FEDERAL REPUBLIC OF NIGERIA

Federal Ministry of Environment

National Drought Plan

November, 2018

FOREWARD

Drought is a naturally occurring phenomenon that exists when precipitation becomes significantly below normal recorded levels, causing serious hydrological imbalance that adversely affects land resources for production systems. In Nigeria, drought is a phenomenon that affects the entire country. However, the degree of vulnerability differs, with the arid and semiarid regions being more vulnerable than the more humid south.

Droughts have occurred in Nigeria during the periods 1914, 1924, 1935, 1943, 1951-1954, 1972-1973 and 1991-1995. The direct and indirect impacts of these droughts have been very enormous with respect to environmental degradation, large scale crop failure and loss of livestock, as well as human displacement and migration, diseases outbreak and death. The cumulative effects of drought gave been expressed in increasing levels of poverty and environmental degradation which will retard the country's ability to achieve the Sustainable Development Goals.

In order to proactively manage drought and avert the increasing poverty levels associated with it, the Federal Ministry of Environment in partnership with the UNCCD through, considered it imperative for Nigeria to develop the "NATIONAL DROUGHT PLAN" for the country. This Drought Plan is directed towards providing the Government of Nigeria with an effective and systematic means of assessing drought conditions, developing mitigating action and programmes to reduce risks in advance of droughts and developing response options which will minimize economic stress, environmental losses, and social hardship during drought periods.

This Drought Plan identifies the principal activities, different institutions to be involved at various levels, groups and regions that are most vulnerable and develops integrated actions and programmes that will reduce the vulnerability and allocate responsibilities to critical stakeholders. This strategy will go a long way in ensuring sustainable agriculture and other means of livelihood; improve the accuracy in drought prediction, improve people's social wellbeing; reduce livestock loss and minimize migration and dislocation of families and family values.

Ibrahim Usman Jibrin

Honourable Minister of Environment

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GLOSSARY OF TERMS

DROUGHT: A deficiency of precipitation from the accepted or normal that, when a season or longer period of time extended over, is insufficient to meet demands. This may result in economic, social, and environmental impacts. It should be considered a normal, recurrent feature of climate.

DROUGHT IMPACT: A specific effect of drought. People also tend to refer to impacts as consequences or outcomes.

EARLY WARNING SYSTEM: The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

GENDER MAINSTREAMING: This is the globally recognized strategy for achieving gender equality and is the process of assessing the implications for women and men of any planned action in all areas and at all levels.

MITIGATION: Short and long term actions, programs, or policies implemented in advance of drought, or in its early stages, to reduce the degree of risk to people, property, and productive capacity.

PARTICIPATORY CAPACITY AND VULNERABILITY ANALYSIS (PCVA): An analytical and planning process, used originally to facilitate community-led assessment of local disaster risk. The process uses a participatory approach and techniques to develop understanding and capture data about vulnerability and exposure to hazards, and to prioritize actions to reduce disaster risk.

PREPAREDNESS: Preparedness is a mitigation action which includes pre-disaster activities designed to increase the level of readiness or improve operational capabilities for responding to a drought emergency.

RESPONSE: Actions taken immediately before, during, or directly after a drought, to reduce impacts and improve recovery. Response measures are an important part of drought preparedness, but should only be one part of a more comprehensive mitigation strategy.

RISK: The potential adverse effects of drought as a product of the frequency and severity of the hazard and corresponding vulnerability.

STAKEHOLDER: Any party (individual or collective) that is actively involved in a process; has interests that may be positively or negatively affected by the performance or completion of the project, and is able to exert influence over the project, its deliverables or its participants.

STAKEHOLDER ENGAGEMENT: An overarching term that encompasses a range of activities and interactions with stakeholders throughout the project cycle.

VULNERABILITY: Characteristics of populations, activities, or the environment that make them susceptible to the effects of drought. The degree of vulnerability depends on the environmental and social characteristics of the region and is measured by the ability to anticipate, cope with, resist, and recover from drought.

LIST OF ACRONYMS

ADP - Agriculture Development Programme

AMCEN - African Ministerial Conference on the Environment

ARC - African Risk Capacity

CAHOSCC - Convention of African Heads of State on Climate Change

CAZS - Center for Arid Zone Studies

CBO - Community Based Organization

CDA - Community Development Association

CRP - Consortium Research Programme

DEWS - Drought Early Warning System

EO - Extension Officer

EIA - Environmental Impact Assessment

ENSO - El Nino Southern Oscillation

ESG - External Support Group

EWS - Early Warning System

FAO - Food and Agriculture Organization

FEPA - Federal Environmental Protection Agency

FIVIMS - Food Insecurity and Vulnerability Information and Mapping System.

FMEnv - Federal Ministry of Environment

FMARD - Federal Ministry of Agriculture and Rural Development

FMH - Federal Ministry of Health

FMWR - Federal Ministry of Water Resources

GDP - Gross Domestic Product

GIS - Geographic Information System

GWP - Global Water Partnership

HA - Hydrological Area

IPCC - Intergovernmental Panel on Climate Change

ITCZ - InterTropical Convergence Zone

ITD - InterTropical Discontinuity

IWRM - Integrated Water Resources Management

LCB - Lake Chad Basin

LEMA - Local Emergency Management Agency

LGA	-	Local Government Area
LNRBDA	-	Lower Niger River Basin Development Authority
MEI	-	Multivariate Enso Index
NAFDAC	-	National Agency for Food, Drug Administration and Control
NAO	-	North Atlantic Oscillation
NAP	-	National Action Plan
NASRDA	-	National Space Research Development Agency
NBMA	-	National Biosafety Management Agency
NBS	-	Nigerian Bureau of Statistics
NDVI	-	Normalized Differences Vegetation Index
NEMA	-	National Emergency Management Agency
NESREA	-	National Environmental Standard and Enforcement Agency.
NEST	-	Nigerian Environmental Study Action Team
NGO		Non-Governmental Organization
NIHSA	-	Nigeria Hydrological Services Agency
NiMET	-	Nigerian Meteorological Agency
NIRSAL	-	Nigerian Incentive Based Risk Sharing System for Agricultural Lending
NOA	-	National Orientation Agency
NUWRRP	-	National Urban Water Sector Reform Programme
OSS	-	Sahara and Sahel Observatory
PDSI	-	Palmer Drought Severity Index
PEWASH	-	Partnership for Extended Water Supply, Sanitation and Hygiene
PVCA	-	Participatory Vulnerability Capacity Assessment
RBDA	-	River Basin Development Authority
RUDA	-	Rural Development Agency
RUWASSA	-	Rural Water Supply and Sanitation Sector Agency
RWSSP	-	Rural Water Supply and Sanitation Programme
SG	-	State Governments
SDG	-	Sustainable Development Goals
SEMA	-	State Emergency Management Agency
SIWI	-	Stockholm International Water Institute
SOI	-	Southern Oscillation Index

SON - Standard Organization of Nigeria

SPI - Standard Precipitation Index

SST - Sea Surface Temperature

SSZ - Sudano Sahelian Zone

UNCCD - United Nations Convention to Combat Desertification

UNICEF - United Nations Children's Educational Fund.

UNISDR - United Nations International Strategy for Disaster Reduction

VAM - Vulnerability Analysis and Mapping

VCI - Vegetation Cover Index

WCA - Water Consumers Associations

WES - Water and Environmental Sanitation

EXECUTIVE SUMMARY

Drought is a complex climatic phenomenon characterized by natural reduction in precipitation that results in negative impacts on the environment and human activities. Four major types of drought are generally recognized. These are:

1. Meteorological
2. Agricultural
3. Hydrological
4. Socio-economic droughts.

Nigeria features wide ranging ecological zones and drought is a phenomenon that affects the country as a whole. The degree of vulnerability however differs, with the semi-arid regions in the north being more vulnerable to drought than the more humid regions in the south.

Drought has occurred in Nigeria in 1883, 1903/1905, 1913/1915, 1923/1924, 1942/1944, 1954/1956, 1972/1973, 1982/1983 and 1991/1995. The major droughts, which are regional and have a 30-year cycle, are known to have occurred in 1883/1885, 1913/1915, 1942/1944 and 1972/1973. The 30-year cycle droughts are usually regional, while the 10-year drought cycles are usually localized. The impacts of drought can be extremely severe for the most vulnerable groups in the society (women and children). The impacts may be grouped in to two:

a) Physical and ecological impacts; and
b) socio-economic impacts

The general aim of the National Drought Plan is to provide an effective and systematic means of assessing drought conditions, develop mitigating actions and programmes that will reduce the potential vulnerability and impacts. Specifically, a Drought Preparedness Plan is to, among others:

1. Serve as a framework for drought monitoring and the implementation of mitigation measures with the overall objective of reducing the vulnerability of the Nigerian environment and human populations to the impacts of drought;
2. Establish criteria for declaring drought emergencies and triggering various mitigation and response activities;
3. Define the duties and responsibilities of all agencies with respect to drought management;
4. Identify mitigation actions, which can be taken to address vulnerabilities and reduce drought impacts;
5. Develop strategies to remove obstacles to the equitable allocation of water especially during shortages and establish requirements or provide incentives to encourage water conservation; and
6. Establish a set of procedures to continually evaluate and exercise the plan and periodically revise it, so that it will stay responsive to the needs of the communities.

A ten-step planning process that is gender responsive is adopted in formulating this plan and recommended for implementation. The steps are:

1. Appoint a Drought Task Force
2. State the Purpose and Objectives of the Drought Plan
3. Seek Stakeholders Participation and Resolves Conflicts
4. Inventors Resources and Identify groups at risk
5. Develop Organizational Structure and Prepare Drought Plan
6. Integrate Science and Policy, Close Institutional Gaps
7. Publicize the proposed plan, Solicit Reaction

8. Implement the Plan
9. Develop Education Programs
10. Carry out Post Drought Evaluation

It is important to emphasize that although the ten steps are sequential, many of the tasks are to be addressed simultaneously under the leadership of the Drought Task Force and its complement of committees and working groups. The steps in the planning process therefore form part of an integrated planning process rather than a list of discrete tasks.

The character and texture of the task force is its dynamism, a sense of mission and a determination to succeed within the shortest possible time. It is normally thorough, transparent and laced with integrity. Cutting through red tape and bureaucracy is its hallmark to achieve a much needed success that saves a situation. So for problems of drought, the emergency element takes the front seat, even when the drought has been anticipated and planned for.

