



**FEDERAL MINISTRY OF ENVIRONMENT
(DEPARTMENT OF CLIMATE CHANGE)**

**NATIONAL POLICY ON CLIMATE
CHANGE**

TABLE OF CONTENT

FORWARD

ACKNOWLEDGEMENT

ACRONYMS

EXECUTIVE SUMMARY

Introduction

Guiding Principles

Strategic Objectives of the Policy

Vision and Mission

Policy Response Approaches

Sectoral Adaptation and Mitigation Programmes

Energy

Agriculture

Water

Coastal Areas

Forestry and Land Use

Transport

Health

Culture and Tourism

Population

Human Settlement

ICT

Action Plan and Implementation Framework

Communication and Awareness Creation

Capacity Building or Strengthening in R&D in Relation to Climate Change

Climate Change Governance

Financing NCCPRS Programmes

International Cooperation

Gender and other Cross Cultural Issues Considerations

Legal Framework

SECTION 1 BACKGROUND

1.1 Introduction

1.2 Contextual Analysis

1.2.1 Global Context-Global Warming and Climate Change

1.2.2 National Geographic Context

1.2.3 National Development Context

1.2.4 National Climate Context

1.2.5 National Policies and Climate Change

(i) Environmental Policies, Strategies and Plans

(ii) Agricultural Policies

(iii) Water Policy

- (iv) Coastal and Marine Environment Policy
- (v) Energy Policy/ Plan
- (vi) Health Policy
- (vii) Transport Policy
- (viii) Culture and Tourism Master Plan
- (ix) Vision 20: 2020

1.3. Nigeria’s Vulnerability to Climate Change

Increase in the Occurrence of Extreme Weather Events

Changes in Temperature and Rainfall

Increasing Pressure on Ecology and Ecosystems

Increasing Vulnerability to Soil Erosion and Flooding

Impacts on Agriculture

Impacts on Water Resources

Impacts on Forests

Coastal and Marine Environment

Impact on Socio-economic and Socio-cultural Sectors

- Energy

- Mining

- Industry

- Population and Settlements

- Health

- Tourism

- Transport

1.4. Nigeria’s Effort in Addressing the Challenges of Climate Change

SECTION 2: VISION, MISSION AND STRATEGIC OBJECTIVES OF THE NATIONAL CLIMATE CHANGE POLICY RESPONSE AND STRATEGY

2.1 Introduction

2.2 Guiding Principles

2.3 Goals and Objectives

2.4 Vision

2.5 Mission

2.6 Policy Response Approaches

- 1 Generating adequate energy from a mix of sources for rapid socio-economic development without significantly increasing the country’s GHG emissions
- 2 Continuously reducing greenhouse gas emissions in all sectors, Particularly in the oil and gas and transportation sectors
- 3 Enhancing food security, reducing poverty and promotion Healthy living for all Nigerians.

- 4 Integrating disaster risk management of climate-related Hazards into development
- 5 Enhancing private sector participation in the expanding Business opportunities in climate change response
- 6 Planning for future climate change scenarios and building dynamic response strategies, including adequate research and infrastructure development
- 7 Building adequate capacity to manage climate change
- 8 Strengthening inter-sector actions and mechanisms concerned with climate change
- 9 Enhancing international cooperation in climate change response

Section 3: SECTORAL CLIMATE CHANGE POLICY RESPONSE AND STRATEGIES

3.1 Sectoral Adaptation and Mitigation Interventions

Introduction

3.1.1 Energy

Policy Statement

Strategies

Activities

3.1.2 Agriculture

Policy Statement

Strategies

3.1.2.1 Crop Production

Policy

Strategies

Strategies/Activities

3.1.2.2 Fishery

Policy Statement

Strategies/activities

3.1.2.3 Livestock

Policy Statement

Strategies/activities

3.1.3 Water

Policy Statement

Strategies/Activities

3.1.4 Coastal Areas

Policy Statement

Strategies/Activities

3.1.5 Forestry and Land Use

Policy Statement

Strategies/Activities

- 3.1.6 Transport
Policy
Strategies/Activities
- 3.1.7 Health
Policy Statement
Strategies/Activities
- 3.1.8 Culture and Tourism
Policy Statement
Strategies/Activities
- 3.1.9 Population
Policy Statement
Strategies/Activities
- 3.1.10 Human Settlement
Policy Statement
Strategy
- 3.1.11 ICT
Policy Statement
Strategy

IMPLEMENTATION PLAN

SECTION 4. Climate Change Strategic Action Plan

4.1 Elements of the Action Plan

Pillar 1: Mitigation and Low Carbon High Growth Development

Pillar 2: Food Security, Poverty Reduction, protection of the
Vulnerables and Health

Pillar 3: Integrated and Comprehensive Disaster Risk Management

Pillar 4: Infrastructure

Pillar 5: Research and Development

Pillar 6: Capacity Building and Institutional Strengthening

Pillar 7: Sustainable and Coordinated Climate Change Financing

4.2 Implementing the Strategic Action Plan

4.2.1 Communication and Awareness Creation

4.2.2 Capacity Building or Strengthening areas of Research,
Technology Development and Transfer etc

4.2.3 Climate Change Governance and Institutional Framework

4.2.4 Financing NCCPRS Activities

4.2.5 International Cooperation

4.2.6 Legal Framework

BIBLIOGRAPHY

ANNEX 1: PROGRAMMES, ACTIVITIES AND IMPLEMENTATION FRAMEWORK FOR THE NCCPRS

ANNEX 2: GLOSSARY OF TECHNICAL TERMS

FOREWORD

Accelerated changes in climate are expected to lead to potentially large impacts in Nigeria due to national circumstances. Government recognizes that unless significant response strategy is put in place and implemented at all levels, climate change poses a serious threat to its national sustainable development and may become a substantive shock to Nigeria's effort to reduce pervasive poverty, create jobs, enhance people's access to sustainable energy and improve the overall socio-economic well-being of its citizenry as enunciated in the objectives of the country's Vision 20:2020 and the new Economic Transformation Agenda.

The Nigeria Climate Change Policy Response and Strategy (NCCPRS) document is the output of a national participatory and stakeholders consultative approach to put in place a well-defined national climate change response framework and implementation plan that incorporates critical elements of mitigation and adaptation. It contains policy elements and short, medium and longer term national strategies that will enable the country to mainstream mitigation and adaptation into its national development efforts. This is to enable Nigeria to respond effectively to the impacts of climate change to reduce its vulnerability and enhance its resilience so that the national priorities of rapid economic growth, energy sufficiency, job creation, food security and transparent and accountable climate change governance will be properly addressed.

Nigeria looks forward to adequate financial, technical and capacity-building support from the private sector and development partners in the implementation of the NCCPRS to enable the country adapt to the unavoidable impacts of climate change through the management of risk and the reduction of vulnerability, as well as make its contribution to the global mitigation efforts.

In the same vein, Government will continue to engage actively and meaningfully in international climate change negotiations, specifically the United Nations Framework Convention on Climate Change (UNFCCC) negotiations, in order to secure a binding, multi-lateral international agreement that will help to keep the threat of climate change from becoming a catastrophe.

Mrs. Hadiza Ibrahim Mailafia

Honourable Minister of Environment
Federal Republic of Nigeria

ACKNOWLEDGEMENT

The Federal Government would like to place on record the valuable contributions of individuals, corporate entities, development partners, Ministries, Department and Agencies of government and indeed, the critical stakeholders leading to the final production of the Nigeria Climate Change Policy Response and Strategy.

We wish to acknowledge the significant role and leadership of the House Committee on Climate Change towards actualizing the policy. We appreciate the vital contributions of the National Council on Environment and the Inter ministerial Committee on Climate Change.

We also acknowledge the financial, technical and strategic support of the United Nations Development Programme (UNDP), under the seventh Country Programme and in conjunction with the Africa Adaptation Programme (AAP) funded by the Government of Japan.

We are also grateful to the consultants and experts engaged at various stages, both at the national and international levels for their painstaking, frank and thorough review and inputs into the development of the Policy document.

Finally, the steadfastness and commitment of the staff, especially in the Department of Climate Change and indeed the whole Ministry, are much appreciated

ACRONYMS

AAP	Africa Adaptation Programme
AI	Annex I (Party to the UNFCCC)
APEI	Air Pollutants Emission Inventories
AR4	Fourth Assessment Report of the IPCC
CBN	Central Bank of Nigeria
CH ₄	Methane
CDM	Clean Development Mechanism
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
DFID	Department of International Development
DNA	Designated National Authority
FME _{env}	Federal Ministry of Environment
FNC	First National Communication (same as INC to the UNFCCC Secretariat)
FORMECU	Forestry Management, Evaluation and Coordinating Unit (of FMEHUD)
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHE	Greenhouse Effect
GHG	Greenhouse Gas
GHGI	Greenhouse Gas Inventories
GNP	Gross National Product
GPG	Good Practice Guidance
HFC	Hydrofluorocarbons
ICT	Information Communication Technology
ICZM	Integrated Coastal Zone Management
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
MDGs	Millennium Development Goals
N ₂ O	Nitrous Oxide
NAI	Non-Annex I (Party to the UNFCCC)
NASPA-CCN	National Adaptation Strategy and Plan of Action on Climate Change for Nigeria
NCCPRS	National Climate Change Policy and Response Strategy
NEEDS	National Economic Empowerment and Development Strategy
NGIR	National GHG Inventory Report
NGIR-GPS	National GHG Inventory Report – General Public Summary
NGIR-PMS	National GHG Inventory Report – Policy Makers Summary
NGIR-TES	National GHG Inventory Report – Technical Executive Summary
NGO	Non-Governmental Organizations
NICRET	National Inventory Compiling and Reporting Team v
NIMET	Nigeria Meteorological Agency
NMVOC	Non-Methane Volatile Organic Compounds
NNCCC	Nigeria National Climate Change Commission
NNPC	Nigeria National Petroleum Corporation
NOX	Nitrogen Oxides (defined as NO + NO ₂)
NRT	National Reporting Template
NSCCTF	National Strategic Climate Change Trust Fund
O ₃	Ozone

ODP	Outreach and Dissemination Package
PFC	Perfluorocarbons SF6 Sulphur Hexafluoride
QA/QC	Quality Assurance and Quality Control
SCCU	Special Climate Change Unit (of the FMEHUD, Nigeria)
SEEDS	State Economic Empowerment and Development Strategy
SF6	Sulphur Hexafluoride
SMP	Spreadsheet Management Protocol
SNC	Second National Communication (to the UNFCCC Secretariat)
SO ₂	Sulphur Dioxide
UGHGI	Urban GHG Inventories
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Projects and Services, New York
UN-REDD	United Nations Programme on Reducing Emission from Deforestation and Forest Degradation
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

Introduction

Scientific evidences are conclusive that the earth is warming and climates are changing with serious and potentially damaging consequences. Climate change is aggravating the environmental issues such as deforestation and land degradation, freshwater shortage, food security and air and water pollution. Projected increases in extreme climatic events as well as more changes in the weather patterns may further threaten the means of livelihoods in the face of inaction.

In Nigeria, the agriculture and food security, water resources, public health, and settlements sectors are particularly vulnerable to climate change. Most vulnerable regions are coastal regions and erosion and desertification-prone areas in the southeastern and northern parts of the country respectively. While everyone is vulnerable, the most vulnerable groups are farmers, fisherfolks, the elderly, women, children and poor people living in urban areas.

Responding to climate change falls into two broad classes of action, mitigation and adaptation. Mitigation refers to measures that may either reduce the increase in greenhouse emissions (abatement) or increase terrestrial storage of carbon (sequestration). Adaptation refers to all the responses that may be used to reduce vulnerability.¹

Nigeria has taken the challenge of climate change seriously. The First National Communication was produced in November, 2003. A stakeholders' initiation workshop on the Second National Communication (SNC) took place in December 2009, and is being finalized and a National Adaptation Strategy and Action Plan (NASPA) has been concluded. Nigeria now has a *Climate Change Department (CCD)* in the Federal Ministry of Environment in Abuja, Nigeria. The CCD is created to implement the Climate Convention and protocol activities. It also coordinates the activities of the *Inter-ministerial Committee on Climate Change*.

Nigeria already has several policies and strategic initiatives which if properly implemented, can serve as adaptive as well as mitigative climate change measures. Many of the initiatives in these policies (e.g. oases rehabilitation in the National Action to Combat Desertification and the National Policy on Drought and Desertification) can be taken as anticipatory adaptation measures and plans, which can be fine-tuned into policy options for climate change response in the country. This comprehensive policy and response strategy will enable these policies to translate into meaningful inter-sectoral activities for sustainable environmental management.

Guiding Principles

National efforts to address climatic change in a policy responsive and strategic way is guided by a number of principles including the following:

- Strategic climate change response is consistent with national development priorities;

¹ Vulnerability is susceptibility to harm or damage potential. It considers such factors as the ability of a system to cope or absorb stress or impacts and to “bounce back” or recover

- Climate change is addressed within the framework of sustainable development, which ensures that climate change response must be sensitive to issues of equity, gender, youth, children and other vulnerable groups.
- The use of energy as a key driver for high economic growth is pursued within the broad context of sustainable development.
- Mitigation and adaptation are integral components of the policy response and strategy to cope with climate change.
- Climate change policy is integrated with other interrelated policies towards promoting economic and environmental efficiency.
- Climate change is cross-cutting and demands integration across the work programmes of several government Ministries/Agencies/Parastatals and stakeholders, and across sectors of industry, business and the community
- Climate change response provides viable entrepreneurialship opportunities. .

Strategic Objectives of the Policy

The strategic goal of Nigeria’s response to climate change is to foster low-carbon, high growth economic development path and build a climate resilient society through the attainment of the following objectives:

- i. Implement mitigation measures that will promote low carbon as well as sustainable and high economic growth;
- ii. Strengthen national capacity to adapt to climate change;
- iii. Raise climate change-related science, technology and R&D to a new level that will enable the country to better participate in international scientific and technological cooperation on climate change;
- iv. Significantly increase public awareness and involve private sector participation in addressing the challenges of climate change;
- v. Strengthen national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional framework for climate change governance.

Vision and Mission

The vision of the National Climate Change Policy Response and Strategy (NCCPRS) is a climate change resilient Nigeria for rapid and sustainable socio-economic development. Its mission is to strengthen national initiatives to adapt to and mitigate climate change in a participatory manner involving all sectors of the Nigerian society, including the poor and other vulnerable groups (women, youth etc.) within the overall context of advancing sustainable socio-economic development in Nigeria.

Policy Response Approaches

A number of key policy approaches will be used to provide an organizing framework for the development and implementation of sectoral strategies, measures and initiatives for effective response. These will include:

1. Generating adequate energy from a mix of sources for rapid socio-economic development

- without significantly increasing the country's GHG emissions:
2. Continuously reducing greenhouse gas emissions in all sectors, particularly in the oil and gas, and transportation sectors;
 3. Enhancing food security, reducing poverty and promoting healthy living for all Nigerians;
 4. Integrating disaster risk management of climate-related hazards into development:

Sectoral Adaptation and Mitigation Programmes

The Climate Change Policy and Response Strategy has identified adaptation and mitigation interventions in key sectors. Some specific adaptation and mitigation actions include:

Energy

- Promoting diverse energy mix with increasing proportion from renewable and other sources using clean technologies;
- Enhancing energy efficiency in all sectors.
- Strengthening private sector participation in the production and use of clean energy
- Support on-going initiative to gradually eliminate gas flaring

Agriculture

- Strengthening integrated agricultural intervention plan to reduce the sector's vulnerability to climate change and enhance its productivity for food security and poverty reduction.
- Reviewing the implementation of existing agricultural policies, laws and regulations to make them adaptable to addressing the challenges of climate change in crop production, fisheries and livestock.
- Reviewing and strengthen climate information systems to provide early warning in a manner useful to the local farmers.
- Supporting existing regulatory frameworks for innovative agricultural financing, insurance, etc.
- Strengthening the capabilities of Extension Services providers in training farmers in best practices including the use of weather and climate data;
- Enlarging the national food storage capacity to store surplus harvests.

Water

- Use regulatory and fiscal measures to manage the supply of water including watershed re-charge;
- Review existing institutional, legal and regulatory frameworks for water supply and wastewater discharge within river basins;
- Invest in programmes to upgrade canals and storage infrastructure to increase capacity and to reduce losses in transport and storage;
- Develop more small-scale earth dams;
- Exploit alternative water supplies such as use of seawater and brackish water through desalination, inter and intra basin water transfer;

- Scale-up international cooperation on River Basin Management by coordinating different interest groups among upstream and downstream users;
- Delimit and protect watersheds to promote stream life and recharge aquifers;
- Continue the advancement of hydrometric network to monitor river flows and flood warning telemetric systems;

Coastal Areas

- Actively support the actualization of the Integrated Coastal Zone Management (ICZM) Plan of Gulf of Guinea and domesticate it for Nigeria in terms of an Integrated Coastal Area Management Plan;
- Develop storm and flood protection as well as preparedness plans for climate-related emergencies in the coastal areas ;
- Adjust physical development plans in line with the actual and potential implications of sea level rise;
- Review and upgrade sea dykes, storm breakers, sea walls;
- Initiate new and or reinforce existing studies on the function of coastal ecological system, and the impact of the climate change and their adapting capacity;
- Improve mangrove cover for the management of flood control;
- Rehabilitate degraded areas in the coastal zone

Forestry and Land Use

- Increase forest covers through afforestation, reforestation and prevention of deforestation;
- Enhance carbon density at plot and landscape level through rehabilitation of degraded areas and increased tree planting activities, and promotion of agro-forestry;
- Adopt fiscal and regulatory measures to reduction wood utilization particularly in constructions and charcoal production;
- Ensure the sustainable use of forest resources to contribute to the livelihoods of the rural communities as they adapt to climate change;
- Promote sustainable forestry that will enable Nigeria to benefit maximally from the potentials of UN-**REDD** and at the same time adequately protects individual communities whose traditional forest based income would be impacted.

