disease prevention and control.
- Area Development Committees are established.

7. Risks and Barriers

- Inadequate human resources,
- Insufficient financial resources,
- Poor rural infrastructure (feeder roads),
- In Sierra Leone, cultural barriers to the use of seasonal forecast information remains; decision makers should be educated or encouraged to used scientific information that may lead to reductions in losses from natural disasters.

8. Financial Resources: US $ 2,070,000

Budget Breakdown

Activity	Year 1	Year 2	Year 3
1. Improve housing conditions and toilet facilities	100,000	100,000	100,000
2. Increase access to safe drinking water and sanitation	200,000	200,000	200,000
3. Construct appropriate low cost water supply and sanitary systems	20,000	20,000	20,000
4. Intensify sanitary inspections	20,000	20,000	20,000
5. Intensify vector control measures	30,000	30,000	30,000
6. Rehabilitate roads and bridges and improve communication	150,000	150,000	150,000
7. Promote community involvement and active participation project activities	50,000	50,000	50,000
8. Improve waste collection and disposal facilities	70,000	70,000	70,000
9. Monitor and evaluate project activities	50,000	50,000	50,000
Annual Totals =	**690,000**	**690,000**	**690,000**

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