The Task Force supervises and co-ordinates actions, implements mitigation and response programmes and makes policy recommendations to the appropriate authority or persons. In terms of membership, the task force should reflect the multi- disciplinary nature of drought and its impacts, and should include representatives of both Federal and State agencies, Academia, NGOs etc. In order to ensure effective and smooth operation of the Drought Task Force, it is necessary to clearly identify the various member organizations, institutions and agencies at Federal, State and Local Government levels whose roles are vital in dealing with the critical situation arising from drought condition.

The organizational structure of the task force and its membership are presented in the Plan and as noted and emphasized, the Drought Task Force has the responsibility of developing a sustainable drought planning process for Nigeria, (using the 10-step Drought Preparedness Plan Programme) in order to ensure:

- Timely and reliable monitoring of drought conditions and an assessment of potential impacts
- Assessment of the vulnerability of key sectors, states, and community groups in the state potential actions to mitigate those impacts, and
- The participation of all stakeholders in preparing for and responding to drought impacts

To ensure effective and efficient operation, the Task Force shall create the following committees:

a) monitoring/early warning system
b) Risk assessment and
c) Mitigation and response.

However, it is sometimes recommended that committees be established to focus on (a) and (b), while the third need, (i.e. Mitigation and response) can be carried out better by the Drought Task Force. The committees will have their own task, although well-established communications and information flow between the committees and the Drought Preparedness Task Force is a necessity to ensure effective planning. Details of the functions of the committees are discussed.

The Task Force would come up with recommendations addressing drought on two different time scales:

1. Short-term responses such as the seeds to farmers, regulating water use through water rationing and relief materials, and
2. Long-term drought mitigation projects including education programmes and drafting and implementing of policies through the relevant agencies

Drought Preparedness Plans are useful in the development of rapid response system for drought occurrences and their impacts. A drought rapid response system will include:

a) Identifying the vulnerable areas, population and economic and environmental sectors. The Risk Assessment Committee shall carry out this function.
b) Mobilizing the people and various levels of government and authorities into action. The Drought Mitigation Committee shall play this role.
c) Response action to meet the food, water, Medicare, shelter and other basic necessities of life of the vulnerable people and communities to be carried out by the Drought Mitigation Committee.

The popularization and domestication of the drought plan is equally vital. This would be achieved through the use of the media such as Radio, Television, Telecommunication devices (NiMet website, Twitter handle, Facebook) and Publications (NiMet Drought and Flood Monitoring Bulletin, Agro-met Decadal Bulletin, etc). Radio and smartphones are suitable for the dissemination of meteorological and other information to rural areas as they are designed to function without electricity. These systems shall be used effectively in all aspects of mobilization and drought information dissemination in drought prone areas. The drought plan will be popularized through the following channels:

a) Posting on Website
b) Radio and Newsletter
c) Community Awareness
d) Information dissemination

Science and technology have important roles to play in mitigating the effects of drought. Different research institutions for mitigating the effects of drought have developed a number of technology packages. Also, traditional practices, which are relevant, would be evaluated, adopted, improved and integrated into other efforts to mitigate the effects of drought. Post drought evaluation is also central in proactive drought management. Its objective is to examine systematically the elements of success and failure in the implementation of the plan and take advantage of lessons learnt to make better plans for the future. This would be done by studying and documenting impacts of drought occurrences as well as providing necessary adjustment for future occurrences. The evaluation exercise would carefully consider recommendations on how to improve the appropriateness of each aspect of the drought plan.

1.0 BACKGROUND

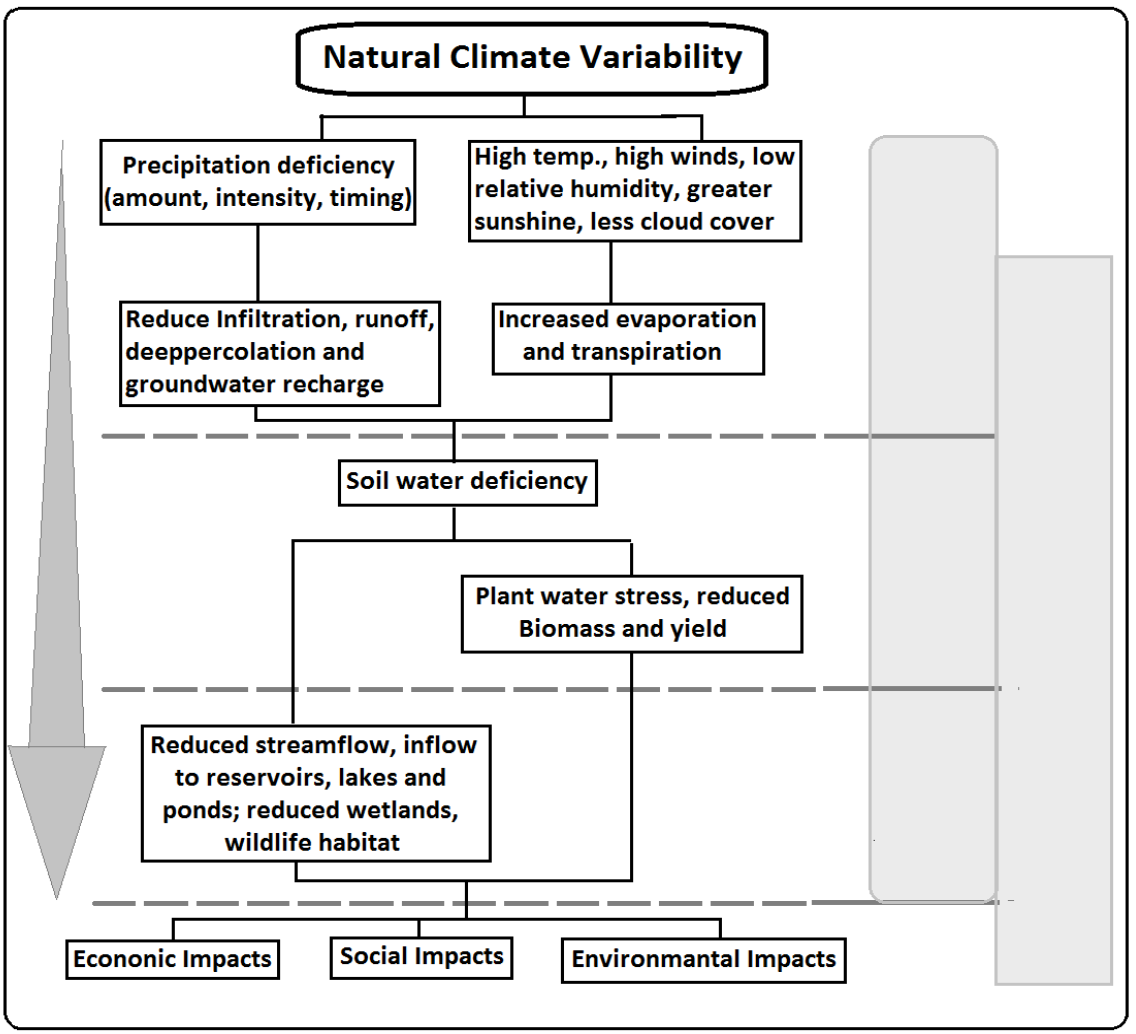
Drought is a natural phenomenon which often impacts people, the economy and ecosystems. Prolonged droughts reduce food production and water availability and at their worst lead to significant human suffering and loss of life. Droughts have a negative impact on ecosystem functions, reduce social, political and economic stability and can increase vulnerability to other natural disasters, such as heat waves and floods.

A broad definition of drought is a deficiency of precipitation over an extended period of time, usually a season or more, which results in a water shortage for some activity, group or environmental sectors.

1.1 Types of Drought

Drought is a complex phenomenon of widespread significance. This complex nature of drought and the varying scale of its occurrence perhaps made it the most enigmatic of all climatic phenomena and the least understood of all natural hazards. In terms of typologies, drought can be classified based on discipline perspectives, as meteorological, agricultural, hydrological and socio-economical (Figure 1):

1. **Meteorological Drought**: It is an expression of precipitation's departure from 'normal' over some period of time. It also connotes the degree of dryness (in comparison to some 'normal' or average amount) and the duration of the dry period. This definition is usually specific to a region since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region. Hence, it always reflects one of the primary causes of a drought.
2. **Agricultural Drought:** Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and so forth. It is usually expressed in terms of needed soil moisture of a particular crop at a particular time. An agricultural drought is considered to have set in, when the soil moisture deficit has dropped to such a level that it adversely affects the crop yield and hence agricultural production. In short, the definitions of agricultural drought hover around soil moisture deficiency in relation to meteorological droughts and climatic factors and their impacts on agricultural production. Such agricultural impacts are caused by short-term precipitation shortages, temperature anomaly that caused increased evapotranspiration and soil water deficits that could adversely affect crop production.
3. **Hydrological Drought:** Hydrological drought is an expression of deficiencies in surface or subsurface water supply (i.e., stream flow, artificial and natural reservoirs and ground water). Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, stream flow, and groundwater and reservoir levels. Competition for water in water storage systems escalates during drought and conflicts between water users increase significantly.
4. **Socio-economic Drought:** The socio-economic effects of droughts are associated with the supply and demand of some economic good. The supply of many economic goods, such as water, forage, food grains, fish, and hydroelectric power, depends on weather.



Source: National Drought Mitigation Center, NDMC, USA

Figure 1. Typology of Droughts

1.2 Causes of Drought in Nigeria

In discussing droughts in Nigeria, it is important to note that the impact and incidence of droughts differ over space and time. While it is incontrovertible that droughts occur over the entire Nigerian littoral, their impacts on lives and livelihoods are more severe in the northern part of the country. Since the 1970s, the term 'the Sahel' has been used as indicating those parts of West Africa where drought was followed by famine and where such a disaster could happen again. This is very unfortunate because there are also other areas in Nigeria where vulnerable populations can be hit by drought and famine.

Oguntoyinbo and Richards (1977) studied eight localities in Nigeria in a north to south transect and found that the mean annual rainfall ranged between 500mm at Katsina in the Sub-Sudanian Zone and in the Guinean Zone. They found among other things that drought was not a new problem to any of these areas and that the drought of 1972-73 was not restricted to only the northernmost areas of Nigeria and that, in terms of farmers' perceptions, drought is seen to be as important a problem in the Guinea Savanna communities as in the Sahelo-Sudanian communities (Figure 2). The figure shows that an area of about 719,600km^2, equivalent of about 83.6%

of Nigeria's area is considered as the drought prone region of the country. This region was severely impacted by both the droughts of the 1970s and the 1980s.