Transport

- Promote the use of efficient means of transport on all transport modes by limiting new acquisitions to those with low emission ratings including electric vehicles;
- Promote multiple modes in public transport to include water and rail as well as the use of non-motorized transport systems;
- Enhance Mass transport systems in major cities using, for example, the Bus Rapid Transport (BRT) concept as adopted in Lagos State;
- Expand transport infrastructures to open up more routes including rail and decongest road arteries in large cities and along major highways;

- Use urban and regional planning approach to optimize location of facilities so as to reduce travel time/cost;
- Provide fiscal and regulatory incentives to make air transport safer and more accessible;
- Re-invest in and revive other transport modes particularly railway to reduce GHG emissions in the sector.

Health

- Promote community resilience in the area of environmental health to reduce vulnerability to climate change
- Educate, empower, and engage citizens to take action to take actions to reduce individual and community vulnerability to climate changes through both mitigation and adaptation;
- Identify and promote mitigation/adaptation with public health co-benefits;
- Establish, improve and maintain robust rapid surveillance systems for climate-related illness, vulnerabilities, protective factors and adaptive capacity;
- Develop and implement community education plans to raise the knowledge, awareness on environmental hygiene and health under the impact of the climate change;

Culture and Tourism

- Build knowledge of the impact of culture and tourism and simple procedures to adopt for adaptation;
- Access, analyze and use basic weather information to inform tourism;
- Build capacities for sourcing, interpreting and applying weather and weather-related information as well as for monitoring effectiveness of climate change response in the sector;
- Invest in energy-efficient and renewable energy technologies in tourism;
- Make the sitting and construction of tourist-specific buildings adaptable to extreme weather events;
- Entrench carbon emissions mitigation criteria into existing initiatives of the culture and tourism sector and as well include carbon emissions mitigation related to culture and tourism developments in the National Development Plans;
- Enhance vegetal cover in tourist sites through afforestation and ecosystem enrichment;
- Design and implement efficient and effective disaster management plan for tourist sites.

Population

- Strengthen existing structures for the implementation of the National Population Policy;
- Expand family life education to reach the out of school adolescents;
- Increase awareness creation of the growing population challenges in the country;
- Implement an aggressive climate education in both the formal and informal sectors;

Human Settlement

- Reduce exposure of vulnerable places by hard and soft engineering
- Reduce vulnerability of building materials

- Avoid ‘at risk’ locations
- Provide enhanced cooling without loss of efficiency
- Target vulnerable elements at risk for adaptation
- Reduce exposure and provide cooling through green and blue infrastructure
- Promote greater resilience of buildings and infrastructure
- Promote storage and recycling of water
- Enhance the use of renewable sources for heating and cooling
- Use trees as additional carbon sinks
- Promote decentralized energy infrastructure

ICT

- Specifically target and ensure the reduction of GHG emissions through extensive use of ICT in socio-economic development process
- Promote “Smart” technologies to maximise energy use in ICT
- Use ICT outlets to promote climate change education
- Employ regulatory tools to prevent the importation of ICT junks and develop and implement an environmentally safe plan for disposal and recycling of discarded hardware and components used in ICTs
- Develop and implement an efficient utilization and interference safeguards for spectrum-related requirements for telecommunication services

Action Plan and Implementation Framework

An Action Plan that will also address the needs of the poor and vulnerable, including women and children has been proposed based on the following seven interrelated pillars:

- Mitigation and low carbon high growth development
- Food security, poverty reduction, protection of the vulnerables and health
- Integrated and comprehensive disaster risk management
- Infrastructure
- Research and development
- Capacity building and institutional strengthening
- Sustainable and coordinated climate change financing

Details of the programmes and activities to be implemented under the strategic action plan are given in Annex 1. The mission of this strategy will be achieved through the following strategic programmes:

Communication and Awareness Creation

Communication and education will be strengthened to raise the awareness and responsibilities of climate change for the citizenry to enhance their participation in the implementation of activities to respond to climate change at all levels, including the communities.

Capacity Building or Strengthening in R&D in relation climate change.

Capacity development would specifically focus the following among others:

- Containing the impacts of climate change such as floods, drought, water shortages (supply and quality), air quality, human health, and habitat loss
- Developing climate scenarios and corresponding policy responses on how climate change impacts would affect human populations, infrastructure, the environment, the economy and society as a whole.
- Periodic vulnerability assessments, and monitoring as well as assessment of the status of natural ecosystems with a view to designing appropriate response measures to control their degradation
- Periodic determination of levels of GHG emissions to identify ‘high-emissions’ sectors and areas where significant GHG reductions can be realized. Such GHG emissions data could also feed into the National Communications as required under the UNFCCC.

Climate Change Governance

To improve the climate change governance in Nigeria, the following target activities will be pursued:

- Development, amendment and perfection of the legal normative documents and system concerning climate change response and other related policies to ensure that an appropriate legislation is in place for the implementation of the activities of NCCRPS;
- Mainstreaming of climate change issues into strategies, plans and planning for socio-economic and sectors development;
- Establishing a functional climate change governance structure and mechanism to encourage coordination of NCCRPS implementation at all levels.

Financing NCCPRS Programmes

A special climate fund will be set up to address the issues of reducing the vulnerability and increasing the resilience of ecosystems and people in the country. The vulnerable segments of the population will be provided with enhanced opportunities to manage their natural resources for sustainable livelihoods and poverty reduction. Also, significant support will be provided for initiatives and activities that will put the country in the path of low carbon development.

The scope of NSCCTF will include, but may not be limited to the following:

- Projects that will enhance the adaptation capacity of Nigeria to the impacts of climate change
- Schemes to strengthen agricultural production systems to integrate biodiversity concerns and make them more resistant to climate change phenomenon
- Schemes for the promotion of energy efficiency.
- Initiatives to strengthen national capacity to undertake consistent research, analyse and monitor climate change impacts.

International Cooperation

As a Party to the UNFCCC and the Kyoto Protocol, Nigeria will continue to demonstrate its relevance through international cooperation by evolving a system for tracking international trends and effective participations in negotiations. It will also continue to promote south-south cooperation in the area in climate change scientific-technological transfer.

Gender and other cross cultural issues considerations

Gender considerations are crucial for successful planning, implementation and evaluation of effective climate change mitigation and adaptation measures, as well as for gender-sensitive policy making. Thus appropriate and effective gender considerations will be taken into cognizance in the implementation of the response strategy to facilitate informed mitigation and adaptation to climate change. This will involve the continuous implementation of the national gender policy to make it responsive to the needs for adaptation to mitigation of and climate change.

Legal Framework

A legal framework will be established through an Act of Parliament with provisions for:

- The establishment of the National Climate Change Agency/Commission and all other Climate Change Management structures and committees.
- The powers and functions of the Climate Change Commission/Agency.
- The consistent implementation of the plan to make the Nigerian economy carbon efficient and the society climate-resilient.

SECTION 1 BACKGROUND

1.1 Introduction

Scientific evidences are conclusive that the earth is warming. Global warming-induced climate change is happening with serious and potentially damaging consequences in the decades ahead. The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC, 2007) has documented dramatic and widespread evidence of global warming producing climate changes. The report concluded that greenhouse gas (GHG) emissions from human activities (anthropogenic GHG concentrations) are responsible for most of the increase in global average temperature since the mid-20th century (IPCC 2007).

All evidences contained in the AR4 report and others (e.g. Stern, 2006; UNDP, 2008; World Bank, 2009) point to the fact that climate change is aggravating the environmental issues of deforestation and land degradation, freshwater shortage, food security and air and water pollution. Projected changes in the incidence, frequency, intensity, and duration of climate extremes such as heat waves, heavy rainfall, and drought as well as more gradual changes in climate, may further threaten livelihoods in the face of inaction.

In Nigeria, climate change portends a serious threat to poverty eradication and sustainable development in general, and the achievement of the Millennium Development Goals (MDGs) and the Vision 20:2020 in particular. This is because the country has a large rural population that lives on climate-sensitive economic and development sectors (agriculture and fisheries) and natural resources (such as water, biodiversity, grassland). In addition, the adaptive capacity of the rural majority to climate change impacts is very low. Perhaps a far more important parameter is the operation of the nation's oil and gas sector which makes Nigeria a major emitter of GHG in Africa. Unfortunately, most current development strategies in the country tend to overlook climate change risks. The costs of not addressing climate change or not adapting to it are very uncertain, but their welfare consequences are expected to be enormous.

Responding to climate change falls into two broad categories: mitigation and adaptation. Mitigation of climate change refers to measures that may either reduce GHG emissions (abatement) or increase terrestrial storage of carbon (sequestration). On the other hand, adaptation is an adjustment in natural or human systems to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC 2007).

Given Nigeria's status as a fossil-fuel dependent economy with a large climate sensitive agricultural sector, the development of a climate change policy and response strategy is critical. Responding to climate change will require Nigeria to seek opportunities and design actions to reduce the vulnerability of the people to climate change impacts. This should include opportunities for to build a resilient and high growth carbon efficient economy that is able to thrive in the era of increasing focus on reduced dependence on fossil energy sources for development. It must also build a climate-resilient economy and society. This makes a strong policy directive and responsive strategy for the country necessary.

1.2. Contextual Analysis

1.2.1 Global Context – Global Warming and Climate Change

Climate is usually described in terms of the mean and variability of temperature, precipitation and wind over a period of time, ranging from months to millions of years (the classical period is 30 years). The sun powers the earth's climate system, and warms its surface, particularly the land and the ocean. Once it is warm, the earth's surface radiates back to the atmosphere. Much of this thermal radiation emitted by the land and ocean is absorbed by the atmosphere, including clouds, and reradiated back to earth. This is called the *greenhouse effect*². The Earth's greenhouse effect warms the surface of the planet. Without this, the average temperature at earth's surface would be below the freezing point. Thus, the earth's natural greenhouse effect makes life as we know it possible. The general concern is that human activities have, in recent times, distorted the natural process of the greenhouse effect on the earth's energy balance.

Since the industrial revolution in Europe, human activities, primarily the burning of fossil fuels and clearing of forests, have greatly intensified the natural greenhouse effect. Human activities have been causing changes in the amounts of GHGs such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide, aerosols (small particles), and cloudiness earth's in the atmosphere. The most significant of these gases is CO₂, and the concentration is increasing rapidly. It is estimated that CO₂ increased from 280 parts per million (ppm) during the industrial era of the 1750s to about 390 ppm by 2010, with an annual growth rate of 1.5 to 2.0 ppm. It is projected that the concentration could reach 550-800 ppm by 2100. This build-up of GHGs has set the earth inexorably on the path to the "*global warming*". Global warming is now regarded as the most serious environmental challenge of our time.

Based on recent IPCC publications, the average temperature at the surface of the Earth has increased over the past century by about 0.6°C. It is estimated that global average surface air warming by 2100, could be between 1.8°C and 4.0°C (likely range is 1.1°C to 6.4°C). Because of the delaying effect of the oceans, surface temperatures do not respond immediately to greenhouse gas emissions, so climate change will continue for hundreds of years after atmospheric concentrations have stabilized. Thus, it is imperative to address the problem adequately at local, national, regional and international levels.

The United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol constitute the basic framework and legal basis for international cooperation on climate change. This embodies the consensus of the international community and serves as the foundation governing the implementation of the Bali Roadmap. The Bali Roadmap affirms the mandate to enhance the implementation of the UNFCCC and its Kyoto Protocol, which is, on the one track, to secure the full, effective and sustained implementation of the UNFCCC by making corresponding arrangements in terms of mitigation, adaption, technology transfer and financial support and, on the other track, to determine further quantified emission reduction targets for developed countries for the second commitment period (after 2012) under the Kyoto Protocol. Both the UNFCCC and the Kyoto Protocol still remain the two legal instruments of negotiation beyond the popular "Copenhagen Accord".

² Analogous to the glass walls in a greenhouse which reduce airflow and increase the temperature of the air inside.

1.2.2 National Geographic Context

Nigeria, with a total population of more than 162 million and a total land area of 923,800 sq km, occupies about 14% of land area in West Africa. It lies between latitudes 4°N and 14°N, and between longitudes 3°E and 15°E, spanning six major vegetation zones that range from lush forests (mangrove forest, fresh water swamp forest and rainforest) in the south, to guinea savanna in the middle belt, while savanna woodland and thorny vegetation dominate the Sudan and Sahel regions of the north.

The highest areas are in the east, north, and west, where land is generally over 1,500 metres, 600 metres, and 300 metres, respectively. The low-lying areas, which are generally below 300 metres, lie along the coast and the main river valleys. The Udi Plateau which lies to the east breaks the monotony of the surface along the coastal lowlands, which are characterized by coastal creeks and lagoons on both sides of the Niger Delta. West of this Delta the coastal areas consist of lagoons and swamps, separated from the open sea by strips of sandy land, which vary in width from 2 to 6 kilometers. The Niger Delta is cut up by numerous water channels through which the River Niger reaches the sea.

The rich ecological diversity of Nigeria is a reflection of the country's highly variable climatic conditions, which makes the country an epitome of sub-Saharan conditions.

1.2.3 National Development Context

According to UNDP (2010), climate change poses a serious threat to equitable and sustainable development in Nigeria, where about 55% of the population were living below the poverty level in 2004 (DFID, 2009). Nigeria is particularly vulnerable because although its economy is dependent on oil, a larger portion of the country (70% of population) is engaged in agriculture for their economic activities. These populations are dependent on climate-sensitive natural resources for their livelihoods and are thus more at risk of being impacted by climate change.

As Nigeria works towards becoming one of the top twenty economies in the world by the year 2020 (Vision 20:2020), the country envisions a large, strong, diversified, sustainable and competitive economy. Such an economy would effectively harnesses the talents and energies of its people and responsibly exploits its natural endowments to guarantee equitable sharing of benefits and high standard of living to its citizens. This vision has an overarching growth target of no less than \$900 billion in Gross Domestic Product (GDP) and a per capita income of no less than \$4,000 per annum.

One of the key pillars of the Vision20:2020 is investment in low carbon fuels and renewable energy. Achieving the goal of low carbon, high growth and resilient socio-economic system for equitable and sustainable socio-economic and environmental development faces some challenges. These include stability and sustainability of enabling environment, adequate institutional and human resources capacity and availability of adequate resources to address mitigation and adaptation initiatives to address climate change. To do this effectively, government needs to ensure that economic growth, resource management, and climate change

mitigation and adaptation can all happen simultaneously, as well as pursue policies that will ensure sustainable development in a strategic and responsive manner.

1.2.4 National Climate Context

Nigeria is located in the tropics and therefore experiences high temperatures all year round. The mean for the country is 27°C. Average maximum temperatures vary from 32°C along the coast to 41°C in the far north, while mean minimum figures range from 21°C in the coast to under 13°C in the north. The mean surface temperature condition over Nigeria is given in Figure 1.

The rainfall pattern varies from a wet coastal area with an annual rainfall greater than 3,500 mm to the Sahel region in the north, with annual rainfall less than 600 mm. There are generally two seasons in the year: the wet and the dry seasons. The length of the rainy season decreases from 9-12 months in the south to only 3-4 months in the extreme north. A high degree of rainfall variability and extremes is a distinct feature of the Nigerian climate, particularly in the northern part where major droughts have alternated with floods in the past.