The underlying causes of most droughts in Nigeria can be related to climate change and changing weather patterns manifested through the excessive buildup of heat on the earth's surface, meteorological changes which result in a reduction of rainfall, and reduced cloud. The resultant effects of drought are exacerbated by human activities such as deforestation, bush burning, overgrazing and poor cropping methods, which reduce water retention of the soil, and improper soil conservation techniques, which lead to soil degradation. Between 1950 and 2006, the Nigerian livestock population grew from 6 million to 66 million, an 11-fold increase. The forage needs of livestock exceeded the carrying capacity of its grasslands.

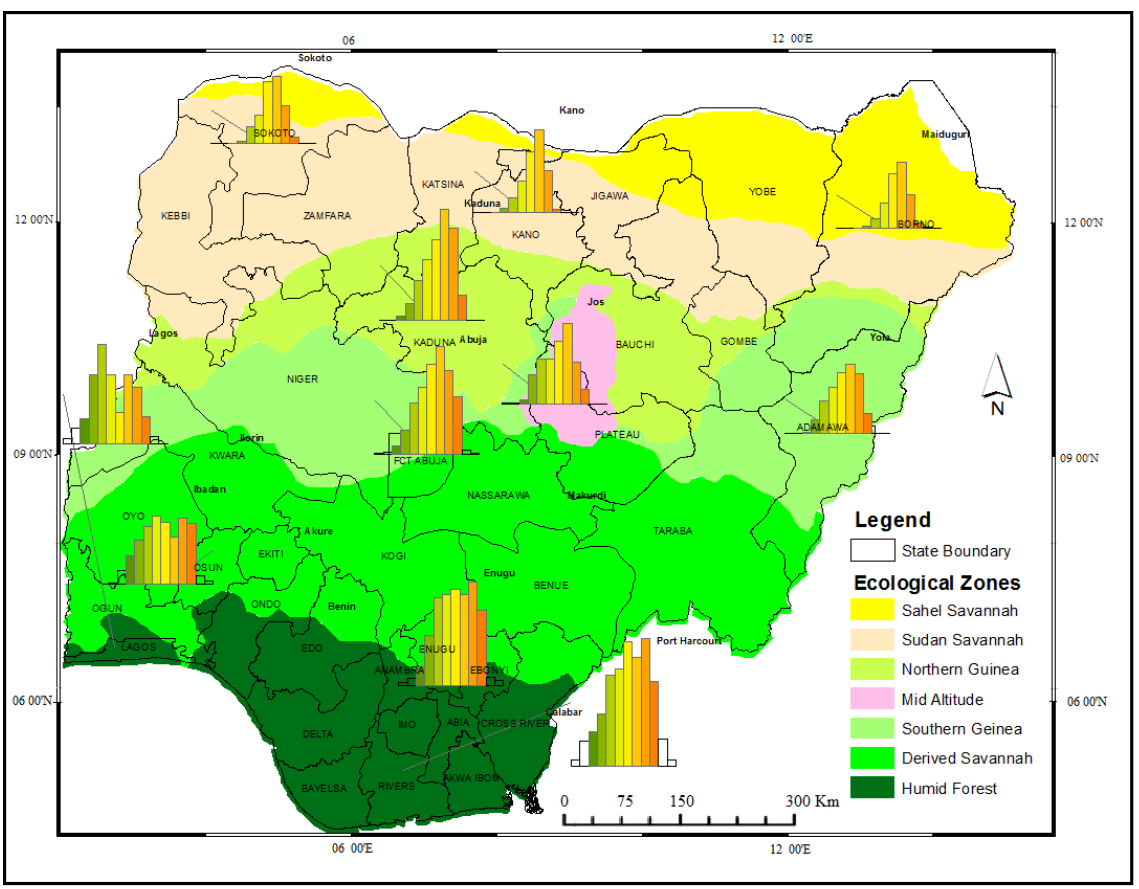


Figure 2. Nigeria showing ecological zones

It is reported that overgrazing and over-cultivation are degrading about 351,000 hectares of land each year. The rate of land degradation is particularly acute when such farming practices are extended to marginal lands such as semi-arid degraded lands, hilly and mountainous areas and wetlands.

Increasing human and animal population, poverty and ignorance, and unplanned development have profound effects on the land and water resources of the region, leading to severe environmental degradation. The extent of degradation arising from inappropriate landuse has not been exactly measured, but the evidences are

numerous, including high erosion rates, low and declining crop yields, reduced livestock carrying capacity, siltation of rivers, dams and irrigation systems and clearance of forest with consequent loss of biological diversity and forest products. Common types of land degradation in Nigeria include; soil erosion, poor drainage, desertification, over-grazing, over-cultivation and deforestation.

As a result of the common physical, environmental, socio-cultural and economic characteristics of the northern part of the country, it is facing up with droughts, desertification and land degradation, the states falling within the region are called drought frontline states. This region stretches from Lake Chad in the east to River Niger in Kebbi State, in the west, covering a distance of about 1500km distance of varied formations and habitats.

1.3 PURPOSE

The purpose of the National Drought Plan is to provide frameworks for long term, holistic approaches towards analyzing and managing drought risks faced by the principal sectors, activities, groups or regions that are most vulnerable to droughts and to develop mitigating actions and programmes that will break the cycle of costly emergency interventions.

From relevant literature relating to drought conventions and agreements, women have been absent from decision-making processes. There is however, increasing consensus on the need to remove the obstacles to women's and men's equal and active participation in and benefit from development initiatives. The most important of these include Agenda 21 (UNCED) in 1992, Beijing Platform for Action in1995; Convention to Combat Desertification in 1994 and the UN Framework Convention on Climate Change/Kyoto Protocol (UNFCCC) in 1992 and 1999, respectively.

Gender issues have been silent from the previous Plans and so one of the main purposes of this plan is to mainstream gender considerations from all levels including decision making, policy and regulation, financing, awareness raising and capacity building and service delivery.

This Plan is therefore for all the people, men, women and children, the environment and the livelihoods of the people. It has targeted a gender responsive and transformative system in order to achieve equality between the boy and girl child as well as between women and men. This will hopefully facilitate an all-inclusive access to water resources and enhance adaptation capacities along gender lines.

1.4 SCOPE

This Plan will be for the Federal Republic of Nigeria which is a country that covers about 923,768 km^2, extending from the Gulf of Guinea Coast to the Sahel of West Africa. It has an estimated population of 190.9 million (2017). The country has three tiers of government Federal, State and Local Governments and is divided into six geopolitical zones (Figure 3), 36 States and a Federal Capital Territory (Table 1) and 774 Local Government Areas (LGAs).

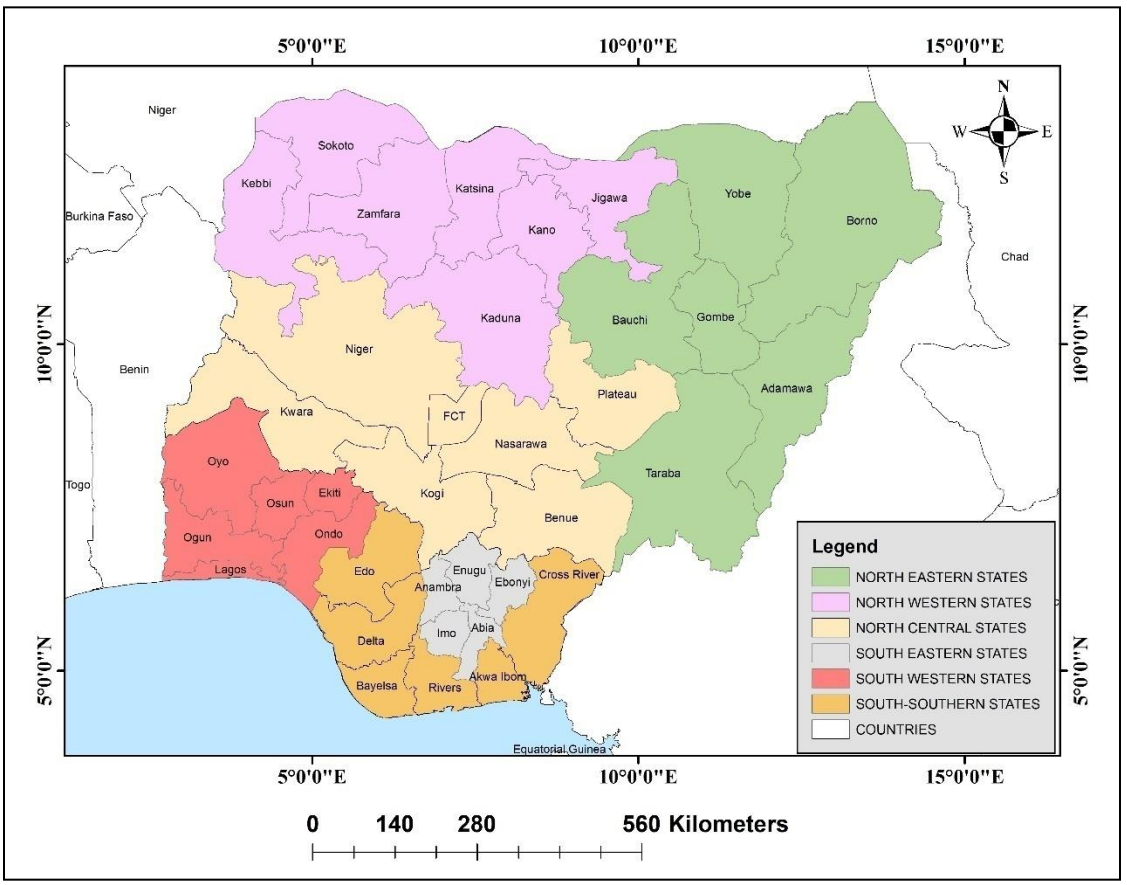


Figure 3. Nigeria showing geopolitical zones

Table 1. List of states in the geopolitical zones of Nigeria

	North East	South East	North West	South West	North Central	South South
1	Adamawa	Abia	Jigawa	Ekiti	Benue*	Akwalbom
2	Bauchi	Anambra	Kaduna	Lagos	Kogi	Bayelsa
3	Borno*	Ebonyi	Kano	Ogun	Kwara	Cross River*
4	Gombe	Enugu*	Katsina	Ondo	Nasarawa	Delta
5	Yobe	Imo	Kebbi*	Osun	Plateau	Edo
6	Taraba	-	Sokoto	Oyo*	Niger	Rivers
7	-	-	Zamfara	-	-	-

* States selected from each geopolitical zone for detailed survey on drought incidents.

1.4.1 Climate

The climate of the country is typically 'tropical' with a unimodal rainfall regime with >80% of the annual rainfall occurring between June and September with the peak occurring in August with bimodal rainfall regime in the southern part of the country. The seasonal movement of the Intertropical Discontinuity (ITD) dominates the

climate of the country. The ITD is a boundary between the warm, moist Tropical Maritime (mT) airmass which originates from the Atlantic Ocean and the dry Tropical Continental (cT) air mass which originates from the continental land mass. It is associated with the movement of the weather fronts in West Africa as a whole. The north to south migration of the ITD dictates the level of influence of the mT and cT air masses and the weather pattern that follows. Rainfall is the main climatic parameter in the country that determines water availability and is the main basis for the demarcation of the seasons into the rainy and dry seasons.

The 'rainy' season lasts for about five months (June-October) in the northernmost areas while it is about twelve months in the southernmost locations. It is initiated by the monsoon of the Gulf of Guinea caused by the northward advance of the ITD. This ensures that the region is brought under the influence of the mT airmass. The 'dry' season is initiated by the southward retreat of the ITD and the subsequent dominance of the cT airmass.

The geographical location of northeast Nigeria in relation to the distance the cT airmass has to travel before reaching the region and its proximity to the Sahara desert makes the area the driest part of the country- drier than the central and northwest parts of the country at the same latitudes.

1.4.2 Vegetation

There are two broad types of vegetation in Nigeria; forest and savanna (Figure 4). Each of these has various variants affecting both the floristic diversity and the structural appearance of the communities.

Within the broad pattern of vegetation types, a striking feature of Nigeria's vegetal cover is the diversity of species available in the country. Many of these provide a variety of products that have proved useful for both local and international exchange economies. In addition, the plant communities harbor many wild animals and birds which are valuable for both human food and potential attraction in the tourist industries. Many of these have now been found as useful tangible resource materials in environmental research management and conservation.

1.4.3 Forest Communities

Forest communities covered the southern parts of the country. As at the time of independence in 1960, the zone recorded a mean annual rainfall of at least 1250 mm. Much of the original forest cover has however been degraded to secondary forest and derived savanna. Wood is the main type of product obtained from the forests of the country. It is widely exploited throughout the country as timber-poles, scaffolding, planks and stakes, charcoal and as fuel wood. These forests and their resources have been greatly degraded as a result of unplanned exploitation and inappropriate harvesting regimes. The importance of these forested zones to the timber trade in the country is evident from the concentration there of about 98% of the saw mills in the country. The forest communities are made of the following variants.

1.4.3.1 Moist Lowland Forests

These are found around Oyo and Edo states where they have been intensively exploited for timber. At the forest margins where human influence is intense, secondary forests comprising of lianas band wide-spread oil palm tree (*Eleias guineensis*) dominate.

1.4.3.2 Forest-Savanna Mosaic

This is a transition zone between the forest to the south and the savanna to the north. This is a zone that is characterized by high rural population densities, shifting cultivation and annual bush burning which have interplayed and degraded the original forest to a derived savanna.

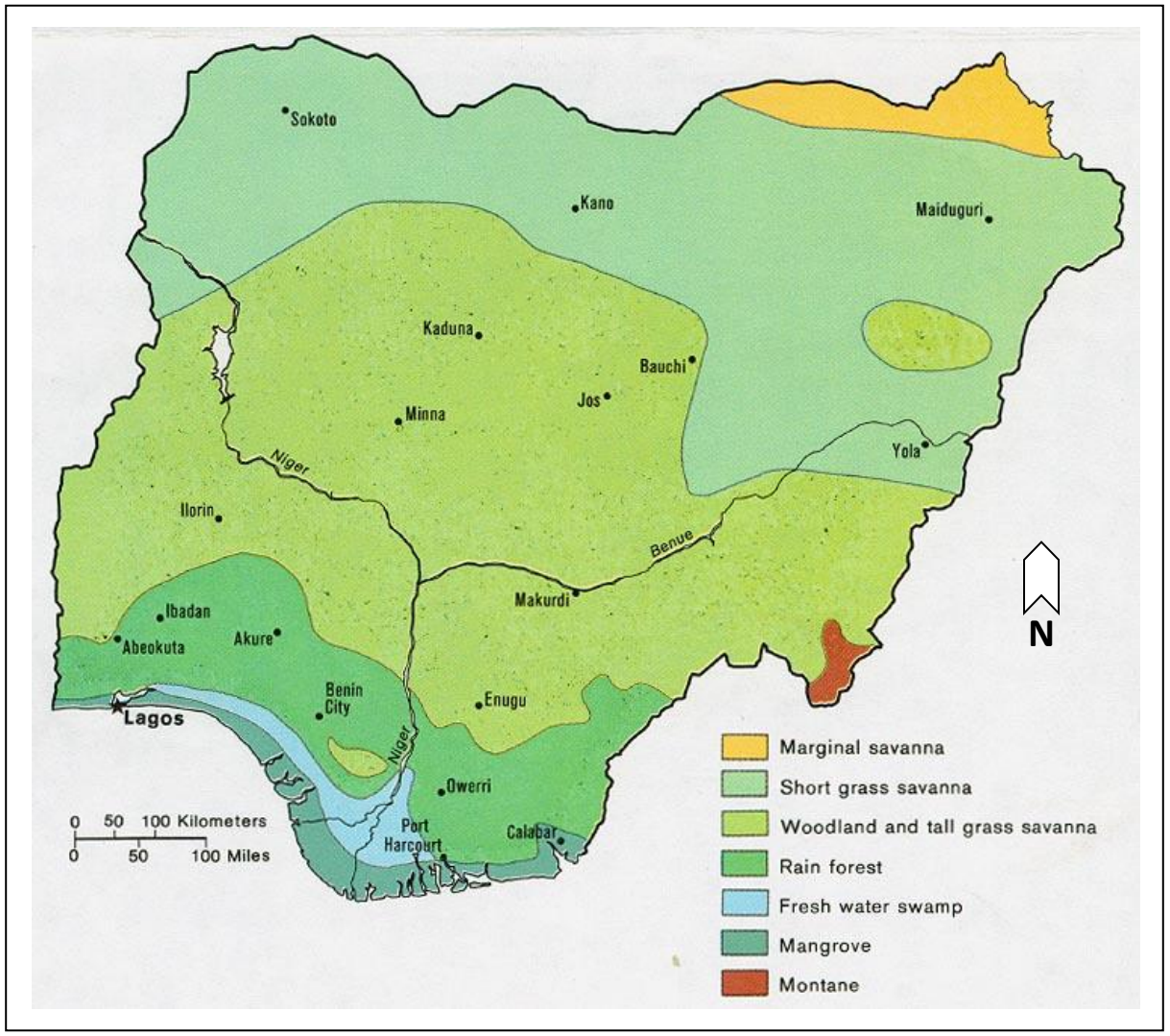


Figure 4. Nigeria showing Vegetation Zones

1.4.4 Savanna Communities

1.4.4.1 Guinea Savanna

This is the largest vegetation zone in Nigeria covering much of the sparsely populated middle belt region. Mean annual rainfall ranges from 1000 to 1500 mm. The Guinea savanna belt has been subdivided into 5 types on the basis of both structural and floristic characteristics.

1.4.4.2 Sudan Savanna

This type of Savanna is considerably drier than the Guinea Savanna. The average annual rainfall is 500-1000mm with dry seasons lasting for seven months or more in a year with relative humidity as low as 25% during the dry season.

Tree species are mostly deciduous, with half of them being small leaved like the Acacia. About a quarter of the species are thorny in addition common species are *Balanites aegyptiaca, Hyphaene thebaica*, *Parkia*

clappertoniana, Adansonia digitata, *Khaya senegalensis,Tamarindus indica, Azadiracta indica*, *Anona senegalensis*, *Ziziphus mauritiana*, *Guiera senegalensis, Acacia ataxacentha* and *Combretum micraathum*.

1.4.4.3 Sahel Savanna

This vegetation zone is found around Lake Chad region in Nigeria. The dominant vegetation species are Dicotyledonous families such as *Annonaceae, Combretaceae and Mimosaceae.* The vegetation is sometimes characterized by thorny plants such as *Acacia senegalensis*, *Acacia nilotica, Acacia laeta, Acacia seyal, Phoenix dactylifera (date palm)* and shrubs include *Calatropis procera.*

1.5 GOALS AND OBJECTIVES

The goal of the National Drought Plan is to provide an integrated document that addresses the challenges posed by water shortages on agriculture, navigation, energy production, drinking water supply, recreation, nature and urban areas that are faced during droughts. In line with the "three key pillars" of drought risk reduction that have been provided to assist drought-prone countries in developing drought management policies and preparedness, the objectives of the National Drought Plan are to:

- implement comprehensive drought monitoring and early warning systems;
- complete vulnerability assessments for sectors, populations and regions vulnerable to drought; and
- implement drought mitigation measures that limit the adverse impacts of drought and provide appropriate response measures when drought occurs.

In consonance with the recommendations for countries developing drought management plans and policies is to use a multi-criteria type of assessment to identify which actions in the DRAMP Framework are most relevant in the national context. Due to the heterogeneity of the environment, economy and society within Nigeria, not every action listed under the framework goals may be applicable. Assigning priority to actions according to their relevance and effectiveness would be a logical first step towards implementing the DRAMP Framework.The DRAMP Framework technical guidelines provide examples of actions that have already been tested and implemented in achieving the goals of the framework. For example, the technical guidelines present an example of indicators and indices used in drought monitoring and early warning systems. Data and examples of drought vulnerability assessments are also presented. Decision-makers tasked with developing drought management plans and policies are urged to use the DRAMP Framework as a guide for the actions to be undertaken.

The specific objectives of the National Drought Plan as aligned to the three key pillars are to:

- Build the capacities of at risk communities to prepare and respond to droughts
- Reduce vulnerability and exposure to recurrent droughts
- Increase equality between children, women and men in accessing water resources and enhance their adaptation capacity
- Serve as a framework for drought monitoring and implementation
- Mitigate measures with the overall objective of reducing the vulnerability of the Nigerian environment and human populations to the impacts of drought;
- Show how to collect and analyse drought related information in a timely and systematic manner;
- Establish criteria for declaring drought emergencies and triggering various mitigation and response activities;
- Provide an organizational structure and delivery system that ensures information flow between and within various levels of government;
- Define the duties and responsibilities of all agencies with respect to drought management;

- Strategize how to maintain the current inventory of state and federal programmes used in assessing and responding to drought emergencies;
- Identify drought-prone areas and vulnerable economic sectors;
- Identify mitigation actions, which can be taken to address vulnerabilities and reduce drought impacts;
- Provide a mechanism to ensure timely and accurate assessment of drought impacts;
- Keep the public informed of current conditions and response actions by providing accurate and timely information to media in print and electronic form;
- Establish a strategy to remove obstacles to the equitable allocation - of water especially during shortages and establish requirements or provide incentives to encourage water conservation;
- Establish a set of procedures to continually evaluate and exercise the plan and periodically revise it, so that it will stay responsive to the needs of the community;
- Identify principal activities, groups or areas most at risk and develop mitigation actions and programmes that reduce drought vulnerabilities.