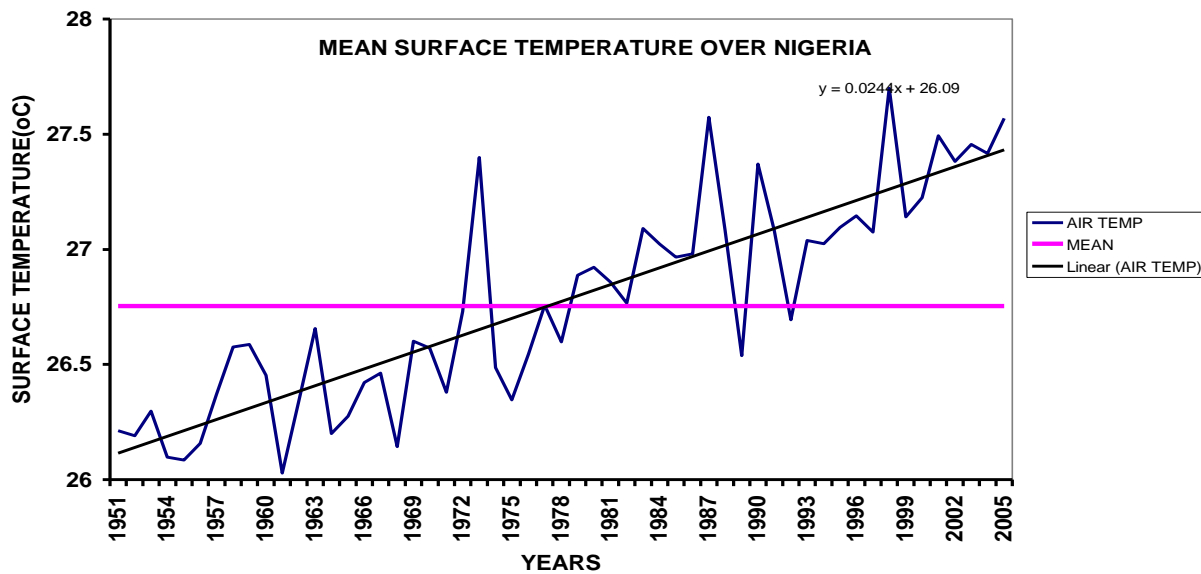


Figure 1 Mean surface temperature over Nigeria (Ojo, 2008)

There is increasing evidence that the mean climatic conditions in terms of rainfall and temperature will change drastically in the future. Based on the IPCC projection, the humid tropical zone of southern Nigeria which is already too hot and too wet is expected to be characterized by increase in both precipitation (especially at the peak of the rainy season) and temperature. Already, temperature increases of about 0.2°C - 0.3°C per decade have been observed in the various ecological zones of the country, while drought persistence has characterized the Sudan-Sahel regions, particularly since the late 1960s. For the tropically humid zones of Nigeria, precipitation increases of about 2 - 3% for each degree of global warming may

be expected. Thus, it is reasonable to expect that the precipitation would probably increase by approximately 5 - 20% in the very humid areas of the forest regions and southern savanna areas.

In contrast, the savanna areas of northern Nigeria would probably have less rainfall, which, coupled with the temperature increases, would reduce soil moisture availability. This may be worsened by the expected decrease in rainfall with greater drought probabilities and larger inter-annual variability.

Data from the Tyndall Centre for Climate Change Research, which are also used in the IPCC assessments, has been used by DFID (2009) to provide a best estimate scenario for temperature and precipitation changes in Nigeria. The estimates for 2010 – 2050 were calculated from an average of the three different IPCC ‘Special Report on Emissions Scenarios’ (low, best estimate and high) for the region to which Nigeria belongs. Tables 1 - 3 summarize the predicted changes obtained for the country by the study (DFID 2009).

Table 1 Projected increase in average temperature of Nigeria (Δ degrees Celsius)

Scenario	2010	2020	2050
Low	0.4	0.5	1.0
Best estimate	0.7	0.8	1.8
High	0.9	1.3	3.2

Table 2 Projected increase in precipitation in Nigeria (Δ mm)

Scenario	2010	2020	2050
Low	3	4	8
Best estimate	5	6	14
High	7	9	19

Table 3 Projected increase in sea level rise (Δ metres)

Scenario	2020	2050	2100
Low	0.1	0.2	0.5
Best estimate	0.15	0.4	0.9
High	0.3	1	2.0

While these estimates are country-wide averages, it should be noted that different zones will have varying effects, In the case of precipitation, some areas may become increasingly desertified, while others will likely suffer increased precipitation. In general, the consensus of various models is that Nigeria’s climate, like those of the rest of Africa will generally become more variable, and a global rise in sea level will have significant effect on the country’s coastline.

1.2.5 National Policies and Climate Change³

Nigeria has a number of critical sector-specific policies in environment, agriculture, forestry, health, water resources, transport, ICT and communication that have significant bearings to this climate change policy and response strategy. Only a few of the policies deal with climate variability and climate change directly, but most have a few measures that have links with climate change. Some of these policies include:

(i) ***Environment policies, strategies and plans:*** Towards meeting the challenges of addressing the environmental problems in the country, the Nigerian government developed a *National Environmental Policy* in 1989 which was revised in 1999 to accommodate new and emerging environmental concerns. The goal of the revised the policy is to achieve sustainable development and, in particular to (i) secure a quality of environment adequate for good health and well-being; (ii) promote the sustainable use of natural resources; (iii) restore and maintain the ecosystem and ecological processes and preserve biodiversity; (iv) raise public awareness and promote understanding of linkages between environment and development; and (v) cooperate with government bodies and other countries and international organizations on environmental matters.

In an attempt to implement the Environmental Policy, Nigeria has enacted specific policies and action plans that, if properly implemented could be adapted to support national climate change adaptation response efforts, particularly with respect to:

- a. ***drought and desertification*** - National Policy on Drought and Desertification; Drought Preparedness Plan, (2007);
- b. ***erosion, flood control and coastal zone management*** - National Policy on Erosion, Flood Control and Coastal Zone Management, (2005);
- c. ***national sanitation policy***
- d. ***forestry*** - Draft National Forest Policy, 2006;
- e. ***biodiversity protection*** - National Biodiversity Strategy and Action Plan, 2004;

The *National Policy on Drought and Desertification* recognizes that climate change could intensify drought and desertification in the northern part of the country that are prone to these environmental problems. In this regard, specific strategies have to be implemented to moderate the negative impacts of climate change on drought and desertification. The specific focus of the policy with respect to climate change is the equipment of relevant agencies, institutions and citizens adequately to collect, analyze and use climate data effectively to ameliorate and combat drought and desertification. A major proposed implementation strategy of relevance to climate change is encouraging landuse practices that enhance CO₂ sequestration, such as afforestation and agro-forestry. This will also reduce soil erosion and increase crop productivity for climate change adaptation and economic development. Other long-term integrated strategies are elaborated in the *National Action Programme (NAP) to Combat Desertification and Mitigate the Effects of Drought* that was developed in 2000, and remains the main implementation modality for the drought and desertification policy.

³ Some of the information in this section is drawn from a recent commissioned study on Nigeria's State of Preparedness for Climate Change Adaptation (HBS, 2010) in which the lead author is also a major contributor to this policy document.

The *National Forest Policy* is in the process of finalization, but there is the *National Forestry Action Programme (NFAP)* which is geared towards ensuring sustainable forest management, promoting participatory process of development, facilitating private sector – forestry development and adopting an integrated approach to forestry development. It comprises of 3 sub-programmes viz: forest management, social forestry and forest industries, all of which, if fully implemented will enable Nigeria to drastically increase its forest cover for climate change mitigation and adaptation and enable it to benefit from the REDD+ global programme.

The goal of the *National Biodiversity Strategy and Action Plan (NBSAP)* is to develop appropriate framework and programme instruments for the conservation of Nigeria’s biological diversity and enhance its sustainable use to enrich the biological diversity of the country and enhance its beneficial effects on climate change adaptation and mitigation options. NBSAP is to promote the integration of biodiversity considerations into national planning, policies, development plans.

The *National Erosion and Flood Control Policy* and its Action Plan is designed to ensure coordinated and systematic measures in the management and control of the hazards of erosion and floods to reduce their impacts on the people and the environment. Some of the key strategies are to: (i) evolve a mechanism for forecasting, monitoring and control of erosion and floods; (ii) review the land use laws and regulations; (iii) promote and strengthen training at all levels in erosion and flood prevention, management and control; and (iv) creating public awareness to encourage participation.

In addition to the above mentioned policies and strategies, Nigeria has many laws and regulatory measures to promote sustainable environmental management in many sectors of the economy. Some of the critical laws that may have influence on climate change response, particularly as they relate to ecosystem adaptation, include (a) *National Park Service Act* – retained as Cap N65 LFN 2004 in national parks; (b) *Endangered Species (Control of International Trade and Traffic) Act*- retained as Cap E9 LFN 2004.

(ii) *Agricultural policy:* Nigeria adopted a new agricultural policy in 2001. Some of the main objectives of the Policy include: (i) the achievement of self-sufficiency in basic food supply and the attainment of food security; (ii) increased production of agricultural raw materials for industries; (iii) increased production and processing of export crops, using improved production and processing technologies; and (iv) generating gainful employment. The policy also seeks to reduce risks and uncertainties in agriculture by reducing the natural hazard factor (*which may include climate change*) militating against agricultural production and security of investment. The policy framework covers many issues that may be impacted by climate change including (i) crops, livestock, fisheries and agro-forestry production, (ii) pest control, and (iii) water resources and irrigation.

(iii) *Water policy:* The National Water Policy was developed in 2004. It seeks to improve on the nation’s water resources management including the management of hydrological risks and vulnerabilities. Emphasis is for the assessment of water resources is to improve real time forecasting of hydrological phenomena, which will be relevant in response to the expected

changes that are likely to occur in the country's hydrological cycle over the next few decades due to climate change impact. .

(iv) Coastal and Martine environment policy: Nigeria's coastline which defines its coastal reaches spans a distance of more than 800km and is made up of highly varied geomorphologic characteristics that are very vulnerable to climate change. Although Nigeria is yet to have a separate policy directed at its coastal zone management, the country is participating in the implementation of the UNDP/UNE/UNIDO/GEF project on *Combating coastal area degradation and living resources depletion in the Guinea Current Large Marine Ecosystem (GCLME) through regional actions*. A major output of this project implementation is *the development of Strategic Action Programme to address sustainable management of the environment of the sub-region*. Some of the remedial actions to address priority trans-boundary problems in the project portend good opportunity for anticipatory adaptation response to climate-induced changes to the coastal environment in Nigeria.

(v) Energy policy/plan: The National Energy Policy establishes guidelines for the protection of the environment in the exploitation of Nigeria's fossil fuels. It also emphasizes the exploration of renewable and alternative energy sources, primarily solar, wind and biomass. Nigeria envisions a peaceful and prosperous nation driven increasingly by renewable energy. By the middle of the century, sustainable and affordable renewable energy will provide half of the country's total energy demand, thereby contributing to the country's efforts to keep GHGs at barest minimum. The country's Renewable Energy Master Plan (REMP) has several pertinent specific objectives which if achieved will enable Nigeria to address climate change risks in the energy sector, as well as ensure that the country meets its increasing energy demands. In particular the country will be able to pursue an economic development path that is less dependent on fossil fuels (e.g. oil)

(vi) Health policy: Increase in health-related problems that are anticipated in a climate change future, and the mounting challenge that climate change may pose to health management are directly related to climate change adaptation. The main objective of National Health Policy (NHP) is to improve the health status of Nigerians and the achievement of the health-related MDGs. Supporting the implementation of the NHP are (i) National Adolescence Health Policy, (ii) National Reproductive Health Policy and (iii) the Nigerian Health Promotion Policy, which is at its draft stage and which vision is to reduce the morbidity and mortality rates due to communicable diseases to the barest minimum; to reverse the increasing prevalence of non-communicable diseases; meet the global targets on the elimination and eradication of diseases; and significantly increase the life expectancy and quality of life of Nigerians.

(vii) Transport policy: Nigeria's transport sector has some critical vulnerability issues which are already being amplified by increasing adverse weather conditions. This is more so because the sector is characterized by a collapsed rail system, weak civil aviation system and poorly maintained road transportation network. The Nigeria's policy in the transport sector in general is aimed at addressing issues such as economic regulation of urban transport, funding, land use and transport planning, safety enforcement, institutional framework and public private partnership in the transportation sector. The implementation of the policy will enhance Nigeria's preparedness for more severe weather conditions in a changing climate.

(viii) Culture and Tourism Master Plan: Culture is a major factor of climate change but is also profoundly affected by climate change. Given the high dependence of tourism on the environment, the sector is highly sensitive to climate and thus a wide-range of environmental changes due to climate change will have severe adverse impacts on it. It is climate that determines the seasonality in tourism demand and its operating costs, such as heating-cooling, snowmaking, irrigation, food, water supply etc. The National Tourism Plan (NTP) was developed in 2005. It emphasized sustainable tourism, including the conservation and protection of national parks and game reserves. This makes it relevant to the imperative of environmental sustainability in the face of increasing climate change.

Vision 2020: A ten-year development plan for stimulating Nigeria's economic growth and launching the country onto a path of sustained and rapid socio-economic development has been drawn up. This is contained in the blueprint known as Vision 2020 which articulates Nigeria's economic growth and development strategies for the period between 2010 and 2020, and will be implemented using a series of medium term development plans. Vision 2020 aims, among others, to reduce the impact of climate change on socio-economic development processes in the overall context of preserving the environment for socio-economic development. In that regard, it would (i) strengthen environmental governance; (ii) promote environmental education; (iii) optimize economic benefits from sustainable environmental management.

1.3. Nigeria's vulnerability to climate change

Climate change has the potential to affect all sectors of our socio-economic development, including the natural ecosystems. In Nigeria, the sectors which are considered most vulnerable to climate change are agriculture and food security, water resources, public health, and habitat. Vulnerable regions are coastal regions and erosion and desertification-prone areas in the southeastern and northern parts of the country. Vulnerable groups include farmers, fisherfolks, the elderly, women, children and poor people living in urban areas.

Climate change is expected to increase the frequency and intensity of severe weather events. Sea level rise may lead to increasing coastal inundation and flooding of low-lying areas. Unfortunately, many States in Nigeria largely lack the infrastructure necessary to respond adequately to such events. Diseases such as malaria are likely to have wider ranges, impacting more poor people that are already most affected by such diseases.

Climate change will also have direct impacts on biodiversity. While some species like grasshoppers or other pests may increase in abundance or range, climate change will increase existing risks of extinction of many threatened species and lead to greater loss of biodiversity. Changing rainfall patterns could devastate the rain-fed agriculture on which so much of the population of Nigeria depends to survive. Increased occurrence of drought may lead to declining agricultural yields and diminished food security. Water supplies may also be altered, primarily through changes in temperature and rainfall.

Increase in the occurrence of extreme weather events

The frequency and intensity of extreme events, such as floods and droughts, has increased in many parts of Nigeria over the past few years. The country fits into the following categories of extreme events depicted by IPCC (2007):

- Warmer and more frequent hot days and nights over most land areas;
- Warmer and more frequent hot days and nights over most land areas;
- Warm spells / heat waves - Frequency increases over most land areas;
- Heavy precipitation events - Frequency (or proportion of total rainfall from heavy falls) increases over most areas;
- Area affected by droughts increases.

It is reasonable to say that climate change will magnify natural disasters' severity in terms of intensity and frequency in Nigeria, but the nature and severity of the changes must be properly diagnosed.

Changes in temperature and rainfall

Based on the IPCC projection, southern Nigeria which is already too hot and too wet is expected to be characterized by increase in both precipitation (especially at the peak of the rainy season) and temperature. Already, temperature increases of about 0.2°C - 0.3°C per decade have been observed in the various ecological zones of the country, while drought persistence has characterized the Sudan-Sahel regions, particularly since the late 1960s. For the humid zones of Nigeria, precipitation increases of about 2 - 3% for each degree of global warming may be expected. Thus, it is reasonable to expect that the precipitation would probably increase by approximately 5 - 20% in the very humid areas of the forest regions and southern savanna areas.

In contrast, the savanna areas of northern Nigeria would probably have less rainfall, which, coupled with the temperature increases, would reduce soil moisture availability. This situation may be worsened by the expected decrease in rainfall with greater drought probabilities and larger inter-annual variability.

Increasing pressure on ecology and ecosystems

The severity of climate change impacts on the ecosystems depends, to a large extent, on the status of the flora and fauna. In particular, the forest ecology and the ecosystems that are already under significant human pressure would be adversely affected. Significant climate change and sea level rise would result in loss of biodiversity, rapid deterioration in land cover and depletion of water availability through destruction of catchments and aquifers. Persistent flooding and water logging could render forest regeneration more difficult.

The savanna biome of northern Nigeria would be very vulnerable to any climate-change-related dramatic reduction in rainfall in the region. This could result in wide spread degradation of habitats. Thus, climate change and sea level rise could affect the boundaries of the ecosystems and the mix of the species that compose them, such that the distribution of new patterns of plant

and animal communities would be a reflection of how the different ecosystems have been able to adapt to the expected climates.

Increasing vulnerability to soil erosion and flooding

Due to climate change, some areas will start receiving heavier and steadier rainfall and such areas will inevitably begin to experience increased rainfall-induced erosion. As a corollary, in the arid northern parts of Nigeria, higher temperatures will contribute to dry conditions which underlie accelerated wind erosion. These are extremely serious situations given that soil erosion is already of catastrophic proportions in Nigeria while floods annually ravage many parts of the country during the rainy season. For example, it is estimated that in Abia, Anambra and Imo States, there are no fewer than 600 gully erosion sites.

As a result of widespread reduction of vegetation cover, all parts of the country are vulnerable to soil erosion resulting from climate change either in terms of removal of soil by wind and rain or deposition of same in low-lying and down-wind locations.