1.6 IMPORTANCE OF NATIONAL DROUGHT PLAN

As documented by Intergovernmental Panel on Climate Change, IPCC (2007), the frequency and intensity of extreme events, such as droughts, have increased in Sudano-Sahelian Region of Nigeria (SSRN). One of the sectors most sensitive to drought is agriculture, which could witness decline in yield in rain-fed crops by as much as 50 percent. Such trends, if continued would threaten the achievement of Sustainable Development Goals particularly (SDG1) which 'targets everybody in the region has enough food, and can work and earn more than $1.25 a day'; (SDG 4) which aims at 'inclusive, equitable and quality education'; (SDG 5) that targets the 'restoration of and sustenance of livelihoods for girls, women, youths and disabled'; (SDG 6) which has the goal of 'water resources management in the country'; (SDG 13) which focuses on 'climate change adaptation challenges; (SDG 15) that addresses 'ecosystem degradation and sustainable management of natural resources' and (SDG 16) which will address the issues of 'peaceful and inclusive societies for sustainable development in the country'.

The importance of National Drought Plan cannot therefore be overemphasized as it is developed with input from different perspectives by multidisciplinary teams. The drought plan will include strategies that if successfully implemented before; during and after drought will go a long way in mitigating the impact of drought and ensure the development of proactive measures that will reduce the impact of droughts on vulnerable populations. The importance of National drought plan includes the following:

- ✓ serves as a framework for drought monitoring and the implementation of mitigation measures with the overall objective of reducing the vulnerability of the Nigerian environment as well as the human populations to the impacts of drought.
- ✓ shows how to collect and analyze drought related information in a timely and systematic manner;
- ✓ establishes criteria for declaring drought emergencies and triggering various mitigation and response activities;
- ✓ provides an organizational structure and delivery system that assures information flow between and within various levels of government;
- ✓ defines the duties and responsibilities of all agencies with respect to drought management;
- ✓ strategizes how to maintain the current inventory of state and federal programmes used in assessing and responding to drought emergencies;
- ✓ identifies drought-prone areas and vulnerable economic sectors;
- ✓ defines mitigation actions, which can be taken to address vulnerabilities and reduce drought impacts;
- ✓ provides a mechanism to ensure timely and accurate assessment of drought impacts on the environment as well as socio-economic impacts, including all impact on the buffer areas;

- ✓ keeps the public informed of current conditions and response actions by providing accurate and timely information to media in print and electronic form;
- ✓ outlines strategies to remove obstacles to the equitable allocation of water especially during shortages and establish requirements or provide incentives to encourage water conservation;
- ✓ establishes a set of procedures to continually evaluate and exercise the plan and periodically revise it, so that it will stay responsive to the needs of the community; and
- ✓ Identifies principal activities, groups or areas most at risk and develop mitigation actions and programmes that reduce drought vulnerabilities.

The National Drought Plan is therefore a very important mechanism that is designed to respond to the challenges of drought in a comprehensive and systematic manner, that at the same time addresses broader development priority, taking into account gender differentiated needs and roles in the society.

The plan seeks to minimize risks, improve local and national adaptive capacity and resilience, leverage new opportunities and facilitate collaboration with the global community, all with a view to reducing Nigeria's vulnerability to the debilitating effects of drought. It will harmonize recommendations from already existing plans, other national adaptation plans and findings from stakeholder consultations to provide comprehensive, transformative, gender responsive and attainable recommendations and identify potential areas of improvement. Gender differentiated perspective, preference and choices will be the hallmark of the National Drought Plan.

1.7 PLAN DEVELOPMENT: INTRODUCTION OF THE 10-STEP PROCESS

The ten step planning process, developed within the last decade and which is currently being adapted in some drought affected countries is applied for this drought preparedness plan for Nigeria. The ten steps include:

1. Appoint a drought task force
2. State the purpose and objectives of the drought preparedness plan
3. Seek stakeholder participation and resolve conflict.
4. Inventorise resources and identify groups at risk.
5. Develop organizational structure and Prepare/write the drought preparedness plan.
6. Identify unmet needs and policy and fill institutional gaps.
7. Publicize the drought preparedness plan and build public awareness.
8. Implement the plan.
9. Develop education programs.
10. Carryout post-drought evaluation.

The goal of the 10 step planning process is to derive a plan that is dynamic and which can reflect changes in government policies, technologies, natural resources management practices etc. It is also intended to serve as a checklist to identify the issues that should be addressed in plan development and appropriate modification.

Step 1: Appoint Drought Task Force

Step 1 focuses on the creation of a Drought Task Force, which is to supervise and co-ordinate the plan development. In particular, the Drought Task Force is to co-ordinate actions, implement mitigation and response programs, and make policy recommendations to the : appropriate authority or persons. The drought Task Force is also to define the scope of the plan, the most drought-prone areas and most vulnerable economic and social sectors, the role of the plan in resolving conflict among water users and other vulnerable population groups, current trends (e.g., in land and water use, population growth) that may increase/decrease vulnerability and conflicts in the future, and principal environmental concerns caused by drought. At its first official action, the task force should state the general purpose and specific objectives.

The drought task force should coordinate will also coordinate implementation of mitigation and response programs (including adaptation), where the women and other vulnerable groups are concerned mainly. The constitution/appointment of the drought task force therefore, needs to incorporate women and youths as members.

Step 2: State the Purpose and Objectives of the Drought Plan

In this regard, a number of questions must be considered some of which may include questions related to:

- Purpose and role of governments at various levels in drought mitigation and response actions.
- Scope of government plan.
- The most drought-prone areas.
- Historical impacts of drought.
- Most vulnerable areas and economic and social sectors.
- Role of the plan in resolving conflicts between water users and other vulnerable groups during periods of water shortage.
- Current trends (e. g. in land and water use, population growth) that may increase/decrease vulnerability and conflicts in the future resources (e. g. human and financial resources) that the governments are ready to commit to the planning process, Legal and social implications of the plan and principal environmental concerns caused by drought.

The purpose of the plan should include an assessment of the vulnerable group (women, children and disabled) to be affected. Their condition/situation during the 3 stages is important for the objective and purpose of the plan. Specific templates may need to be developed in order to X-ray 'would – be' impacts of drought on women, youths and disabled etc.

Step 3: Seek Stakeholder Participation and Resolve Conflict

It may be noted that social, economic and environmental values often clash, as competition for scarce water resources intensifies. Therefore, it is essential for the Task Force to identify citizens or groups that have stake in drought planning (stakeholders and their interests). This is particularly necessary to allow participation and discussions on concerns of the various stakeholders, and in the process, to give the stakeholders a chance to develop an understanding of one another's viewpoints and to generate collaborative solutions.

Public participation may of course, take many forms. It should be realized that time and money may constrain how actively the task force can solicit input from stakeholders. However, one way to facilitate public participation is to establish a citizen's advisory council, as a permanent feature of drought preparedness plan, to help the task force keep information flowing and resolve conflicts between stakeholders. Another way is to invite stakeholders to serve on working groups of the risk assessment committee.

It is also important for the states to establish advisory councils at both the state and the local government levels. These councils will bring communities together, to discuss their water use issues and problems and seek collaborative solutions.

Stakeholder participation in key activities should be gender sensitive, and need to be recognized in the planning process. Conflicts relating to women's use of natural resources must be defined in order to resolve them appropriately. Thus interests of women as a key stakeholder group should be identified.

Step 4: Inventorise Resources and Identify groups at risk

The task force should initiate an inventory of natural, biological and human resources, including the identification of constraints that may impede the planning process. It is also important to determine the vulnerability of these groups and resources to periods of water stress that result from drought. Of course, the most obvious natural resource of importance is water, where it is located, how accessible it is, of what quality and quantity it is etc. Biological resources refer to the quality and quantity of grasslands/rangelands, forests, wildlife etc. Human resources include the labour needed to develop water resources, livestock resources, process complaints of citizens etc. It is also important to identify constraints to the planning process and to the activation of the plan in response to a developing drought. These constraints may be physical, financial, legal or political. For example, legal constraints can include water rights, existing public laws etc.

Identification of groups at risk gives opportunity to ascertain populations of women, youth, children, disabled and other vulnerable groups, to be considered in the planning process. Labour needed to inventory resources, including their development will include women and the youth especially for livestock, farm crops, water sources etc. Therefore, identification of groups at risk is important and these naturally will include the vulnerable groups.

Step 5: Develop Organizational Structure and Prepare Drought Plan

This describes the process of developing an organizational structure for completion of the tasks necessary for drought preparedness plan. As already noted above, step 1 of the drought planning process focuses on the creation of a Drought Task Force, which has two purposes. First, it is to supervise and co-ordinate the plan development. Secondly, after the plan is developed, and during times of drought when the plan is activated, the Task Force coordinates actions, implements mitigation and response programmes and makes policy recommendations to the appropriate authority or persons. The Task Force is also to define the scope of the drought plan, the most drought-prone areas and most vulnerable economic and social sectors, the role of the plan in resolving conflicts between water users and other vulnerable population groups, current trends (e.g., land and water use, population growth) that may increase/decrease vulnerability and conflicts in the future, and principal environmental concerns caused by drought. The task force is also encouraged to oversee development of a web site that would contain information about the planning process, a copy of the plan, and current climate and water supply information.

At any level in the organizational structure, women should be seen to be represented, therefore such representation should be seen in the plan at any opportunity, especially at the implementation stage that involves various stakeholders, and for instance, women can serve as extension agents for women groups. They can also be part of monitoring and evaluation activities. Women should be members of the committees (A, B, C, etc.).

Step 6: Integrate Science and Policy, close institutional Gaps

Step 6 of the National Drought Plan is no doubt an essential aspect of the planning process. In some cases in Nigeria, the policy makers' understanding of the scientific issues and technical constraints involved in addressing problems associated with drought is often limited. Likewise, scientists have a poor understanding of existing policy constraints for responding to the impacts of drought. No doubt, communication and understanding between science and policy communities must be enhanced if the planning process is to be successful. Integration of science and policy during the planning process will also be very useful in setting research priorities and synthesizing current understanding. As research needs and gaps in institutional responsibilities become apparent during drought planning, the drought task force should compile a list of those deficiencies, and make recommendations on how to remedy them to the appropriate authorities.

Integration of science and policy should include consideration of issues in the gender policy of a nation. Science and policy communities must be encouraged to include gender issues in their plans and engagements.

Step 7: Publicize the Proposed Plan, Solicit Reaction

Step 7 (Publicize the proposed plan, solicit reaction) is another essential aspect of the planning process. If there has been good sensitization, communication and involvement of the public throughout the process of establishing a drought plan, there may already be better-than-normal awareness of drought and drought planning by the time the task force recommends various drought mitigation and response actions. Things to emphasize in writing news releases and organizing information dissemination meetings during and after the drought planning process could include:

1. How the drought plan is expected to relieve impacts of drought.
2. What it will cost to implement each mitigation or response action, and how it will be funded.
3. What changes people might be asked to make in response to different degrees of drought, such as restricted lawn watering, water rationing and car washing or not irrigating certain crops at certain times.

Publicizing the proposed plan is an awareness raising activity which should involve participation of women and other vulnerable groups. Therefore, in soliciting reaction, views from a cross section of women, youths, people living with disabilities and other vulnerable groups, concerning the plan must be also be sought.

Step 8: Implement the plan

Step 8 (implementing the plan) involves the implementation of both the short-term operational aspects of the plan, and the long-term mitigation measures, which should normally be overseen by the task force or its designated representatives. In this step, periodic testing, evaluation and updating of the drought plan will keep the plan responsive to stated needs of stakeholders and vulnerable groups.

Institutional gaps concerning gender issues will need to be assessed and addressed, such that implementation of the plan, at every stage should involve consideration of gender issues and women personnel as part of the team implementing the plan.

Step 9: Develop Education Programs

Step 9 is another essential aspect of the National Drought Plan. It involves a broad-based education programme to raise awareness of short-term water issues. This will help to ensure that people know how to respond to drought when it occurs and that planning does not lose ground during non-drought years.

Gender sensitive education programs are needed both for the teachers and the target pupils/students. It is important to study for instance, how drought can affect women farmers? Curriculum development should ensure the entrenchment of disaster risk reduction (DRR), resilience and drought mitigation issues. Efforts should be made to improve the capacities of the programs to address drought and gender issues with regards to droughts.

Step 10: Evaluate and Revise Drought the Plan

Step 10 has to do with post drought evaluation or audit which would document and analyze the assessment and response actions of government, non-governmental organizations and others, and provide for a mechanism to implement recommendations for improving the system. Without post drought evaluation, it

is difficult to learn from past successes and mistakes, because institutional memory fades with time. Post-drought evaluations should include an analysis of the causes of drought, climatic and environmental aspects of the drought, its economic and social consequences, the extent to which pre-drought planning was useful in mitigating impacts, in facilitating relief or assistance to stricken areas and in post recovery and rehabilitation issues in any weakness or problems caused or not covered by the plan. Attention must also be directed to situations in which drought-coping mechanisms worked and where societies exhibited resilience. Evaluations of previous responses to severe drought are also a good planning aid. To ensure unbiased appraisal, government may wish to place responsibility for evaluating drought and societal response to it, in the hands of non-governmental organizations (NGOs) such as the Nigerian Environmental Study Action Team (NEST), or specialized research institutes such as the Centre for Arid Zone Studies (CAZS). This step is particularly significant for revising the plan to keep it current and making an evaluation of the plan's effectiveness in the post drought period.

An important step which should examine extent of entrenchment of gender issues in all the steps. Evaluators should include women in the exercise. The evaluation should also be on drought risk and drought plan for gender issues entrenchment, noting that drought planning is a process, not discrete event.

1.8 GENDER MAINSTREAMING

Gender Mainstreaming, is the globally recognized strategy for achieving gender equality and is the process of assessing the implications for women and men of any planned action in all areas and at all levels. It is important that all staff and stakeholders (as opposed to gender coordinators and gender focal points) take responsibility for addressing gender and social inclusion concerns in adaptation planning to address this concern.

It is also a process of assessing the implications for women, youths, people living with disabilities and the elderly of any plan of action, policy or programme at any level. It is a way of ensuring that these groups have the opportunity to participate in the design, implementation, monitoring and evaluation of policies and programmes, and benefit equally from policies and programmes. The use of participatory approaches during community analysis and needs assessment, where all members of the community are involved in planning, gives an understanding of the gender roles, including different vulnerabilities.

Gender should be mainstreamed into the National Drought Plan by considering gender differentiated impacts of and vulnerability to drought, encouraging use of sex-disaggregated data and the gender dimensions of the adaptation options in various sectors.

2.0 RELATIONSHIP TO OTHER PLANS AND POLICIES

Policies and strategies provide the framework and guidance to support the implementation of best management practices and suitable interventions. For several years, Nigeria has been striving to find appropriate policies and strategies to address drought-related issues. Table 2 provides an overview of some plans and strategies and their relationship in handling drought- related issues. It should be noted that even though the focus is on drought, some of the national and regional policies have drought-related components, such as agriculture, livestock, land, natural resources, rural development, and poverty alleviation.

Table 2. Existing Plans and Policies and their Relationship to Drought

S/N	EXISTING PLAN AND POLICIES	RELATIONSHIP TO DROUGHT
1	**The National Water Policy**	The NWP (2004) resulted from the water sector reviews put together by the Water Resources Management Reform Programme (WRMRP) in 1997 consequent to the enactment of the Water Act 101 of 1993. The programme carried out a Water Sector review in Legal and Regulatory Framework, Institutional Framework and Participatory Approach, Information and Water Resources Data base, Water Resources Economics and Financing, Environment and Resource Sustainability, Water Resources Infrastructure, Assets and Assets Management and International Waters. The report of these reviews provided inputs in the formulation for a Water Resources policy, principles and strategies. Nigerian Government embarks with this Water Policy on a new way on management and control of water resources with the vision of optimizing the use of Nigeria's water resources at all times, for present and future generations to live in harmony with environmental requirements, without compromising the existence of the future generations. In the light of this vision the new management of water resources represents the challenge of carefully balancing the water uses and water protection through a regulatory system of river basin based management and regulated allocations of water resources. The guiding principles of the National Water Resources Policy are: • The water policy shall be subject to and consistent with the Constitution in all matters including the determination of the public interest and the rights and obligations of all parties, public and private, with regards to water. • All water, wherever it occurs in the water cycle, is a national asset and resource common to all, the use of which shall be subject to national control. All water shall have a consistent status in law, irrespective of where it occurs. • The objective of managing the quantity, quality and reliability of the nation's water resources is to achieve optimum, long term, environmentally sustainable social and economic benefit for society from their use. • There shall be no ownership of water but only a right (for environmental and basic human needs) or an authorisation for its use. Any authorisation to use water in terms of the water law shall not be in perpetuity. • The planning and management of Nigeria's water resources shall take place within a framework which facilitates awareness and participation among all users at all levels.

		• Water resources shall be assessed, developed, apportioned and managed in such a manner as to enable all users to have equitable access taking into account the sustainability of the resource. • Water quality and quantity are interdependent and shall be managed in an integrated manner, which is consistent with broader environmental management approaches. • Water quality management options shall include the use of economic incentives and penalties to reduce pollution; and the possibility of irretrievable environmental degradation as a result of pollution shall be prevented. • The management of water resources shall seek to harmonize human and environmental requirements, so that the human use of water does not individually or cumulatively compromise the long term sustainability of aquatic and associated ecosystems. • The operational management of water resources and services shall be decentralized to the lowest practicable level in accordance with the established 8 hydrological areas (HA) as the basic units of water resources management in Nigeria. • International water resources, specifically shared river systems, shall be managed in a manner that optimises the benefits for all parties in a spirit of mutual co-operation. Allocations agreed for downstream countries shall be respected. • Water quality management options shall include the use of economic incentives and penalties to reduce pollution, so that beneficiaries of the water services shall contribute to the cost of its establishment and maintenance on an equitable basis. • The resource base shall be protected against any kind of pollution. The protection measures shall be based on both regulatory and market-based approaches to water.
2	**National Urban Water Sector Reform Programme (2004)**	The Federal Government of Nigeria initiated the National Urban Water Sector Reform Programme (NUWSRP) in 2004 in collaboration with the World Bank. This was in response to the challenges in the urban water supply and sanitation sector. The World Bank, United States Agency for International Development (USAID), African Development Bank (AfDB), the French Agency for Development (AFD), and other development partners with interest in the urban water supply sector of Nigeria are supporting the urban water utility reforms and infrastructure development. These reforms aim to increase access to improved water supply services in the urban areas and make the water utilities to be financially viable. The reforms also aimed to improve the Governance framework, Human and Institutional Capacity, and Accountability of urban water supply utilities for sustainable services.
3	**The National Rural Water Supply and Sanitation Programme (RWSSP)**	The National Rural Water Supply and Sanitation Programme (RWSSP) was launched in 2004, as part of a major effort by the Federal Government in the improvement of water and sanitation services in rural Nigeria, aimed at achieving the MDGs (before 2015 and now the SDGs) on water and sanitation. Most of the rural water supply and sanitation projects and programmes of the Federal Government, development partners, and NGOs initiated between the early 2000s and 2010 were based on the RWSSP (PEWASH, 2016). A number of sector reform initiatives and National Policies on water and sanitation issues were also developed to support the RWSS Programme. Some of the key actors implementing projects and programmes in the