Impacts on agriculture

One of the sectors most sensitive to climate change is agriculture. With nearly 70% of the country's population depending on agriculture for sustainable livelihoods, and agriculture still contributing nearly 40% of the country's GDP, the country is highly vulnerable to climate variability and long-term climate change, which could result in higher food prices, and lower domestic revenues. Under a "business as usual scenario", agricultural productivity could decline between 10 to 25% by 2080. For some parts of the country, the decline in yield in rainfed agriculture could be as much as 50%. Such trends clearly threaten the achievement of the MDGs, in particular as they relate to the country's food security.

Rural households engaged as subsistence and smallholder farmers are most vulnerable to the impacts of climate change on agriculture. They may be affected in the following ways:

- increased likelihood of crop failure;
- increase in diseases and mortality of livestock, and/or forced sales of livestock at disadvantageous prices;
- increased livelihood insecurity, resulting in assets sale, indebtedness, out-migration and dependency on food aid; and
- downward spiral in human development indicators, such as health and education.

Such impacts will further aggravate the stresses already associated with subsistence production, such as isolated location, small farm size, informal land tenure, low levels of technology and narrow employment options, in addition to unpredictable and uneven exposure to world markets that smallholder farmers particularly risk-prone in the face of climate change.

Indirect effects of climate change on agriculture include the effects on pests and diseases and the impacts of these on agricultural production, the impacts on health, and the impacts on agro-related socio-economic activities. Various pests, including rice stink bug, lima-bean pod borer,

rice weevil, and soybean pod borer would probably expand their distribution areas in the event of climate change.

In general, the various impacts of climate change on crop production in the country could have tremendous impact on income, employment and food production. There would also be significant impacts on the characteristics of labour, employment and population processes and their characteristics.

Impacts on water resources

Climate change would result in increased variability in rainfall, predictably resulting in floods in some humid areas of the country and decrease in precipitation resulting in droughts in the north. Thus, the characteristics of the component of the hydro-climatological systems of the different ecological zones in the country would be altered, with their consequences on the availability of water resources.

Higher temperatures changes will affect the amount of runoff that becomes groundwater. Similarly, reduced rainfall, particularly in the northern part would further compound the inability of the zone to meet people's demand for water. The northern part of the country may increase its dependence on underground water sources. But decreased rainfall would lead to lower water tables and this could increase the water stress and problems of environmental sustainability and water resources management in the future.

Climate change will affect water use in all socio-economic sectors and consequently demand for water. Of particular significance is the fact that reduced river flow will reduce HEP production. Already, there is increased concern that marked fluctuations in the level of the waters in Kainji, Jebba and Shiroro dams due changes in climate is disrupting electricity generation from the hydro power stations.

Impacts on forests

Many of the forest products are consumed directly by the households collecting them. The direct values of forests come from harvesting of fuel wood and poles for construction of houses and fences and the consumption of other forest products like plant products for craft production, food, medicine, cosmetics and timber in particular. Although there are no quantitative estimates for the country, forest use can contribute significantly to the GDP. In Namibia, for example, forest use is estimated to be contributing up to 3 per cent to national income (Reid, et. al., 2007).

In accordance with the study by Reid et. al., (2007) the areas with broadleaf woodlands in the southern part of the country are likely to experience no particular losses due to climate change. Indeed it is thought that the potential to use forest products here could increase. However, in the more arid zone to the north, potential benefits from climate change might be offset by increases in tree damage from fire.

Coastal and marine environment

The coastline of Nigeria is already undergoing pronounced morphological changes as a result of natural and anthropogenic activities. The natural phenomena include occasional sea surges and tidal waves, while human activities include (i) haphazard construction of ill-designed jetties and groynes, (ii) sand mining, (iii) unplanned and accelerated infrastructural development, (iv) pollution and (v) general land degradation. The anticipated accelerated sea level rise (ASLR) of 0.5 - 1m would worsen these problems. In general, sea level rise impact in general will include (i) inundation and flooding, (ii) exacerbation of coastal erosion, (iii) increased frequency of ocean storm surges, (iv) changes in ocean dynamics, which could have effects on fishery resources, and (v) migration and nutrient distribution patterns, Resources, migration and nutrient distribution patterns (Awosika and Folorunsho 2009). Many low lying areas will be affected by ASLR and increased flooding from storm surges due to global warming. Beach erosion could pose more threat as a result of ill-designed jetties/groynes which could cause alterations in current directions with the result that erosion could shift to other places as being witnessed on the Bar Beach on Victoria Island, Lagos. The filling up of some mangrove wetlands for development is already causing flooding in many areas and could be worsened by climate-change related ASLR. Increased frequency of shipwrecks particularly in the Lagos axis will exacerbate erosion along the coast.

With specific reference to the Niger Delta, it is estimated that with an accelerated sea level rise (ASLR) of about 0.5m, about 35% of the delta could be lost. With ASLR of about 1.0 m about 75% of the delta could be lost. The number of people at risk, assuming no measure and development, would be 0.9 million, 2.10 million and 4.50 million with ASLR of about 0.2 m., 0.5 m., and 1.0 m respectively, resulting in massive *environmental refugee*. With the projected climate change and sea level rise the capital values at risk would be about \$8.05 billion and \$17.5 billion respectively with ASLR of 0.2 m and 1.0 m. with no development and no mitigation/adaptation measures.

Impact on socio-economic and socio-cultural sectors

Energy: Climate change will have significant effects on the energy sector in Nigeria. In particular, rising temperatures, changes in the amount of precipitation and variation in humidity, wind patterns and the number of sunny days per year, could affect both consumption and production of energy. These impacts would be profound, although the nature and magnitude of the impacts may not be easy to predict.

In general, both energy supply and demand would be affected by climate change and sea level rise. Obviously, increased temperatures would result in increased energy demand for air conditioning, refrigeration and other household uses. Water pumping requirements may increase significantly in response to increased water need for irrigation and residential, commercial, and municipal water use to offset temperature increases. This will be very critical in this era of energy deficiency in the country.

Mining: Mining is a major socio-economic sector in Nigeria. In the Niger Delta alone, total investment in oil mining amount to over US \$13 billion, most of which is under threat from climate-change related sea level rise. Considerable losses will thus be incurred in terms of investments and developments of the Niger Delta, particularly with respect to Government

revenue in oil and oil-based industries such as oil refineries in coastal cities (e.g. Port Harcourt and Warri) and damage to many infrastructure and social amenities.

Industry: In general, some industrial products (e.g. food and drinks) are weather dependent and many industries are vulnerable to extreme weather conditions. For example, severe storms are detrimental to many industries including offshore oil, and gas drilling and fisheries that dominate the coastal zone of Nigeria. Some industries are also dependent on availability of local resources, which may be affected by changes in the climate. Variations in the production costs of crops, domestic animals, fish, wood, water and mineral resources due to climate change and sea level rise, would affect, for instance, industries processing agricultural products, hydroelectricity generation and aluminum industry. Changes in biological diversity, which may result from climate change, could also hamper the development of agricultural and pharmaceutical products. The loss of coastal zones, mangroves forests and wetlands, would affect fisheries and many other economic activities based on the species in these habitats. Such vulnerability could result in forced relocation, loss of revenue and inability to continue operations.

Population and settlements: Climate Change would also directly or indirectly affect population and human settlements in Nigeria. In general, about 15% of the country’s population is presently affected by climatic variation and sea level changes. With climate change, between 50% and 60% of the population would be affected. Global warming-related extreme events such as floods (resulting landslides in some areas) strong winds, droughts and tidal waves could cause massive relocation of people. They could contribute to increased population movement via (a) declining agricultural productivity (b) managed and unmanaged retreat from land which is vulnerable to sea level rise and (c) temporary displacement. Declining agricultural productivity that has been a major trigger for population movement in the country could be worsened, especially in the semi-arid and arid zones of northern Nigeria.

Health: The human health impacts of climate change in Nigeria would occur in various ways and because of the poor health status of many citizens, the impacts could be devastating. The impacts could either be direct or indirect. Some of the direct impacts of climate change on health in Nigeria would include deaths, stroke, illness and injury due to increased exposure to heat waves and effects upon respiratory systems. Indirect effects of climate change and sea level rise include altered spread and transmission of vector-borne diseases (including malaria etc.) and altered transmission of contagious diseases (including cholera, influenza etc). The key known effects of changing weather and climate on health are depicted in Table 4.

Table 4: Effects of weather and climate variability on health

Health Outcome	Known effects of weather and climate variability
Heat stress	<ul style="list-style-type: none"> ☐☐☐Deaths from cardiopulmonary disease increase with high temperatures ☐☐☐Heat-related illness and death increase during heat waves
Air pollution-related mortality and morbidity	<ul style="list-style-type: none"> ☐☐☐Weather affects air pollutant concentrations ☐☐☐Weather affects distribution, seasonality and production of Aeroallergens

Health impacts of weather disasters	<ul style="list-style-type: none"> ☐☐☐Floods, landslides and windstorms cause direct effects (deaths and injuries) and indirect effects (infectious disease, psychological morbidity) ☐☐☐Droughts are associated with increased risk of disease, and Malnutrition
Mosquito-borne diseases, tick borne diseases (e.g. malaria, dengue)	<ul style="list-style-type: none"> ☐☐☐Higher temperatures shorten the pathogen development time in the vectors and increase potential transmission to humans ☐☐☐Each vector species has specific climate conditions (temperature, humidity) necessary to be sufficiently abundant to maintain Transmission
Under nutrition	<ul style="list-style-type: none"> ☐☐☐Climate change may decrease food supplies (crop yields, fish stocks) or access to food supplies
Water / food-borne Diseases	<ul style="list-style-type: none"> ☐☐☐Survival of disease organisms is related to temperature ☐☐☐Water-borne diseases are most likely to occur in communities with poor water supply and sanitation ☐☐☐Increases in drought conditions may affect water availability ☐☐☐Extreme rainfall can affect transport of disease organisms into water supply

Tourism: Tourism, one of Nigeria’s fastest growing industries, is based on wildlife, natural reserves, coastal resorts, and an abundant water supply for recreation. Many tourist attractions are located along the coastal zone of the country. Thus, any significant sea level rise due to global warming and climate change would impact on these tourist attractions that range from modern architectural basis through traditional relics to recreational grounds like beaches. Many beaches (e.g. the Victoria Island beach) in Nigeria will be lost. River deltas and maritime wetlands are also potentially endangered, while the existence of coastal settlements, including large cities, is threatened. With the destruction of a lot of these features, most of the socio-cultural features (e.g., the first Christian Church in Badagry, near Lagos) will be threatened. Those tourist-attracting traditional festivals (e.g. Argungu festival on river Argungu in Kebbi State) may decline to the extent that climate change induces shrinkage of such rivers. The anticipated loss of wildlife following the destruction of wildlife sanctuaries and reserves due to reduced vegetation as a result of climate change would discourage tourism.

Transport: Nigeria’s transport systems will not escape the effects of global warming and climate change. For example, higher sea level rise may require costly changes to other ports and coastal roads and railways as the current means of communications along the coast may be covered by the intruding sea water or washed away by erosion. Changes in lake and river levels would also affect inland navigation. More frequent storms would affect shipping and other forms of transport. Also increased temperatures will exacerbate the problems of road and railways, as for example, the roads will become very hot for vehicle tyres. Increased temperatures may also expose these vehicles to increased hazards of road accidents. Also, increased hot weather could cause increased rail length and consequently potential hazards of rail

transportation. Any change in prevailing winds and increased dust haze would affect the safety and efficiency of take-off of flights. Airports near the ocean may also be vulnerable to sea level rise. If sea level should rise, for instance, drainage would be needed at the international airports of Lagos and Port Harcourt and other coastal airports.

1.4 Nigeria's Efforts in Addressing the Challenges of Climate Change

Nigeria has taken the challenge of climate change seriously. The First National Communication was produced November, 2003. A stakeholders' initiation workshop on the second National Communication (SNC) took place in December 2006, and it should be finalized before the end of the year.

Nigeria now has a *Department of Climate Change Unit* (DCC) in the Federal Ministry of Environment Abuja, Nigeria. DCC is created to implement the Convention and the protocol activities. It also coordinates the activities of the *Inter-ministerial Committee on Climate Change* whose membership are drawn from the Ministries of Finance, Agriculture, and Water Resources; Energy Commission, Nigeria National Petroleum Corporation (NNPC), Foreign Affairs, Nigerian Meteorological Agency (NIMET), Industry, NGOs (Nigerian Environmental Study/Action Team), and the Academia

Afforestation remains one of the most potent response measures to check the impacts of climate change. Government is currently embarking on a number of afforestation programmes. Under the guidance of the African Union Commission, Nigeria is keying into the project on the "Green Wall Initiative." For this, a "green wall" of trees will be planted across the dry-land area of Nigeria to push back deforestation and secure agriculture and livelihoods across the Sudano-Sahelian zone of the country. This initiative will address not only climate change, but the UN Millennium development goals as well. There is also the Presidential Initiative on Afforestation Programme for Environmental Sustainability targets about 40 million trees to be planted annually.

Government recognizes that much more needs to be done and has placed climate change issues high on its development agenda. Efforts are now being accelerated to ensure that climate risks will be integrated into national development projects and strategies, including NEEDS/SEEDs, and the Economic Blue Print known as Vision 20:2020.

SECTION 2: VISION, MISSION AND STRATEGIC OBJECTIVES OF THE NATIONAL CLIMATE CHANGE POLICY RESPONSE AND STRATEGY

2.1 Introduction

Climate change is happening and its adverse effects are already affecting Nigeria. With right policies and capacities in place, adaptation to the effects of climate change in particular can offer opportunities for strengthening sustainable human development. Social equality, wealth generation, security and environmental safety and quality can all improve substantially over the coming decades, if issues of climate change are properly integrated into national development. Development ambitions can therefore remain high despite climate change.

2.2 Guiding Principles

National efforts to address climatic change in a policy responsive and strategic way will be guided by the following principles:

- Strategic climate change response is consistent with national development priorities, including poverty alleviation, access to basic amenities including energy, job creation, rural development, human resource development and improved health, leading to sustainable economic growth.
- Climate change is addressed within the framework of sustainable development. *Climate change response must be sensitive to issues of equity, gender, youth, children and other vulnerable groups.*
- The use of energy as a key driver for high economic growth is pursued within the context of sustainable development involving energy conservation, energy structure optimization and strengthened ecological preservation and construction.
- Mitigation and adaptation are integral components of the policy response and strategy to cope with climate change.
- Climate change policy is integrated with other interrelated policies towards promoting economic and environmental efficiency.
- Climate change is cross cutting and demands integration across the work programmes of several government Ministries/Agencies/Parastatals and stakeholders, and across sectors of industry, business and the community. *The process for both the formulation and implementation of climate change initiatives/activities will be guided by continuous multi-stakeholder consultations and dialogues nationally and internationally*
- Climate change response provides viable entrepreneurialship opportunities. *Strengthening private-public partnership for the development of clean energy technology-based commercial activities as well as climate adaptation and mitigation businesses.*
- Significant national financial resources are needed to implement climate change mitigation and adaptation initiatives for visible impact. *Mobilization of additional concessional and innovative finance to national/state/local budgets, including market-based financing mechanisms, from global, regional and national sources, is critical and will be appropriately targeted and facilitated.*

- Promoting research and development and adoption of “best practices” (including indigenous knowledge) as well as capacity building programmes on climate change issues.
- Adequate, coordinated and strategic institutional, policy and legislative response to climate change challenge.
- The principle of “common but differentiated responsibilities” of the UNFCCC continues to be the platform for Nigeria’s engagements in international negotiations on climate change and international cooperation.
- The precautionary principle, which demands that appropriate actions are taken where significant evidence of climate related risks exist, and places emphasis on dealing with the causes, rather than the impacts;
- The Principal Responsible Party pays, which appropriately allocates the costs of environmental damage and resource utilization, and the production and disposal of waste to the Principals, rather than to society at large.

2.3 Goal and Objectives

The strategic goal of Nigeria’s response to climate change is to foster low-carbon, high growth economic development path and build a climate resilient society through the attainment of the following objectives:

- i. Implement mitigation measures that will promote low carbon use for sustainable high economic growth;
- ii. Enhance national capacity to adapt to climate change;
- iii. Raise climate change related science, technology and R&D to a new level that will enable the country to better participate in international scientific and technological cooperation on climate change;
- iv. Increase public awareness and involve private sector participation in addressing the challenges of climate change;
- v. Strengthen national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional framework for climate change governance.

Efforts will be made to realize the objectives through the adoption of a series of institutional, legal, economic and technological instruments in order to (a) strengthen energy conservation, (b) optimize energy mix for rapid economic growth, (c) improve environmental integrity, (d) enhance adaptation capacity, (e) intensify research and development and improve research capacity, (f) increase climate change financing, (g) raise public awareness and (h) improve mechanisms for climate change administration. The purpose is to enable Nigeria to respond effectively to climate change by:

- Putting in place adequate mitigation and adaptation measures that will not only minimize national climate change risks and enhance the capacity of Nigerians to adapt to climate change, but also maximize opportunities and socio-economic and environmental benefits of following a low carbon development path

- Improving national understanding of the country’s vulnerability to climate change in various economic sectors through research;
- Promoting synergy between climate change response and national development priorities;
- Ensuring adequate funding for climate change initiatives from national and international sources;
- Maximizing Nigeria’s potential to benefit from climate change adaptation and/or mitigation by appropriate international negotiation positioning;
- Improving climate change governance in the country through a coordinated approach.