		rural water supply and sanitation sector of Nigeria include development partners such as African Development Bank, Tulsi Chanrai Foundation, EU, JICA, DFID, UNICEF, USAID, World Bank and NGOs such as Water Aid, among others.
4	**Partnerships for Expanded Water Supply Sanitation and Hygiene (PEWASH)**	The Partnership for Expanded Water Supply, Sanitation and Hygiene (PEWASH) is a National collaboration for the improvement of access to water supply and sanitation in Nigeria, through a structured multi-sector partnership. PEWASH is designed to build on previous efforts and complement existing water supply and sanitation strategies by instituting a coordination and prioritization framework for project delivery. PEWASH aimed at providing an opportunity for the water and sanitation sector to leverage the plentitude of expertise, technology and financial resources from the government (Federal, State, and Local), development partners, the private sector, civil society and communities. The 15 year programme has been broken down into three phases, preparatory phase (2016-2018), expansion phase (2019-2025) and acceleration phase (2016-2030). Through this strategy, Nigeria aims to eliminate open defecation by 2025 and achieve 100% access to rural water supply and improved sanitation by 2030. PEWASH programme is to contribute to improvements in public health and eradication of poverty in Nigeria through equitable and sustainable WASH interventions. Water and Sanitation are critical factors in human development and economic growth, and therefore central to the achievement of the Sustainable Development Goals (SDG). Nigeria is committed to attaining the SDG-6 targets for water and sanitation by 2030. The PEWASH programme is specifically aimed at achieving SDG-6.1 and 6.2 targets in the rural areas through a multi-sectoral partnership while supporting the empowerment of rural dwellers in Nigeria. Data from the 2015 Joint Monitoring Programme of WHO/UNICEF (2015) indicate an increase in access to water supply from 25% in 1990 to an estimated 57% in 2015 (32% increase) and a drop-in access to improved sanitation from 38% in 1990 to an estimated 25% in 2015 (13% decrease) in the rural areas in Nigeria. Increasing and sustaining access to water supply and reversing the decrease in access to sanitation is the top priority of the Government. A growing population and an ever-increasing demand for water and sanitation services for public health, food production, and micro and small industries in the rural areas, calls for greater concerted efforts well beyond present endeavors (PEWASH, 2016). Within the ambit of SDG-6, the main objective of the PEWASH programme is to prioritize the achievement of 100% access to water supply and improved sanitation in rural areas by the year 2030, and eliminate open defecation by 2025. To achieve the SDG-6 targets-6.1 and 6.2 in its entirety, access to WASH in small town/urban areas and in all Public Institutions (Schools, Health Institutions, Markets, Offices, Public places, etc.) will need to be achieved. The PEWASH programme however is currently limited to rural WASH, and select WASH in public places to serve as a catalyst to spur investments in this area by demonstrating successful models in LGAs across the country. The PEWASH intends to adopt a phased approach in order to achieve its objectives and targets.
5	**National Forest Policy, 2006**	"National Forest Reform law of **2006**" was passed, which amended the **National**

		forest Law of 2000. The National Forest Policy is consistent with the national objectives and the principles guiding sustainable development. It focuses on managing the nation's forestry sector in a way that the forests would continue to deliver goods and services in perpetuity. In other words to meet the needs of this generation without compromising the rights of future generations. The Law recognized the problems of the past and stressed the integration of community, conservation and commercial **forest** management for the benefit of all. The guiding principles for the National Forestry Policy are as follows: i. Embark on aggressive afforestation scheme in the affected and threatened ecological zones, using drought resistant indigenous and exotic tree species. ii. Encourage the use of alternative sources of energy e.g. coal briquettes, efficient wood stoves, solar energy, wind energy, biogas, etc, and promote efficient wood stoves. iii. Develop an appropriate integrated land use plan in the affected ecological zones, which should emphasize the establishment of Grazing Reserves to reduce wanton destruction of vegetation by humans and animals. Necessary steps would be taken to ensure sustainable management of the Grazing Reserves to reduce outmigration. iv. Enforcement of the bush-burning laws and regulations. v. Develop early warning system for drought forecasting and management. vi. Carry out Awareness Campaigns to sensitize all stakeholders on Sustainable Forest Management. vii. Support the development and appropriate management of forest resources in the buffer areas and fringe zones.
6	**Drought Preparedness Plan (2007)**	The National Drought preparedness Plan was developed by UNCCD/FGN, and contains a number of adaptation strategies, such as to: a. Monitor and implement mitigation measures; b. Collect and analyze drought-related information in a timely and systematic manner; c. Identify drought-prone areas and vulnerable economic sectors; d. Provide mechanism to ensure timely and accurate assessment of drought impacts; e. Keep the public informed on current conditions and response actions by providing accurate and timely information to media -print and electronic form; among others.
7	**National Action programme to combat desertification and mitigate the effects of Drought**	The National Action Programme (NAP) was developed in 2000 in line with Article 10 of the UN Convention to Combat Desertification and Mitigate the Effects of Drought. The document spells out long-term integrated strategies that focus on improved productivity of land, and the rehabilitation of resources in the dry sub-humid, semi and arid areas of Nigeria, with particular emphasis on agriculture and water resources management.
8	**National Biodiversity Strategy and Action Plan**	The National Biodiversity Strategy and Action Plan gave information on the status of biodiversity and its contribution to varied sectors of Nigerian economy including tourism, agriculture, water resources, health, commerce and industrial development. It showed how biodiversity impacts on the lives and livelihoods of the people as well. The value of biodiversity to Nigerians and the linkages it has on

		various sectors of the Nigerian economy was vividly shown. The threats to biodiversity, causes and consequences of biodiversity loss in Nigeria were also identified and analysed. It outlined the Policy, Legal, and Institutional Frameworks on conservation and sustainable use of biodiversity as an integral part of the national policy on environment. The Government is committed to the conservation of Nigeria's rich forest biodiversity to meet the needs and aspirations of present and future generations. The government will promote the conservation and rational utilization of representative samples of all ecosystems and species in the country. The national biodiversity conservation strategy will continue to be based on a system of Protected Areas, including Forest Reserves, National Parks and Game Reserves. In recognition of the fact that the local communities must share from the benefits of these Protected Areas, there must be a meaningful participation of these communities in their management. Efforts to safeguard biodiversity in private forests and to improve agricultural biodiversity through farm forestry initiatives must be supported. The government is a signatory to a number of international agreements and Conventions on forest issue covering conservation, access to genetic resources, trade in endangered species and cross border cooperation and it will continue to support and implement these obligations.
9	National Adaptation Strategy and Plan of Action on Climate Change for Nigeria	The National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN) seeks to minimize risks, improve local and national adaptive capacity and resilience, leverage new opportunities, and facilitate collaboration with the global community, all with a view to reducing Nigeria's vulnerability to the negative impacts of climate change.
10	**Sustainable Development Goals (SDGs)**	The Sustainable Development Goals (SDGs) are intended to be universal in the sense of embodying a universally shared common global vision of progress towards a safe, just and sustainable space for all human beings to thrive on the planet. Nigeria together with other 193 countries on 25th September 2015, subscribed to an ambitious set of goals under "Transforming our world: the 2030 Agenda for Sustainable Development" to end poverty, protect the planet, and ensure prosperity for all. Land degradation has a dedicated Goal, "SDG-Goal 15: which aims to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss". Water and Sanitation has a dedicated Goal, "SDG-Goal 6: Ensure availability and sustainable management of water and sanitation for all". The goal is much more ambitious than the previous Targets-under MDGs, and aspires to reach everyone, everywhere with sustainable and affordable access to safe water and improved sanitation. It is more about "quality of services" than mere access (Universal Sustainable Development Goals, 2015). The target (SDG 6) is focused on the means of implementation to achieve the water and sanitation targets through international cooperation and capacity building support and by supporting and strengthening the participation of local communities in improving water and sanitation management. SDG-6.1: By 2030, achieve universal and equitable access to safe and affordable

		drinking water for all. SDG-6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
11	**The Agriculture Promotion Policy (2016 –2020)**	Nigeria still imports a significant amount of food. Nigeria is also not earning significant foreign exchange from agriculture, meaning we are losing on both ends. Therefore, it became paramount to "refresh our strategy" to tackle these 2 issues head on. The purpose therefore of this policy document is to provide a disciplined approach to building an Agribusiness ecosystem that will solve these two (2) gaps.
International Policies		
1	**United Nations Convention to Combat Desertification (UNCCD)**	Established in 1994, the United Nations to Combat Desertification (UNCCD) is the sole legally binding international agreement linking environment and development to sustainable land management. The Convention addresses specifically the arid, semi-arid and dry sub-humid areas, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found. The new UNCCD 2018-2030 strategic framework is the most comprehensive global commitment to achieve Land Degradation Neutrality (LDN) in order to restore the productivity of vast expanses of degraded land.
2	**United Nations Convention on Biodiversity (1993)**	The United Nations Convention on Biodiversity is an international legally-binding treaty with three main goals: conservation of biodiversity; sustainable use of biodiversity; fair and equitable sharing of the benefits arising from the use of genetic resources. Its overall objective is to encourage actions, which will lead to a sustainable future.
3	**UN Framework Convention on Climate Change (UNFCCC), 1992**	The UN Framework Convention on Climate Change (UNFCCC) is an intergovernmental treaty developed to address the problem of climate change. The Convention, which sets out an agreed framework for dealing with the issue, was negotiated from February 1991 to May 1992 and opened for signature at the June 1992 UN Conference on Environment and Development (UNCED) — also known as the Rio Earth Summit. The UNFCCC entered into force on 21 March 1994, ninety days after the 50th country's ratification had been received. By December 2007, it had been ratified by 192 countries.

4	**Land Degradation Neutrality**	To address the issue of land degradation on a global scale, a goal of Land Degradation Neutrality (LDN) was established in the Rio+20 Outcome Document, "The Future We Want", and has now been ratified by the United Nations General Assembly's Target 15.3 of the Sustainable Development Goals (SDGs). In October 2015 LDN was adopted as the target of the UNCCD, where it is defined as a "state whereby the amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems" (UNCCD, 2015).
Initiatives to Mitigate Drought Impacts		
1	**National Agency for the Great Green Wall**	This initiative was launched in 2005 as a strong political response to serious challenges posed by desertification, land degradation, loss of biodiversity, Climate Change and drought. The main goal of this initiative was to increase food security and reduce poverty and help in achieving Sustainable Development. From the initial idea of a wall of trees from West Africa to East Africa, the concept of the Great Green Wall transformed into integrated rural development programme addressing the challenges of climate change, desertification and improving the livelihoods of the affected people in the dry lands. The Great Green Wall Initiative therefore according to the Harmonized Regional Strategy is a set of integrated actions addressing the multi-sectoral problems affecting the lives of people in the African Sahelo – Saharan areas.
2	**Nigeria-Niger Transboundary Ecosystem Management Project**	This GEF supported project is aimed at creating conditions for sustainable integrated ecosystem management in the trans-boundary areas between Nigeria and Niger with a view to improve livelihoods in the areas covered by the Maiduguri Agreement between the two countries.
3	**National Forest Development Initiative (2000)**	This initiative focused on the : o Development of forestry schemes for each ecological zone; o Training and re-training of forestry staff; o Establishment of forestry reserves in every local government area of the country; o Selection of suitable afforestation sites, survey and preparation of land for planting in the rainy season each year; o Development and upgrading of forestry management skills; o Establishment of a scheme for dry farm development and management for forest and wildlife; and o Comprehensive review of the National Forest Policy.
4	**North East Arid Zone Development Programme (NEAZDP):**	Between 1968 and 1973, many northern states of Nigeria suffered the Great Drought which affected food supply, a development which prompted the formation of many initiatives to surmount the threat. NEAZDP was one of the initiatives.