2.4 Vision

The vision of the National Climate Change Policy Response and Strategy (NCCPRS) is a climate change resilient Nigeria for rapid socio-economic development that is sustainable.

2.5 Mission

The mission of the NCCPRS is to strengthen national initiatives to adapt to and mitigate climate change in a participatory manner that involves engaging all sectors of the Nigerian society, including the poor and other vulnerable groups (women, youth etc.) within the overall context of advancing sustainable socio-economic development in Nigeria.

2.6 Policy Response Approaches

Nigeria’s policy response to climate change is driven by the need to urgently climate-proof the country’s economy and society as well as its physical environment. This will entail efforts to reduce vulnerabilities and strengthen adaptation to climate change in all sectors and at all levels, as well as develop and implement mitigation initiatives towards a low-carbon and high-growth development path. A number of key policy approaches will be used to provide an organizing framework for the development and implementation of sectoral strategies, measures and initiatives for effective response. These are as follows:

1. **Generating adequate energy from a mix of sources for rapid socio-economic development without significantly increasing the country’s GHG emissions:** By 2020, Nigeria plans to have a large, strong, diversified, sustainable and competitive economy that will be resilient, diversified and effectively guarantee a high standard of living and quality of life to its citizens. Towards this end, the overall target for the power sector is to grow installed power generation capacity from 6,000MW in 2009 to 20,000MW by 2015 and 35,000MW installed by 2020. This means that the country will undertake massive energy generation from various sources. The challenge is to balance the imperative of accelerating the transformation of economic growth pattern with an energy conservation and efficient utilization without increasing drastically GHG emissions in the country. In the NCCPRS, the balance will be achieved through the optimization of energy generation and consumption and raising the proportion of renewable (including small-large scale hydropower) and other clean sources to meet growing local demands, among others.

- 2. Continuously reducing greenhouse gas emissions in all sectors, particularly in the oil and gas and transportation sectors:** To control GHG emissions in the course of accelerating the economic transformation of National economic growth pattern, the promotion and adoption of low-emission energy path will constitute a major policy and strategic approach. This requires a conscious commitment to a transition towards a low carbon economy, with the concomitant shifts away from fossil fuel or coal generated energy towards renewable, as well as the introduction of energy efficiency measures in various sectors, including housing and transportation, within a regulatory and an ambitious framework for the country's low carbon growth strategy.
- 3. Enhancing food security, reducing poverty and promoting healthy living for all Nigerians:** Food security in Nigeria will be threatened by climate change. Climate change will alter rainfall, evaporation, run-off and soil moisture in an uncertain manner that will have effects on agriculture and national food security. This may in the long-term make the attainment of the MDGs in Nigeria difficult. Thus, the need for building resilience in the agriculture, livestock, and aquaculture sectors is compelling.
- 4. Integrating disaster risk management of climate-related hazards into development:** Climate change is a fact and a threat to human society. Envisaged increases in temperature, variations in rainfall, sea level rise and more intensive weather related extreme events, such as floods, droughts and heat waves are unavoidable. Reversal of GHG emission trends will still not exonerate the country from planning against future induced threats. Thus, in addition to the indispensable task of reducing global carbon emissions through mitigation and a gradual transition to a post-carbon society, equal efforts must be directed towards disaster risk management to reduce the country's vulnerabilities. Adaptive management and risk management are complements in creating and maintaining resilience. This makes the integration of disaster risk management of climate-related hazards into national development policies and programmes critical and an important policy response issue to climate change.
- 5. Enhancing private sector participation in the expanding business opportunities in climate change response:** Responding to climate change and achieving low carbon high growth and development encompass a very wide spectrum of activities and business opportunities. It will require significant public and private sector action and cooperation. Across this spectrum, the private sector would need to take on various roles that contribute to the NCCPRS goals and objectives. The private sector has an enormous role to play in this, undertaking the investment and technological innovation that will underpin low carbon growth, providing finance for mitigation and adaptation, adopting lower carbon production processes, and encouraging and facilitating more climate conscious purchasing decisions by consumers. The establishment of a clear policy framework will be important in creating an environment that is conducive to private sector engagement, particularly in the areas of energy sourcing and infrastructure development, will give business greater confidence to undertake the low carbon investments that are needed.

While ‘climate proofing’ of private sector investments is important, the role of the private sector is not limited to managing its own climate exposure. There are also emerging business opportunities in helping others to reduce their climate risks, including (i) generating new finance, to help fill the massive deficit in available funds for mitigation and adaptation, (ii) designing, manufacturing and distributing goods and services that can help reduce the vulnerability of individuals and communities to climate change; and (iii) providing risk management tools, including insurance. Thus, a regulatory framework will be established to ensure the active involvement of the private sector in the national response.

6. Planning for future climate change scenarios and building dynamic response strategies, including adequate research and infrastructure development:

Uncertainty about the rate of climate change and its consequences still remains and has important implications for public policy. Various studies have shown that the optimal mitigation and adaptation efforts may be greater than it would be if the median projection of climate change were known, with certainty, to be correct. As uncertainty is resolved over time, policies and strategies should be adjusted in the light of new information. Overall, the possibility of catastrophic damage from climate change cannot be ignored. This implies that the only sustainable policies and strategies are those that minimize the risk of catastrophic damage. One way of addressing such risks is through the precautionary principle, which implies that we should avoid courses of action with poorly understood possibilities of highly adverse outcomes. Only adequate research and responsive and flexible infrastructure development that will be elaborated in this document will assist the country to adequately address and response to future climate uncertainties.

That possibility suggests that the NCCPRS will be a flexible strategy that could be easily modified over time and that could include several elements such as (i) research to resolve uncertainties about potential damage and to develop technologies that might cut the cost of reducing emissions or be helpful in adapting to a warmer climate; (ii) economic incentives to encourage inexpensive reductions in emissions today, with the expectation that more-extensive reductions may be merited in the future; and (iii) policies that would facilitate adaptation, thus lowering the cost of any warming that did occur.

7. Building adequate capacity to manage climate change: Rapid and sustained actions to build capacity for planning and implementing measures is needed to effectively respond to the challenges of climate change. A major limitation in Nigeria’s response to climate change is the rather weak institutional policy and legal capacity to address the problems in a coordinated manner. While taking cognizance of existing institutions and policies/strategies and plan, significant effort will be made to build capacity to manage climate change challenges.

8. Strengthening inter-sector actions and mechanisms concerned with climate change: Climate change response requires an integrated and interdisciplinary approach involving different sectors. Sectoral approach has been the bane of sustainable implementation of

development policies, programmes and plans in Nigeria. The implementation of NCCPRS will focus on inter-sectoral and coordinated institutional arrangements for the sustainable impacts of interventions and actions.

- 9. Enhancing international cooperation in climate change response:** Nigeria will continue to be an active player in international negotiations and activities to respond effectively to climate change.

SECTION 3: SECTORAL CLIMATE CHANGE POLICY RESPONSE AND STRATEGIES

3.1 Sectoral Adaptation and Mitigation Interventions

Introduction

This chapter focuses on the policy and response strategies for dealing with the challenges of climate change. The emphasis is on the key vulnerable sectors in terms of mitigation and adaptation responses. Although these strategies and activities are couched on sectoral basis, their implementation would pay particular attention to inter-sectoral collaboration.

3.1.1 Energy

Meeting the energy needs of Nigeria for socio-economic development remains a front line issue in the country. Presently, the energy produced in the country is far less than is needed. This is severely constraining to the development aspirations of the country and will become even more challenging in the future as human populations increase and the pressure to achieve greater development grows. The challenge will be mainly in two respects: (i) producing adequate energy for the country and (ii) minimize GHG emissions in the process. These will require improved investment, regulatory control and use of low-cost but efficient technologies.

Policy Statement: Ensuring adequate energy for sustainable rapid socio-economic development without substantially increasing the sector's GHG emissions.

Strategies:

- i. Promoting diverse energy mix with increasing proportion from renewable and other sources using clean technologies;
- ii. Improving energy efficiency in the various sectors;
- iii. Strengthening private sector participation in the production and use of clean energy

Activities

- i. Review the implementation of existing national energy policies, plans and regulations to make them responsive to mitigating GHG emissions as well as increasing national adaptive capacity to climate change impacts in terms of:
 - Elimination of subsidies on fossil fuel.
 - Subsidizing the development of renewable and other clean energy sources.
 - Standardization of energy equipment, vehicles, power generation systems and consumption in homes, offices and industries towards achieving higher energy efficiencies.
 - Decreasing use of fuel (heavy) oil.

- Generating energy from renewable sources to account for a minimum of 20% by 2030.
 - Re-engineering thermoelectric plants with combined-cycle technology.
 - Strengthening fiscal and regulatory measures to actively encourage private power companies in the production of electricity (ensuring adequate connectivity of privately generated electricity to national grid) .
 - Promoting targeted research in low carbon technologies and renewable energies.
- ii. Support households to take actions necessary for efficient domestic energy utilization;
 - iii. Support the on-going effort to upgrade energy infrastructures including transmission lines, to improve efficiency in supply;
 - iv. Expand the national grid coverage to meet electric power demand particularly at the grassroots;
 - v. Support on going initiative to gradually eliminate gas flaring;
 - vi. Promote efficiency in the use of oil and gas.

3.1.2 Agriculture

Policy Statement: Ensure continued promotion of sustainable agriculture at all levels of production.

Strategies: Develop an integrated agricultural intervention plan to reduce the sector’s vulnerability to climate change and enhance its productivity for food security and poverty reduction.

3.1.2.1 Crop Production

Sustainability in crop production is a major issue in Nigeria. Low yield, loss of agricultural land and poor management regimes are some of the critical challenges in the sector. Nigeria continues to depend on import to meet its food need. For instance, more than two-fifths of rice consumed in the country is imported. The need to significantly increase import (which may not be there) will be compelling in the years ahead except Nigeria is able make a turn around in its food crop production:

Policy

Continue to pursue programmes and plans to attain self-sufficiency and sustainability in crop production

Strategies

Reviewing and implementing extant policies and plans for accelerated crop production including expansion of food reserves.

Strategies/Activities

The following are some of the critical activities that need to inform the country's response:

- i. Review the implementation of existing agricultural policies, laws and regulations to make them adaptable to addressing the challenges of climate change in crop production in terms of;
 - Employing existing relevant as well as new and/or revised regulatory measures to designate and preserve agricultural lands from encroachment in all parts of the country.
 - Rapidly improving farm management practices including e.g. crop and pasture rotations, adjustment of planting dates suitably to 'new' climate regimes, managing crop residue, using organic matter in soils, appropriate utilization of organic pesticides and fertilizers, precision farming etc.;
 - Addressing land degradation through proven techniques, appropriate technologies and regulatory measures;
 - Promoting sustainable irrigation agriculture and adapting existing systems to use and re-use of water more efficiently.
 - Expand accessibility of farmers to irrigation water to enhance all year round farming and reduce reliance on rain-fed agriculture;
 - Adopt scientific and technological innovations to minimize climate risks, including (a) development and use of drought-tolerant, and pests and diseases resistant crop varieties; (b) promotion of conservation agriculture for sustainable livelihoods
 - Expanding water harvesting practices and drainage systems across the country;
- ii. Review and strengthen climate information systems to provide early warning in a manner useful to the local farmers.
- iii. Strengthen on-going initiatives to diversify into value adding agricultural activities;
- iv. Support existing regulatory frameworks for innovative agricultural financing, insurance, etc.
- v. Encourage the use of fiscal measures to improve returns and reduce investment risks in food cropping;
- vi. Strengthen the capabilities of Extension Services providers in training farmers in best practices including the use of weather and climate data;
- vii. Enlarge the national food storage capacity to store surplus harvests.

3.1.2.2 Fishery

The fishery sector is vulnerable in two main respects. First, whilst the sector offers a cheap source of animal protein to many Nigerians, it is as yet unable to meet the fish need of the country. Presently the sector produces only a third of what the country needs. The fraction could become lower in the future with a projected bigger population. Secondly, declining water

availability due to climate change could impact severely on fish production particularly at the artisanal level.

Policy Statement: Continue to promote sustainable fish production and fishery resources management under uncertain climatic conditions

Strategies/activities

- i. Reviewing and strengthening the implementation processes of the existing policies on fishery to make them respond to the challenges of uncertain climatic conditions which would affect water availability in terms of:
 - Continuing to effectively protect wetlands, water bodies, rivers and streams from further pollution, encroachment by settlements and farming as well as controlling their infestation by aquatic weeds through the use of regulatory measures;
 - Enhancing the adoption of innovative technologies for water re-use, efficient storage for culled fish, as well as improving the access of small-scale fish farmers especially in peri-urban areas to critical inputs;
 - Strengthening existing efforts to assure accessibility of fish farmers to hardier, high yielding and early maturing species and varieties of fish;
- ii. Strengthening the existing initiative to provide access of fisher-folks to productive assets including micro-credits to enable them adopt sustainable fishery management practices and adapt to varying climatic conditions;
- iii. Monitor large scale fishing activities in international waters to ensure compliance to international and national regulations;
- iv. Strengthen research and development in aquaculture.

3.1.2.3 Livestock

About 80-90% of all livestock in Nigeria is located in the semi-arid and arid regions of the country. By virtue of the dominance of these regions of the country (which may get drier as the climate changes) in livestock production, the sector is highly vulnerable to climate change. In particular, climate change is likely to lead to increase in the incidence of livestock pests and diseases, such as trypanosomiasis. It may also lead to reduced grassland productivity, which may create pasture scarcity that can generate more conflicts and even migration. Even with these challenges, demand would climb up appreciably putting pressure on the production processes.

Policy Statement; Promote, using existing framework of policy and regulations, sustainable livestock production taking cognizance of declining availability of grazing land and fodder as well as variable climatic conditions.

Strategies/activities:

- i. Incentivize integration of livestock into farming systems; and promote semi- intensive livestock keeping;

- ii. Promote the breeding of animals from various ecological zones that are adaptable to the ‘new’ climate regime;
- iii. Encourage de-stocking to reduce pressure on grazing lands;
- iv. Initiate or support rangeland enrichment with fast growing herbs/shrubs;
- v. Designate more areas as grazing reserves based on a balanced analysis of land use demand for other purposes;
- vi. Make information from Early Warning Systems on droughts, floods and diseases outbreaks accessible to livestock herdsman and women;
- vii. Disseminate through Extension Services best practices for livestock management under uncertain conditions;
- viii. Strengthen efforts to continue to build mutual trust and understanding between farmers and herdsman to foster desirable interaction between the two;
- ix. Develop and implement special livestock insurance schemes for livestock farming;
- X. **Improve and stabilise rural income in livestock production and processing;**
- xi. Continue to promote the establishment of fodder banks and conserved feeds (hay, silage, etc)
- xii. Continue to pursue the development of a conducive atmosphere for the emergence of strong leadership among the pastoralist groups.

3.1.3 Water

The water sector is overwhelmingly significant because of its decisive relevance in virtually every other sector. As the quantum of rainfall declines and its regimes turn out to be complicated, water supply would become a serious challenge in the years ahead. This would be more so as the projected significant population increases in the country would shove up demand for water for all purposes. Nigeria must therefore pursue plans and programmes that would make water more available even as sources shrink

Policy Statement:

Continue to pursue the development and implementation of water supply plans that will ensure sufficient water for various purposes under a changing climate regime with reduced rainfall;

Strategies/Activities

- i. Continue to use regulatory and fiscal measures to manage the supply of water including watershed re-charge;
- ii. Review existing institutional, legal and regulatory frameworks for water supply and wastewater discharge within river basins;
- iii. Invest in programmes to upgrade canals and storage infrastructure to increase capacity and to reduce losses in transport and storage;
- iv. Develop more small-scale earth dams, optimally located for expanded storage of raw water;
- v. Continue rigorously, the on-going effort to promoting the adoption of water conservation and harvesting practices in every sector and at all levels;
- vi. Exploit alternative water supplies such as use of seawater and brackish water through desalination, inter and intra basin water transfer;
- vii. Invest in and regulate wastewater treatment facilities to improve effluent quality;
- viii. Scale-up international cooperation on River Basin Management by coordinating different interest groups among upstream and downstream users; Delimit and protect watersheds to promote stream life and recharge aquifers;
- ix. Continue the programme of de-silting riverbeds and dams to improve their carrying capacities and water storage respectively;
- x. Continue the advancement of hydrometric network to monitor river flows and flood warning telemetric systems;

3.1.4. Coastal Areas

The coastal areas are strategic in Nigeria. They house the bulk of country's critical economic infrastructures and some of the largest human populations are found in them. They thus provide significant vulnerability concern for climate change response.

Policy Statement: Develop and implement an Integrated Coastal Zone Management plan using the community-based approach to achieve the following strategies:

Strategies/Activities

- i. Actively support the actualization of the Integrated Coastal Zone Management (ICZM) Plan of Gulf of Guinea and domesticate it for Nigeria in terms of an Integrated Coastal Area Management Plan;
- ii. Develop storm and flood protection as well as preparedness plans for climate-related emergencies in the coastal areas ;
- iii. Adjust physical development plans in line with the actual and potential implications of Sea Level Rise;
- iv. Determine the cost of implementing pilot re-settlement projects, and relocation of houses as well as other socio-economic infrastructures out of high-risk areas;
- v. Review and upgrade sea dykes, storm breakers, sea walls;
- vi. Initiate new and or reinforce existing studies on the function of coastal ecological system, and the impact of the climate change and their adapting capacity;
- vii. Improve mangrove cover for the management of flood control;
- viii. Rehabilitate degraded areas in the coastal zone

3.1.5. Forestry and Land Use

Forestry and landuse have major roles to play in mitigation and adaptation in terms of reducing atmospheric concentrations of GHGs. Unfortunately land is being lost due to population pressure and careless use, and the nation's forests have almost disappeared completely.

Policy Statement: Promote sustainable forestry and landuse that are able to respond to the challenges of climate change

Strategies/Activities:

Develop and implement a Forestry Development Plan in the context of an integrated Land Use Planning Programme for sustainability, including the promotion of the functional integrity of ecosystems and their environmental goods and services as well as carbon capture. Activities would include:

- i. Increasing forest covers through afforestation, reforestation and prevention of deforestation;
- ii. Ensuring the enforcement of existing and future forestry regulatory laws;

- iii. Enhancement of carbon density at plot and landscape level through rehabilitation of degraded areas and increased tree planting activities, and promotion of agro-forestry;
- iv. Encouraging sustainable forest management for integrated vulnerability reduction;
- v. Adopting fiscal and regulatory measures to reduction wood utilization particularly in constructions and charcoal production;
- vi. Improving governance in forestry resource;
- vii. Ensure the sustainable use of forest resources to contribute to the livelihoods of the rural communities as they adapt to climate change;
- viii. Promote sustainable forestry that will enable Nigeria to benefit maximally from the potentials of **REDD** and at the same time adequately protects individual communities whose traditional forest based income would be impacted through:
 - Use of fiscal and regulatory tools to achieve greater protection of forests in the various parts of the country; Initiating a change in current human activities towards reforestation of land to increase the terrestrial carbon sink;
 - Maintaining a dynamic international relationship that helps to promote REDD activities;
 - Forestry programmes should be sensitive to the needs of the local communities and particularly to their land rights. Ensure ‘voice and choice’ in REDD design and implementation for local communities;
 - Collecting and integrate information & fill data gaps for national REDD opportunities & scoping;
 - Engaging effectively those who depend on forests or deforestation and forest degradation;
 - Protecting existing forests and encourage the use of non-forested land for agriculture;
 - Promoting low-impact logging and sustainable forest management
- ix. Promote of community participation in forest development.
- x. Strengthening the capacity of NGOs in support of environmental education on the rational use of forest resources

3.1.6 Transport

The transport sector is a major source of GHG emission. It is recognized in climate response as requiring significant attention. This is because it thrives mainly on fossil fuel and emits enormous amount of GHGs. Unfortunately, the sector is under-developed in the country. It is dominated by poorly regulated private sector operators

Policy: Continue to pursue the on going reform towards the evolution of an efficient transportation system that minimizes GHG emissions and makes public transport services available and affordable.

Strategies/Activities

Put in place an implementable transport development plan that will:

- i. Promote the use of efficient means of transport on all transport modes by limiting new acquisitions to those with low emission ratings including electric vehicles;
- ii. Promote multiple modes in public transport to include water and rail as well as the use of non-motorized transport systems;
- iii. Enhance Mass transport systems in major cities using, for example, the Bus Rapid Transport (BRT) concept as adopted in Lagos State;
- iv. Expand transport infrastructures to open up more routes including rail and decongest road arteries in large cities and along major highways;
- v. Use urban and regional planning approach to optimize location of facilities so as to reduce travel time/cost;
- vi. Provide fiscal and regulatory incentives to make air transport safer and more accessible;
- vii. Re-invest in and revive other transport modes particularly railway to reduce GHG emissions in the sector..

3.1.7 Health

Climate change is expected to create new health challenges. These will be in the form of increased severity of known illnesses and diseases as well as appearances of new ones. This will exacerbate the extant poor status of human health in Nigeria. To effectively adapt, cope with and mitigate climate change, sound health is critical. The country must therefore significantly improve human health in every respect to build resilience thereby enhance the capacity to deal with the various challenges coming with climate change.

Policy Statement: Strengthen the health promotion capacity of the national health system to fulfill the National Health Policy objective of improving the health status of Nigerians and the achievement of the health-related Millennium Development Goals in the face of increasing climate change.

Strategies/Activities

- i. Promote community resilience in the area of environmental health to reduce vulnerability to climate change through:
 - Promotion of built environments that mitigate climate change and/or reduce impact of climate change on health (e.g. smart growth, open space and parks to reduce urban heat islands; buildings designed to weather wildfire; trees, cool roofs/green roofs, cool pavement and reduce flood risk);
 - Development of permeable surfaces, modernize sewage systems;
 - Reduction in baseline exposures to toxic air and water pollutants;
 - Promotion of sustainable local food systems;
 - Promotion strong social support networks
 - Enhanced public health infrastructure
- ii. Educate, empower, and engage citizens to take action to take actions to reduce individual and community vulnerability to climate changes through both mitigation and adaptation;

- iii. Identify and promote mitigation/adaptation with public health co-benefits, including (a) Health Impact Assessments on proposed mitigation and adaptation strategies to determine impacts on vulnerable populations and cumulative health impacts; and (b) Health and public health participation in policy discussions.
- iv. Establish, improve and maintain robust rapid surveillance systems for climate-related illness, vulnerabilities, protective factors and adaptive capacity, including but not limited to (a) environmental conditions (e.g. heat, air pollution, vectors, water contamination etc.); (b) climate-related illness; (c) vulnerabilities and protective factors (e.g. chronic diseases, social support networks) and (d) adaptive capacities (e.g. access to cooling centres);
- v. Develop and implement community education plans to raise the knowledge, awareness on environmental hygiene and health under the impact of the climate change;
- vi. Review and implement existing policies in urban development to adapt them to changing climate conditions;
- vii. Develop and implement an orderly development plan for urban and development

3.1.8 Culture and Tourism

Culture and tourism as an activity impacts negatively on the physical environment which accentuate the phenomenon of climate change. High patronage of tourist centres alone can cause marked degradation of the environment unless serious control measures are in place.

Policy Statement: Develop and implement culture and tourism programmes that are responsive to the challenges of climate change.

Strategies/Activities

Promote synergies between tourism/culture sector and other sectors. Main interventions include:

- i. Using awareness creation to build knowledge of the impact of culture and tourism and simple procedures to adopt for adaptation;
- ii. Accessing, analysing and using basic weather information to inform tourism;
- iii. Building capacities for sourcing, interpreting and applying weather and weather-related information as well as for monitoring effectiveness of climate change response in the sector;
- iv. Investing in energy-efficient and renewable energy technologies in tourism;
- v. Making the sitting and construction of tourist-specific buildings adaptable to extreme weather events;.
- vi. Developing and implementing an environmental ‘Code of Ethics’;
- vii. Entrenching carbon emissions mitigation criteria into existing initiatives of the culture and tourism sector and as well include carbon emissions mitigation related to culture and tourism developments in the National Development Plans;
- viii. Enhancing vegetal cover in tourist sites through afforestation and ecosystem enrichment;
- ix. Designing and implementing efficient and effective disaster management plan for tourist sites.

3.1.9 Population

The greatest challenge that Nigeria has is related to the sheer size of her population and the rapidity with which it is growing. This has enormous implications for resources utilization in the country as its resource base decreases, Increasing population featuring a sizable proportion of limitedly skilled persons will constrained socio-economic growth and make it impossible for the country to address the climate change challenge.

Policy Statement

Continue to pursue strategies and plan to evolve a population structure and quality for sustainable development.

Strategy;

Reviewing and continuing the implementation of the national population policy for sustainable development.

Activities

- i. Strengthen existing structures for the implementation of the National Population Policy;
- ii. Expand family life education to reach the out of school adolescents
- iii. Increase awareness creation of the growing population challenges in the country;
- iv. Implement an aggressive climate education in both the formal and informal sectors
- v. Develop measurable indicators for the assessment of the performances the population action and establish an efficient monitoring plan.

3.1.10 Human Settlement

Virtually all settlements - rural and urban in the country are experiencing substantial lateral growth partly due to rapid population growth but also as a result of weak urban development control. Human activities in the town and cities are sources of large GHG emission and the deep poverty in many quarters limits the ability to cope with climate change. The phenomenal expansion of settlements into rural areas claims progressively larger areas from vegetation cover thereby increasing GHG emission and limiting the ability of the natural areas to play its moderating roles. Climate change response activities must address these issues.

Policy Statement:

Develop to achieve sustainability in settlement development to adapt settlement functioning to mitigate and adapt to climate change.

Strategy

Continue to implement existing urban and regional policies and plans to adapt settlement function to climate change. The activities should include

- i. Use regulatory rules to pursue the setting of Green Belt for all cities and towns to curb further spread of settlements into the adjoining rural areas;
- ii. Reduce exposure of vulnerable places by hard and soft engineering

- iii. Reduce vulnerability of building materials
- iv. Avoid ‘at risk’ locations
 - v. Provide enhanced cooling without loss of efficiency
- vi. Target vulnerable elements at risk for adaptation
- vii. Reduce exposure and provide cooling through green and blue infrastructure
- viii. Promote greater resilience of buildings and infrastructure
 - ix. Promote storage and recycling of water
 - x. Enhance the use of renewable sources for heating and cooling
 - xi. Use trees as additional carbon sinks
- xii. Promote decentralized energy infrastructure
- xiii. Develop and implement efficient city transport system

3.1.11 ICT

Progress in ICT is positively affecting development in many areas. It is providing new directions in how things are done and is giving more cost-effective results. Its major advantages are accuracy and speed. Nigeria needs to exploit all of these to strengthen its ability to adapt, cope with and mitigate climate change.

Policy Statement

Continue to develop and deploy ICT capabilities in the country to make Nigeria more able to cope with, adapt to and mitigate climate change.

Strategy

Continue the implementation of ICT policies and plan in the country for sustainable develop to include specific attention to climate change. This should include the following:

- i. Specifically target and ensure the reduction of GHG emissions through extensive use of ICT in socio-economic development process.
- ii. Promote “Smart” technologies to maximise energy use in ICT;
- iii. Use ICT outlets to promote climate change education;
- iv. Employ regulatory tools to prevent the importation of ICT junks and develop and implement an environmentally safe plan for disposal and recycling of discarded hardware and components used in ICTs.
- v. Develop and implement an efficient utilization and interference safeguards for spectrum-related requirements for telecommunication services

SECTION 4. CLIMATE CHANGE STRATEGIC ACTION PLAN

4.1 Elements of the Action Plan

Within the strategic response framework of fostering low-carbon, high growth economic development path and building a climate resilient society to enable Nigeria to meet the challenge of climate change, the following 10-year Action Plan (2011-2020) is proposed. In line with the response approaches enumerated in section 2.6, the programme will be built on the following seven interrelated pillars that will also address the needs of the poor and vulnerable, including women and children:

Pillar 1: Mitigation and low carbon high growth development

Although Nigeria's present contribution to the generation of greenhouse gases is low, the country's determination to propel its economy to be one the twenty economies of the world by the year 2020 indicates that the country's energy consumption will increase drastically in the next few years. This requires that the country would need to play a critical role, within the global demand, to pursue a low carbon development path that will not only reduce emissions now and in the future but also support sustainable high growth development. To do this effectively, Nigeria will:

- Develop a strategic energy plan and investment portfolio for the generation of adequate energy from a mix of sources to ensure national energy security without significantly increasing the country's GHG emissions;
- Increase the renewable proportion of the national energy portfolio;
- Partner with developed countries and the private sector for the transfer and adoption of state-of the art technologies for a low-carbon growth path (e.g., 'clean coal' and other technologies);
- Expand the social forestry programme on government and community lands throughout the country;
- Expand the greenwall initiative for the afforestation of desertification-prone areas of the country;
- Review energy and technology policies and incentives to promote efficient production, consumption, distribution and use of energy.

Pillar 2: Food security, poverty reduction, protection of the vulnerables and health

Climate change is likely to impact most severely on the poorest and most vulnerable in society and will have significant impact on the country's food security and the poor's access to basic services, including health and housing. To protect the poor and improve their access to basic needs in the face of increasing climate change, we will under this pillar:

- Research and develop climate change resilient cropping systems and crop varieties (including indigenous and other varieties suited to the needs of resource poor farmers), which are tolerant of flooding, drought and other environmental hazards, as well as fisheries and livestock systems that will ensure national food security;

- Increase the resilience of vulnerable groups, including women and children, through development of community-level adaptation, livelihood diversification, better access to basic services and social protection, such as safety nets and insurance;
- Establish and/or strengthen functional surveillance systems for existing and new disease risks and ensure health systems are geared up to meet future demands, as dictated by changing climate change scenarios and empower local health professionals in low adaptive capacity areas;
- Promote the implementation of improved water resources management and sanitation programmes in areas extremely vulnerable to climate change, such as the coastal areas and flood-and drought-prone areas of the country.

Pillar 3: Integrated and comprehensive disaster risk management

Disaster risk reduction will be an integrated aspect of the country's response to climate change. In this regard, the current disaster management system will be further strengthened to deal with the increasingly frequent climate change-induced extreme weather events. Thus in the process of mainstreaming disaster risk reduction into the national response to climate change, we will:

- Put in place appropriate policies, laws and regulations to facilitate an integrated and comprehensive approach to disaster management;
- Strengthen the government's capacity and that of civil society partners and communities to manage natural disasters;
- Strengthen community-based adaptation programmes and establish them in each of the disaster prone parts of the country
- Put in place and/or strengthen early warning systems to enable more accurate short, medium and long-term forecasts of natural hazards.

Pillar 4: Infrastructure

Changes in climate will stress existing infrastructure, exacerbating current weaknesses and forcing major programmes of renewal and replacement. New infrastructure will be required for present and future generations expecting higher standards of living, while existing and planned infrastructure may need to be reinforced and adapted to cope with higher temperatures, greater and more frequent extreme events, sea-level rise, and changing rainfall regimes. Also, investment in smart infrastructure and human capacities will be required to mitigate emissions from, for example, energy, transport, agriculture, and forestry sectors. Thus, under this pillar, Nigeria will:

- Repair and rehabilitate existing infrastructure (e.g., coastal embankments, river embankments, river erosion control works, flood shelters and drainage systems, urban drainage systems) and ensure effective operation and maintenance systems;
- Undertake strategic planning of future infrastructure needs, taking into account the likely future patterns of urbanisation and socio-economic development, as well as the anticipated climate change-induced changing hydrological regimes of the country;
- Invest in the planning, designing and construction of urgently needed new infrastructure in various sectors to meet the changing conditions expected with climate change.

Pillar 5: Research and development

Research and development will continue to play in enhancing our understanding of the divers of climate change and the options we have to reduce its impacts. Research will be required to estimate the likely scale and timing of climate change impacts on different sectors of the economy, to inform planning of future investment strategies. Appropriate dissemination of findings will be made to ensure that the general public is aware of the latest research, lessons and technologies available in other parts of the world. Under this pillar we will:

- Model climate change scenarios for Nigeria by applying global climate change models and methodologies at regional and national levels to include current and future emission scenarios;
- Model the likely impacts of climate change on agriculture, land and water resources, ecosystems and biodiversity, energy production and use, transport, etc.;
- Undertake vulnerability assessment of climate change impacts and adaptation opportunities in the country;
- Research on the economic costs of climate change mitigation and adaptation options in Nigeria, including its likely impacts on the macro-economy and key sectors (e.g., livelihoods and food security), and use results to develop a climate-resilient national development plan;
- Research the linkages between climate change and (a) poverty, (b) health, (c) security etc., and vulnerability in order to identify possible interventions to increase the resilience of poor and vulnerable households to climate change;
- Research and develop appropriate technologies, including technological transfer, for climate change mitigation and adaptation;
- Strengthen the capacity of the Centre for Climate Change and Freshwater Resources and other relevant institutions and networks for climate change knowledge management to ensure that Nigeria has access to real-time global information and technologies on climate change and ensure that data is widely and freely available to researchers.

Pillar 6: Capacity building and institutional strengthening

To meet the challenge of climate change, appropriate climate governance structure will be put in place, including strengthening the capacity of government ministries and agencies, civil society and the private sector. Under this pillar, Nigeria will:

- Review all government policies (sector by sector) to ensure that they take full account of climate change and its impacts;
- Mainstream climate change in national, state local and sectoral development planning to ensure that impacts on vulnerable groups and women are prioritised in development plans;
- Build the capacity of the Special Climate Change Unit and other relevant key government ministries and agencies (e.g., Ministries of Agriculture, Water Resources, Land, Housing and Urban Development, Health, Women Affairs, Science and Technology, NEMA, Agricultural Research Institutes etc) to take forward climate change adaptation;

- Build the capacity of the government to undertake international and regional negotiations on climate change. Regional and international cooperation is essential in order to build necessary capacity and resilience;

Pillar 7: Sustainable and coordinated climate change financing

Climate change is a serious threat to poverty eradication and sustainable development in Nigeria. To respond effectively to climate change mitigation and adaptation challenges, Nigeria will require a lot of resources beyond what governments at all levels can provide. The landscape for funding climate change activities in Nigeria is expected to rapidly change, with significant increases likely to emerge from a variety of sources, including national and state budgets, private sector operators, global funds and development partners. A challenge will be how best to manage this diverse funding for climate change to achieve climate-related development objectives most efficiently, effectively and sustainably. Under the pillar of sustainable and coordinated financing for climate change, Nigeria will:

- Develop sustainable financing mechanisms, including the establishment of a Climate Change Trust Fund;
- Develop operational guidelines for the climate change sustainable financing mechanism;
- Establish a dedicated secretariat to provide advice and support to Ministries of Environment and Finance in the management of the funds for climate change;
- Build the capacity of the government, civil society and the private sector on carbon financing to access various global climate funds.

Details of the programmes and activities to be implemented under the strategic action plan are given in Annex 1.

4.2 Implementing the Strategic Action Plan

To bring the Policy to bear on the issues of climate change, the following elements of implementation are crucial. These include reaching out to the masses (communication and awareness creation), capacity building, governance issues, funding and appropriately targeting gender and vulnerable groups among others.

4.2.1 Communication and Awareness Creation

Nigerians are poorly aware of the impacts of climate change on their socio-economic activities. Thus, the changing climatic patterns and their increasingly grievous consequences are little appreciated. Moreover, there is no established climate change or environmental protocol or information system for Government Executives, parents, teachers and the youth, to enable them access environmental information. The current provisions in national educational curricular, as well as R&D programmes are inadequate in providing environmental and climate change awareness. In addition, there is the challenge weak environmental legislation and enforcement to coordinate environmental planning and action.

The strategy of NCCPRS is to strengthen the communication and education to raise the awareness and responsibilities of the climate change for the citizenry to enhance their participation in the implementation of climate change response activities at all levels, including the communities. Awareness raising plan and strategy would be developed and implemented at all levels and in all sectors sensitive and vulnerable to climate change to ensure that at least 50% of the population and all policy-makers have basic knowledge about climate change and its impacts by 2020. The process for the Communication, propaganda, and education to raise the awareness for all levels, organizations, sectors, and individual will be expedited through the popularisation of common knowledge of climate change to the mass and provision of in-depth information to policy and decision-makers.

Main activities will include:

- Develop a strategy and education plan to raise the awareness and communication about climate change;
- Develop overall plan to raise awareness on climate change to screen and selected target groups (including management officials at all levels);
- Develop the proposal to establish a network of communicator and complete the mechanism to maintain regular activities of this network to commune level;
- Develop overall plan to integrate the contents of climate change in educational curriculum of popular school and university level;
- Develop programs for training courses to specific target people, training and technology transfer: compose communication, education and training documents and materials; use communication tools: books, newspaper, gazette, radio, movies to disseminate the activities within the climate change context;
- Develop behaviour/habit in sustainable development at individual and community level (save electric, water; classify and recycle waste, etc);
- Encourage the participation of the enterprises and community in the activities within the context of climate change.

4.2.2 Capacity Building or Strengthening areas of Research, Technology Development and Transfer etc

Rapid and sustained action to build capacity for planning and implementing appropriate response to climate change and other forms of global environmental change are needed. Unless appropriate capacity is in place to address climate change holistically, it has the potential of delaying or impeding the attainment of the Millennium Development Goals and other development goals in the country, with potentially serious implications for food security, ecosystem vitality, economic development, and human health.

Capacity in mitigation, adaptation, technology development, research and development in relation to climate change initiatives and actions and at the levels of the public, private and civil society to address the complex issues of climate change have to be strengthened to create the necessary institutional set up for an effective national response to the phenomenon. Emphasis should be on an integrated and interdisciplinary approach involving different professionals, organizations and institutions and their relations with climatic alterations at all levels, including

the local communities.

An assessment of how climate change elements will affect phenomena such as floods, drought, water shortages (supply and quality), air quality, human health, and habitat loss is needed. Development of climate change scenarios and corresponding policy responses on how these changes could affect human population, infrastructure, the environment, the economy and society as a whole would be critical.

In addition to vulnerability assessments, periodic monitoring and assessment of the status of key natural eco-systems will be required to design appropriate response measures that can check against their degradation and preserve them for the sake of current and future generations. Periodic determination of levels of GHG emissions will also have to be undertaken in order to identify 'high-emissions' sectors and areas where significant GHG reductions can be realised. Such GHG emissions data could also feed into the National Communications as required under the UNFCCC.

A targeted capacity-building framework is important in the areas of science, policy, adaptation, mitigation, technology generation, carbon finance and markets to strengthen the human resource capital base for these subjects. These include, among others:

- Strengthen the capacity of the Special Climate Change Unit and/or Climate Change Agency/Commission, as well as other relevant line ministries and agencies to effectively carry out their functions regarding climate change response, including having: (a) capacity to use of geophysical and socio-economic data for the calculation of GHG emissions for use in setting up a GHG reduction policy and tools; (b) capacity to facilitate and/or undertake vulnerability and adaptation assessment on a regular basis; and (c) capacity as the Designated National Authority (DNA) for the development and implementation of CDM Projects.
- Strengthen the capacity of the Nigerian Meteorological Agency (NIMET) to undertake climate change predictions and scenario analysis at regional/local levels
- Establish Climate Change desk offices in all Local and State Governments
- Develop procedures for CDM project, and generate at least 500 CDM Projects by 2030.
- Develop and/or strengthen planning and capacity development initiatives of NEMA at other relevant institutions in charge of **Disaster Risk Reduction (DRR)** to reduce risk, prepare and recover from disasters to enhance national capacity to cope with climate disasters,
- Build the capacity of local communities to enable them adapt to the adverse impacts of climate change;
- Promote and support science-technological research, awareness raising to serve the implementation and management of NCCRPS;

4.2.3 Climate Change Governance and Institutional Framework

Climate change governance can be taken as the sum of organizations, policy instruments, financing mechanisms, rules, procedures and norms that regulate the processes of environmental

protection. It is about how decisions are being made, who is responsible, how they carry out their mandate, and how they are accountable.

Towards improving the climate change governance of Nigeria and ensuring an effective implementation of the policy and strategic action plan a strengthened institutional framework will be put in place. In addition to strengthening the capacity of the present Special Climate Change Unit of the Federal Ministry of Environment, including the feasibility of establishing a Climate Change Commission, the following target activities will be pursued to improve the climate change governance in the country:

- Development, amendment and perfection of the legal normative documents and system concerning climate change response and other related policies to ensure that an appropriate legislation is in place for the implementation of the activities of NCCRPS;
- Mainstreaming of climate change issues into strategies, plans and planning for socio-economic and sectors development;
- Putting in place a functional climate change governance structure and mechanism to encourage coordination of NCCRPS implementation at national state and local as well as community levels.

The governance structure will be anchored on the provisions of the new climate change laws to be enacted, and will comprise:

- a. strengthening the capacity of the Inter-Ministerial Committee on Climate Change to continue to perform its current advisory role more functionally and effectively;
- b. establishing and supporting the functionality of a National Climate Change Technical Committee to gather and collate input and advice from key climate change stakeholders for its use in the coordination of Nigeria’s climate change response activities; and
- c. Establishing a National Climate Change Coordination Unit in the Presidency to provide high-level political support to climate change response activities in the country.

An organizational structure for Climate Change Management will be presented in chart form as soon as the national decision is made on the structure of the management structure that will implement the policy and response strategy.

FIG. 1
NIGERIA’S CLIMATE CHANGE POLICY AND RESPONSE STRATEGY IMPLEMENTATION MANAGEMENT STRUCTURE CHART OR ORGANIGRAM

4.2.4 Financing NCCPRS Activities

To respond effectively to climate change mitigation and adaptation challenges, Nigeria will require a lot of resources beyond what governments at all levels can provide. Thus adequate financing of the NCCRPS will require putting in place a financing mechanism, which goal will

be to support the efforts of the Government to reduce emissions, move towards a low-carbon high growth economy and adapt to the impact of climate change. Fortunately, the country has recognized that its national resources are not enough to respond effectively to the impact of climate change. To this end, the Federal Government is putting in place a *Nationally Strategic Climate Change Trust Fund* (NSCCTF). The Fund's niche will consist of partnership building, fungible programme components, extensive stakeholder participation, cognate technical expertise and broad range of contribution from traditional and non-traditional sources, particularly the private sector.

The Fund will be designed with a view to tackling climate change impacts to reduce the vulnerability and increase the resilience of the people, as well as improving the overall well-being of people living in the very vulnerable areas of the country. Its overall objective will be to implement short to long-term climate change related actions and activities and measures that will not only increase the resilience of national development sectors to the impacts of climate change, but also enable the country to chart the course of sustainable low carbon economic development. Projects would mostly focus on long-term planned response strategies, policies, and measures, rather than short-term (reactive) activities. The NSCCF would serve as a catalyst to leverage additional resources from the private sector, bilateral and other multilateral sources for:

- Implementation of international climate change deals and protocols
- Promoting overall economic development of Nigeria in a sustainable manner that reduces the country's vulnerability and enhances its resilience to climate change

The scope of NSCCTF is yet to be fully elaborated, but it will be broad enough to cover many activities related to climate change and sustainable development in Nigeria. These activities will include, but may not be limited to the following undertakings:

- Projects that will enhance the adaptation capacity of Nigeria to cope effectively with the impacts of climate change
- Schemes designed to strengthen agricultural production systems (crop and livestock) to integrate biodiversity concerns and make them more resistance to climate change-induced weather extremes such as drought.
- Schemes for the promotion of energy efficiency in various sectors such as buildings, transport, etc.
- Initiatives to strengthen national capacity to undertake consistent research, analyse and monitor climate change impacts.
- Projects that will increase the level of awareness of climate change among Nigerians at all levels of governance.
- Other partners' support that will facilitate improved access of technology transfer to support economic diversification and transition from fossil dependent economy to green economy.

4.2.5 International Cooperation

As a party to the UNFCCC and the Kyoto Protocol, Nigeria is a major player in the international arena of climate change. It will continue to demonstrate its relevance through international

cooperation by evolving a system for tracking international trends and effective participations in negotiations. Nigeria will maintain an appropriate attendance at regional (Africa) and international climate change negotiation and related meetings, including playing a lead technical role in finalising African and G77+ China positions on critical climate change issues. It will also continue to promote south-south cooperation in the area in climate change scientific-technological transfer. The focus and objective is to optimize Nigeria's potential to benefit from climate change adaptation and mitigation by appropriate international response and agreements.

4.2.6 Legal Framework

The enactment of this policy and response strategy will provide the basis for the institutional framework for climate change management in Nigeria. A legal framework will be established through an Act of Parliament with provisions for:

- The establishment of the National Climate Change Agency/Commission and all other Climate Change Management structures and committees.
- The powers and functions of the Commission/Agency.
- The consistent implementation of the plan to make the Nigerian economy carbon efficient and the society climate-resilient.

BIBLIOGRAPHY

Adejuwon J. O., Adesina F.A., Ekanade O., Ogunkoya O.O., Akinyemi F.O., Odekunle et. al. (2006), "Food Security, Climate Variability and Climate Change in Sub Saharan West Africa". A Final Report Submitted to Assessments of Impacts and Adaptations to Climate Change (AIACC), Project No. AF 23. Published by The International START Secretariat 2000 Florida Avenue, NW Washington, DC 20009 USA www.start.org

Adesina, F.A. and Odekunle, T.O. (2011), Climate Change and Adaptation in Nigeria: Some background to Nigeria's response 1, *2011 International Conference on Environmental and Agriculture Engineering IPCBEE vol.15(2011)* © (2011) IACSIT Press, Singapore

Adesina, F.A. and Odekunle, T.O. (2011), Climate Change and Adaptation in Nigeria: Some background to Nigeria's response II, *2011 International Conference on Environmental and Agriculture Engineering IPCBEE vol.15(2011)* © (2011) IACSIT Press, Singapore

Center for Energy Research and Development (OAU) 2003. Trends in Greenhouse Emissions in Nigeria, 1988-2000

Center for Energy Research and Development (OAU) 2003. Trends in Greenhouse Emissions in Nigeria, 2000-2040

Ibe, A.C. 1990. Global Climate Change and the Vulnerability of the Nigerian Coastal Zone to Sea level rise: impacts and responses measures. A Distinguished Lecture under the auspices of the Federal Ministry of Science and Technology, Lagos, Jan. 1990. NIOMR Tech. Paper No. 52, 39p.

Ibe A.C and S.O. Ojo, 1994. Overview of Expected Impacts of Climate Change in the West and Central African Region. UNEP Regional Seas Report and Studies, No 148.

Ibe, A.C (with J.G. Tobor) 1992. Global Climate Change and Coastal Resources and Installations in Nigeria: Impacts and Response Measures. Francisgraphix Publishers, 150p

Obioh, I.B, 2008. Proposed Climate Change Policy and the Framework for Integration into National Planning in Nigeria. Centre for Energy Research and Development, OAU, IFE, NIGERIA.

Odekunle, T. O. and Adejuwon, S.A (2007), 'Assessing changes in the rainfall regime in Nigeria between 1961 and 2004', Journal: *Geojournal* , vol. 70, no. 2, pp. 145-159

Oladipo, E. O. 2011: Sustainable Development: Concepts, Economics, Financing and Risks. Presented at the Training Programme on Sustainable Financing, African Capital Alliance, Lagos. 3 June 2011.

Oladipo, E. O., 2010: The Global Framework for Mitigating Climate Change. in Eze, O.C and Oche, O. eds. *Climate Change and Human Security in Nigeria* NIIA 147 – 166..

Oladipo, E. O., 2010: Towards Enhancing the Adaptive Capacity of Nigeria: A Review of the Country's State of Preparedness for Climate Change Adaptation – A Report Commissioned by the Heinrich Boll Foundation, Nigeria.

Oladipo, E. O., 2010: Greening our National Policies and Action Plans. Paper presented at the 4th National Stakeholders' Forum on The New Mechanism for Environmental Protection and Sustainable Development in Nigeria. Abuja, Nigeria 2 November 2010.

Reid, H., Sahlén, L., Stage, J., MacGregor, J. 2007. *The economic impact of climate change in Namibia: How climate change will affect the contribution of Namibia's natural resources to its economy*. Environmental Economics Programme Discussion Paper 07-02. International Institute for Environment and Development, London.

ANNEX 1

PROGRAMMES, ACTIVITIES AND IMPLEMENTATION FRAMEWORK FOR THE NCCPRS

Pillar	Programmes	Activities	Time-frame			Responsibility	
			Short-term	Medium-term	Long-term		
Mitigation and low carbon high growth development	<i>Improved efficiency in the production and consumption of energy</i>	Study the future energy needs of the country and identify the least cost energy supply path that satisfies future energy demand based on the desired high growth path of the economy for job creation and poverty reduction, without appreciate increase in GHG emissions.	X				
		Improve energy efficiency in power production, transmission and distribution through appropriate investments.		X	X		
		Improve energy efficiency in (i) agricultural and industrial processes, and (ii) residential, commercial/service and transport sectors, among others, through appropriate policies and investments		X	X		
	<i>Oil and natural gas exploration and reservoir management</i>		Increase investment in the ongoing initiatives for the elimination of gas flaring.	X	X		
			Invest in gas exploration to expand its accessibility to the energy poor majority.		X		
			Invest in carbon capture and storage and general reservoir management.		X	X	
			Invest in other GHG reduction project families to oil and natural gas operations such as cogeneration, fuel switching and energy efficiency improvements.			X	
			Review coal mining methods and undertake a feasibility study to assess the technical, economic, social and environmental feasibility of coal mining for power generation (including factors such as how to capture coal bed	X			

		methane) to increase power supply and improve energy access				
		If the feasibility study is positive, invest in coal mining and coal-fired power generation plants using clean coal technology.		X	X	
	<i>Enhanced renewable energy development and use</i>	Promote an enabling environment for renewable energy investments. Invest to up-scale the implementation of existing renewable energy programmes (e.g. hydro, solar and wind energy), while identifying new ones as per the renewable energy master plan .	X			
		Research and investment to harness other potential renewable energy sources, including tidal and wave energy.	X	X		
		Provide micro-credit for wide adoption of proven improved biomass stoves and other technologies to reduce deforestation		X	X	
	<i>Reducing emission from agriculture</i>	Support and fund research and on-farm trials of new water management technology on crop production.	X	X		
		Support agricultural extension service to popularize new water management techniques for crop production.		X	X	
		Invest in research and projects to reduce GHG emissions in livestock and from manure.		X		
	<i>Reducing emission from urban waste</i>	Develop a broad based waste management plan to include reduction of waste and its conversion into energy.	X			
		Design and establish urban waste dumps in all major urban areas from where methane can be captured and used for improved energy access and job creation.		X	X	
		Use CDM mechanism to set up small power plants by capturing the produced methane from waste dumps		X	X	
	<i>Afforestation and reforestation programme</i>	Provide support to existing and new afforestation programmes for erosion and desertification control in all ecological zones of the country.	X	X		

		Establish a national REDD+ readiness and carbon policy framework.	X			
		Invest, if appropriate, in reforestation of degraded reserve forests.		X	X	
		Promote household and social forestry programmes to enhance carbon sequestration.	X	X		
		Research the suitability of various tree species (including indigenous tree species) for their carbon-locking properties for designing various forestry programmes and for the benefit of other environmental and socio-economic functions.	X	X		
Food security, poverty reduction, protection of the vulnerables and health	<i>Institutional capacity for research towards climate resilient crop varieties</i>	Collection and preservation of local varieties of climate change adaptable and robust cultivars and documentation of their characteristics	X	X		
		Intensive research to develop climate resilient varieties of crops, including sorghum, maize, millet, rice etc, for various ecological zones of the country.	X	X		
		Field trials and dissemination to farmers of the local robust cultivars and the newly developed varieties, in partnership with the extension service and NGOs.		X	X	
		Strengthening the capacity of key research institutions to undertake research and disseminate findings among farmers.	X			
	<i>Development of climate resilient cropping systems</i>	Identify likely climate changes in the main agro-ecological zones of the country.	X			
		Research and develop climate resilient cropping patterns suited to different ecological regions of the country.	X	X		
		Conduct field level trials of climate resilient cropping patterns and associated water management systems.	X	X		
		Develop seed supply and extension mechanism for the promotion of climate resilient cropping systems in the various ecological zones of the country.		X	X	

	<i>Adaptation against climatic hazard of drought</i>	Prepare GIS maps of areas vulnerable to droughts	X			
		Develop and test adaptive measures in drought-prone areas by combining appropriate cultivars, cropping patterns and land and water management practices.	X	X		
		Disseminate proven adaptive measures widely to farmers		X		
		Develop safety net mechanisms, such as insurance systems, through public private partnership		X		
	<i>Adaptation in fisheries sector</i>	Assess potential threats to fish spawning and growth of fish in the freshwater fisheries sector and develop integrated adaptive measures to management.	X			
		Assess potential threats to fish spawning and growth of fish in the coastal zone and brackish water and develop appropriate adaptive measures and cultural practices to their management.	X			
		Assess potential threats to the marine fish sector and develop adaptive measures, including integrated zone management.	X			
		Establish early warning systems (e.g. weather observatories and sea fluctuations monitoring and action systems, aquatic resources and ecosystems monitoring systems) for the sector.		X		
		Develop safety net mechanisms, such as insurance systems through public private partnership, for the sector.		X	X	
	<i>Adaptation in poultry and livestock sectors</i>	Assess potential threats to the poultry and livestock sector and develop adaptive measures.	X			
		Disseminate proven adaptive measures widely among farmers.	X	X		
		Strengthen veterinary services systems, including animal health measures, in light of the likely increase in disease prevalence.	X	X		
	<i>Adaptation in health sector</i>	Research on the impact of climate change on health (including the incidence of malaria and	X			

		dengue, diarrhoeal diseases, heatstroke, etc.) and the cost to society of increased mortality, morbidity and consequent fall in productivity.				
		Improve and/or establish and maintain robust rapid surveillance systems for climate-related illness, vulnerabilities, protective factors and adaptive capacity.	X	X		
		Develop adaptive strategies against outbreaks of malaria, dengue and other vector borne diseases and invest in preventive and curative measures and facilities.		X		
		Develop adaptive strategies against diarrhoeal and other diseases, which may increase due to climate change, and invest in preventive and curative measures and facilities.		X		
		Enhance community resilience in the area of environmental health to reduce vulnerability through community education to raise the awareness on environmental hygiene and climate change impacts on health.	X	X		
	<i>Water and sanitation programme in climate vulnerable areas</i>	Monitor changes in water quality and quantity available for drinking and forecast future changes due to climate change.	X	X		
		Plan for and invest in additional water supply and sanitation facilities		X		
	<i>Livelihood protection in ecologically fragile areas</i>	Undertake comprehensive assessment of the impact of climate change on the livelihoods of the people living in ecologically fragile areas of the country (e.g. coastal areas, flood, water erosion and desertification prone areas) .	X			
		Develop plans, through participatory approach, for the sustainable management of these ecologically fragile areas to enhance their resilience.	X	X		
		Invest in the implementation of the plans climate resilience against erosion in income, employment and human health in the ecologically fragile areas of the country.		X	X	
	<i>Livelihood protection of vulnerable socio-</i>	Undertake comprehensive study of the impact of climate change on women and gender relations	X			

	<i>economic groups (including women)</i>	and the development and implementation of initiatives to address these in national response to climate change				
		Develop comprehensive and participatory plans for the protection of the livelihoods of vulnerable groups who will be especially severely impacted by climate change	X	X		
		Invest in the implementation of the developed plans and initiatives to address climate change challenges of the vulnerables (e.g., women, marginal and small farmers, the infirm and elderly, physically challenged people).		X	X	
Disaster Management	Risk	<i>Improvement of flood and drought forecasting and early warning</i>	Review of the hydro-meteorological data network and the setting up of telemetric stations.	X		
			Improve in the dissemination of warnings through more comprehensive real time forecasts,	X	X	
			Improve on awareness building programmes at community level on warnings produced and released by the Nigeria Meteorological Agency (NIMET) and other relevant institutions	X	X	
		<i>Improvement of coastal storm surge warning</i>	Establish and/or strengthen the present coastal storm-surge warning systems. .	X	X	
			Improve in the dissemination of coastal storm-surge warning to local communities, through awareness campaigns.		X	
		<i>Awareness raising and public education towards climate resilience</i>	Put in place policies and initiatives to mainstream disaster risk reduction for climate change resilience into national development.	X		
			Strengthen the capacity of NEMA to manage climate change-induced or accelerated disasters.		X	
			Improve the capacity of NEMA to raise awareness among local communities about impacts of climate change		X	X
			Train local communities on disaster risk reduction means, including, but not limited to, shelter management, search and rescue, and health issues related to disaster management	X	X	
		<i>Risk management</i>	Establish an effective insurance scheme for		X	

	<i>against loss on income and property</i>	losses in property due to climate change impacts.				
		Develop and pilot an effective insurance scheme for loss of income from various sources to persons, households and enterprises.		X		
		Upscale the pilot insurance schemes for lowering risk of adverse impact of climate change.		X	X	
Infrastructure	<i>Repair and maintenance of existing flood embankments</i>	Assess the condition of all existing flood embankments and prepare GIS maps	X			
		Undertake immediate repair and rehabilitation of existing embankments and appurtenant structures taking future forecast flood levels into account.	X	X		
	<i>Repair and maintenance of existing coastal embankments and development of dykes</i>	Survey the condition of existing coastal embankments and/or dykes and produce GIS maps with present coverage of areas protected by these embankments.	X			
		Plan, design and cost immediate repairs of existing embankments/dykes to improve their capacity to curtail storm surge.		X		
		Upgrade and/or establish embankments/dykes to withstand future projected sea level rises and storm surges		X	X	
	<i>Improvement of urban drainage</i>	Assess the drainage capacity of major flood-prone cities (e.g. Lagos, Ibadan, Kano, Enugu, Maiduguri etc.) and investigate structural and non-structural causes of water logging within the cities and their immediate surroundings using hydro-dynamic models	X			
		Design and invest in improvements in the drainage capacity of the major cities		X		
	<i>Adaptation against Floods</i>	Undertake hydrological modelling of the Niger-Benue and major river basins against future climate change scenarios to estimate future flood levels and risks in Nigeria.	X			
		Produce flood vulnerability maps of the major river basins based on future projected climatic	X	X		

		parameters.				
		Plan, design and construct flood management infrastructure (embankments and/or others as appropriate) in light of likely future flood levels		X	X	
		Categorize the flood plains according to various levels of vulnerability.	X			
		Improve on long-term flood forecasting and warning including, but not limited to, installation of a telemetric network and weather and hydrological RADARS, and development of Digital Elevation Models (DEM).		X	X	
		Plan and implement non-structural flood-proofing measures.		X	X	
	<i>Adaptation against storm surges</i>	Analysis of meteorological data to improve predictions of changes in the pattern of coastal storm surges.	X	X		
		Repair, maintenance and upgrade existing coastal embankment structures in the coastal environment of the country for protection against storm surge.		X	X	
		Plan, design and construct new dykes along the affected coastal areas.		X	X	
		Plan and develop coastal green belts as a measure against storm surge	X	X		
	<i>Planning and design of river training works</i>	Preparation of GIS maps and identification of erosion prone areas including monitoring mechanisms	X			
		Undertake physical and hydro-dynamic modeling of the main hydrological basins of the country.	X	X		
		Design and implement watershed and river management training programme and projects		X	X	
Research and Development	<i>Strengthening the capacity of the Centre for Climate Change and Freshwater Resources and other relevant institutions.</i>	Strengthen the capacity of the Centre for Climate Change and Freshwater Resources and other relevant institutions and networks for research on climate change and climate change impacts and their management		X		
		Establish a virtual GHG emissions and climate		X		

		change technology bank.				
		Develop and maintain a dynamic web portal for climate change information dissemination.		X	X	
		Develop training programmes for high and mid-level officials of the Government, NGOs and private organisations/associations and provide training in collaboration with research centres and universities	X			
		Support a climate change research group to undertake continuous research in many areas of climate change.	X	X		
	<i>Climate change modelling at national and sub-national levels</i>	Improve on the understanding of the science of climate change in Nigeria.	X	X		
		Increase national capacity to undertake GHG emissions inventory and mitigation analysis.	X	X		
		Enhance national capacity for the construction of GCM models with small grids.	X	X		
		Construct appropriate GCM models with small grids to obtain regional variations in weather and building capacity to operate and update them.		X	X	
		Collect additional field data for effective use of the calibrated models to predict future climate change		X	X	
		Model impacts of climate change on different sectors of the national development.	X	X		
		Link up regional climate change models to generate better boundary conditions and produce realistic climate change scenarios for Nigeria.		X	X	
	<i>Preparatory studies for adaptation against sea level rise (SLR)</i>	Setting up data collection network stations to monitor sea level rises and salinity along with other appropriate hydro-meteorological data.	X			
		Modelling the inundation and salinity impacts of SLR by specific time lines.		X	X	
		Modelling and predicting the socio-economic and health impacts of SLR.		X	X	
		Develop and implement a comprehensive and integrated plan for the sustainable management		X	X	

		of the country's coastal zone in the face of increasing climate change and model outputs.				
	<i>Monitoring of ecosystem and biodiversity changes and their impacts</i>	Set up a well-designed monitoring system to evaluate changes in ecosystem and biodiversity, covering all important and sensitive ecosystems	X	X		
		Develop participatory monitoring systems by involving local trained people such as school teachers, communities and academic researchers	X	X		
		Document and report changes in ecosystems and biodiversity and asses the implications, including those for the livelihoods of local people, and recommend adaptation measures		X	X	
	<i>Macroeconomic and sectoral economic impacts of climate change</i>	Evaluate the impact of climate change on the macro-economy of Nigeria including impacts on growth, employment, trade patterns, inflation, etc.	X	X		
		Undertake sectoral economic impacts of climate change for major sectors such as agriculture, industry, services, health, transport, security and financial services such as insurance	X	X		
		Assess the impacts of climate change on poverty and on people living in vulnerable areas such as, coastal and low-lying floodplains, drought and desertification-prone and erosion-prone areas of the country.	X	X		
		Assessment of climate change and its impacts on the economics of vulnerable groups such as women and children	X	X		
Capacity building and institutional strengthening	<i>Revision of sectoral policies for climate resilience</i>	Draft a consultation paper on the National Climate Change policy, the integration of climate change issues into development planning and sectoral policies and how they should be formulated for discussion with key stakeholders	X	X		
		Incorporate climate change concerns in all sectoral policies and strategies through appropriate revisions in consultation with	X	X		

		relevant stakeholders				
		Publish the National Climate Change Policy	X			
	<i>Main-streaming climate change in national, sectoral and spatial development programmes</i>	Establish and build the capacity of climate change cells in ministries and agencies to incorporate climate change considerations in all planning processes	X	X	X	
		Agree design and planning parameters for project design for selected years.	X	X		
		Modify the Project Proforma in an appropriate way		X	X	
	<i>Strengthening human resource capacity</i>	Enhance the capacity of Government staff for policy, programme and project formulation, and implementation, through training and in other ways	X	X	X	
		Enhance capacity of key staff of Government, private sector organisations and NGOs on accessing international and national Carbon and climate Change Funds	X	X	X	
		Enhance the human resource capacity within and outside Government for Climate Change negotiations	X	X	X	
	<i>Strengthening institutional capacity for climate change management</i>	Setting up of mechanisms, including the establishment of the Climate Change Commission, for inter-ministerial and inter-institutional coordination at various levels of the Government, and for managing new adaptation and planned mitigation funds	X	X	X	
		Undertake organizational reform and strengthening of key Government and others agencies	X	X	X	
	<i>Main-streaming Climate Change in the Media</i>	Capacity Building and Training of print and electronic journalists	X	X		
		Exposure visits to climate change hot spots across the country and tracking global negotiations	X	X		
		State of Climate Change Reports, Earth Files, Features, Photo-Features	X	X	X	
		Media networking	X	X	X	
Sustainable and coordinated climate	<i>Facilitate a national climate change fund</i>	Establish a National Committee to design the national climate change fund, including its	X			

change financing.		governing instrument for approval by government				
		Launch the national climate fund to overcome emerging and immediate needs of Climate Change	X			
		Link the national climate fund to national budget, vision 2020 and Mid-term plan.		X	X	
	<i>Build national capacity to access global climate change funds</i>	Link the national climate fund to international financing schemes, including the Green Climate Fund		X	X	
		Establish a national technical committee to support the Department of Climate Change(DCC) to facilitate proposals to access global climate change funds	X	X		
		Enhance the human resource capacity of the members of the national technical committee and the relevant staff of the DCC.	X	X	X	
	<i>Strengthen capacity to manage national climate change fund</i>	Establish a functional governance structure for the national climate change fund, including the establishment of a Secretariat.	X			
		Enhance the human resources capacity of the fund's Secretariat for transparent and accountable management of the national climate change fund.	X	X	X	

ANNEX 2:GLOSSARY OF TECHNICAL TERMS

Climate Change

“Climate change” means a change of climate which is attributed directly or indirectly to human activities that have altered the chemistry of the global atmosphere,

Greenhouse Gases

A greenhouse gas (GHG) is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range Many greenhouse gases occur naturally, such as water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Others such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6) result exclusively from human industrial processes.

Emissions

“Emissions”, in relation to a greenhouse gas, means emissions of GHGs into the atmosphere that are attributable to human activity

Global Warming

Global warming or precisely Anthropogenic Global Warming (AGW) refers to the warming of the Earth's lower atmosphere due to "enhanced greenhouse effect" mainly associated with human-induced increased concentrations of GHG in the atmosphere and changes in landuse.

Vulnerability

Vulnerability is susceptibility to harm or damage potential. It considers such factors as the ability of a system to cope or absorb stress or impacts and to “bounce back” or recover

Mitigation

Mitigation of climate change refers to measures that may either reduce GHG emissions (abatement) or increase terrestrial storage of carbon (sequestration).

Adaptation

An adjustment in natural or human systems to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC 2007). Adaptation is all the responses to climate change that may be used to reduce vulnerability.

Precautionary Principle/Approach

Principle #15 of the Rio Declaration notes:

"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Annex 1 Countries

Parties include the industrialized countries that were members of the OECD (Organization for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

Non-Annex 1 Countries

Parties are mostly developing countries. Certain groups of developing countries are recognized by the Convention as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Others (such as countries that rely heavily on income from fossil fuel production and commerce) feel more vulnerable to the potential economic impacts of climate change response measures.

Clean Development Mechanism (CDM)

Article 12 of the Kyoto Protocol defines the Clean Development Mechanism (CDM) as a partnership process between the developing and the developed country parties to the protocol which enables the developing country parties achieve sustainable development while contributing to the ultimate objective of the Convention, while assisting the developed country parties in achieving compliance with their commitments under Article 3 of the Protocol. The CDM is aimed at assisting developing countries in achieving sustainable development, to contribute to the ultimate objective of the UNFCCC and to assist Annex I Parties in achieving compliance with their emission limitations.

Low Carbon Economy

An economy in which all production and consumption activities have been redesigned and configured to attain and is getting towards attaining a net zero CO₂- equivalent emissions over an annual cycle or other defined time frame.