		The Programme was aimed at promoting and assisting the rural populace in the proper use of their natural resources which covers an area of 22,860km^2.
5	**Federal Government of Nigeria/European Union Linkage Agreement**	This Linkage was handled under the aegis of the EU/FGN LOME III Funds and executed via the *CAZS/Silsoe College, Cranfield University, United Kingdom Linkage (1990-1996* which facilitated manpower development, joint field- and on-farm and socio-economic researches particularly in the areas of climatology, water resources, range management, ecology and agriculture in the Sahelo-Sudanian region of the country. The linkage provided the basis for the understanding of the re-charge mechanism of the ground water of the Hadejia – Jama'are – Yobe basin and the prediction of ground water development for small-scale irrigation and domestic supply in the semi arid zone of North East Nigeria.
6	**Federal Ministry of Environment/UNIMAID (CAZS) Linkage on Drought and Desertification Control:**	The FMEnv/CAZS Linkage is mandated to assist the Federal Ministry of Environment in research and training on all issues relating to drought mitigation and desertification control that are of relevance to the mandate of the Federal Ministry of Environment. Through this linkage CAZS implemented the following strategic projects: o Sand dune stabilization at Kaska and Garin Mamodu in Karasuwa, Yobe State. o Community woodlots established at Konduga and Sabon Garin Nangere, Yobe State to provide fuelwood, fodder, gum Arabic and fruits. o Biogas generation chambers to check use of fuelwood for cooking. o Fuel efficient stoves that reduced fuelwood requirements by families by 50%. o Land rehabilitation and restoration through harrowing of degraded (*fako*) lands to enhance infiltration of water. o Reseeding of degraded rangelands with improved seeds at Marguba and Jakusko Nasari Grazing Reserve. o Monitoring of environmental attributes through establishment of weather stations; piezometers and GIS and Remote Sensing Unit.
	The African Risk Capacity (ARC)	The African Risk Capacity (ARC) was established as a Specialized Agency of the African Union (AU) to help Member States improve their capacities to better plan, prepare and respond to extreme weather events and natural disasters, therefore protecting the food security of their vulnerable populations. ARC is an African solution to one of the continent's most pressing challenges, transferring the burden of climate risk away from governments – and the farmers and pastoralists whom they protect – to the ARC that can handle that risk much better. This African-owned, AU-led financial entity will use "*Africa Risk View*" - an advanced satellite weather surveillance and software – developed by the UN World Food Programme (WFP) – to estimate and trigger readily available funds to African countries hit by severe weather events. Because such events do not happen in the same year in all parts of the continent, pan-African solidarity in the creation of a disaster risk pool like ARC is financially effective. Pooling risk across the continent could significantly reduce the cost to countries of emergency contingency funds, while decreasing reliance on external aid.

A complete review of the relationship of various drought-related policies and strategies cannot be realized within the limits of this analysis. However, it is recognized that there are many ministries, agencies and ongoing projects that address various aspects of drought related issues that have not been able to establish the linkages with these other policies and strategies in order to facilitate risk reduction and reduce the impacts of drought and climate variability. These other policies interface with national disaster and/or drought policies and plans, and vice versa.

3.0 OVERVIEW OF DROUGHT IN THE COUNTRY

Nigeria is situated in West Africa lying between latitudes 4°16' and 13°52' North and longitudes 2°49' and 14°37' East. The country stretches from the Guinean Coast which is strongly under the influence of the Atlantic Ocean to the Sahel, a transitional zone of the Sahara desert.

The climate of Nigeria is largely controlled by the inter-tropical convergence zone (ITCZ) also known as Inter-Tropical Discontinuity (ITD), the North ward progression of the sun during the Northern hemisphere summer season (May, June and July), brings the rain-bearing south-westerly winds over most of the country thus bringing the rainy season, on the other hand the retreat of the inter-tropical discontinuity south wards (September, October/November) marks the onset of the dry season, that is characterized by the dust laden North-Easterly harmattan winds. This brings variation in total annual rainfall which ranges from 1500mm and 4000mm in the south to 300mm and 1000mm in the north (Figure 5).

Droughts are believed to occur in the country largely at the beginning of the rainy season as a result of failure of the moisture laden air masses to penetrate deep into the hinterland bringing in water vapour for the rains occur. Conversely, if the air masses retreat southwards too early at the end of the rains, droughts can occur over the country. Apart from these broad patterns of circulation which could lead to droughts, weak southwesterly trades can lead to dry spells within the rainy season which could cause moisture deficiency and crop failure.

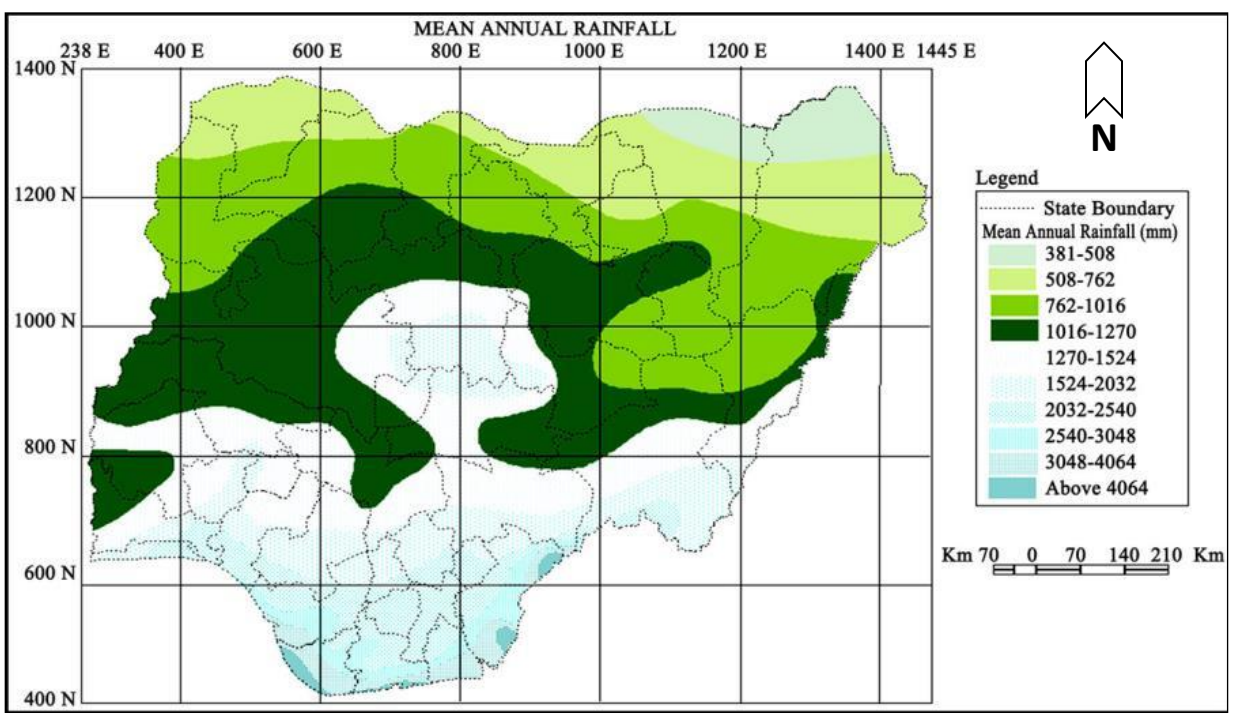


Figure 5. Mean Annual Rainfall (mm) over Nigeria

Nigeria, as a developing country is particularly sensitive to the effects of climate change. A large part of the economy depends on natural resources which are particularly vulnerable to climate change which brings with it

changes in weather patterns that can have serious repercussions for the entire population, upsetting seasonal cycles, harming ecosystems and water supply, affecting agriculture and food production.

The Fifth Assessment Report presents strong evidence that climate change threats in Africa could undermine the progress that the countries have made in tackling disease, malnutrition and early deaths, and gains in agricultural productivity. The report highlight that extreme climate events such as tropical storms, floods, landslides, wind, heat and cold bringing with them droughts, floods or sea level rise that are already visible in the country.

Drought has become a major concern for Nigeria. The frequency, severity, duration and spatial extent of drought are expected to even further intensify in the coming decade because of climate change and associated risk. The disastrous impacts of drought on food security, social stability, livelihoods, the environment and the economy calls for renewed commitment towards drought management in the country so that the impacts on various sectors could be mitigated.

Current drought management practices in Nigeria focus on emergency and relief measures, and less on risk mitigation. A shift towards a risk-based drought management approach offers opportunities to move away from expensive and inefficient relief actions. This approach is based on three pillars:

i. drought monitoring and early warning, based on real-time data to provide suitable indicators, seasonal forecasts and user friendly early warning systems, and communication and data sharing;
ii. drought impact and vulnerability assessment to determine who and what is vulnerable and the reasons for vulnerability;
iii. mitigation and response, consisting prioritized and planned actions aimed at addressing the identified vulnerabilities and responding to drought.

Drought monitoring and early warnings would provide key timely information to users for their effective decision making and action taking. A comprehensive drought early warning system will ensure effective and efficient drought risk management in the country.

3.1 Drought Vulnerability of the Geopolitical zones of Nigeria

Although droughts occur over the whole country, the northern zone is more vulnerable to the threats of droughts and when they occur they are more severe (Figure 6). This is not surprising because the mean annual rainfall (mm), the number of rain days, duration of the rainy season and other rainfall descriptors decrease in a south to north transect.

On the whole, irrespective geographical location certain individuals, households, or communities experience differences in drought impacts, even when they are in the same geographic region. These vulnerabilities take the form of physical exposure, socio-economic vulnerability, and limited capacity to reduce vulnerability and disaster risk. Capacities to reduce vulnerabilities and risks arise out of a complex mix of factors, which include poverty, social class, age group, ethnicity and gender relations. Pre-existing conditions of vulnerability make the poor especially women more exposed to the effects of drought, as social, economic and agro-environmental circumstances may become more severe with drought. Women's and men's different roles and responsibilities, such as water and fuelwood collection, agricultural practices, and inequitable power/gender relations affect their different vulnerabilities and risk levels. The drought vulnerabilities of the geopolitical zones are given in the next section.

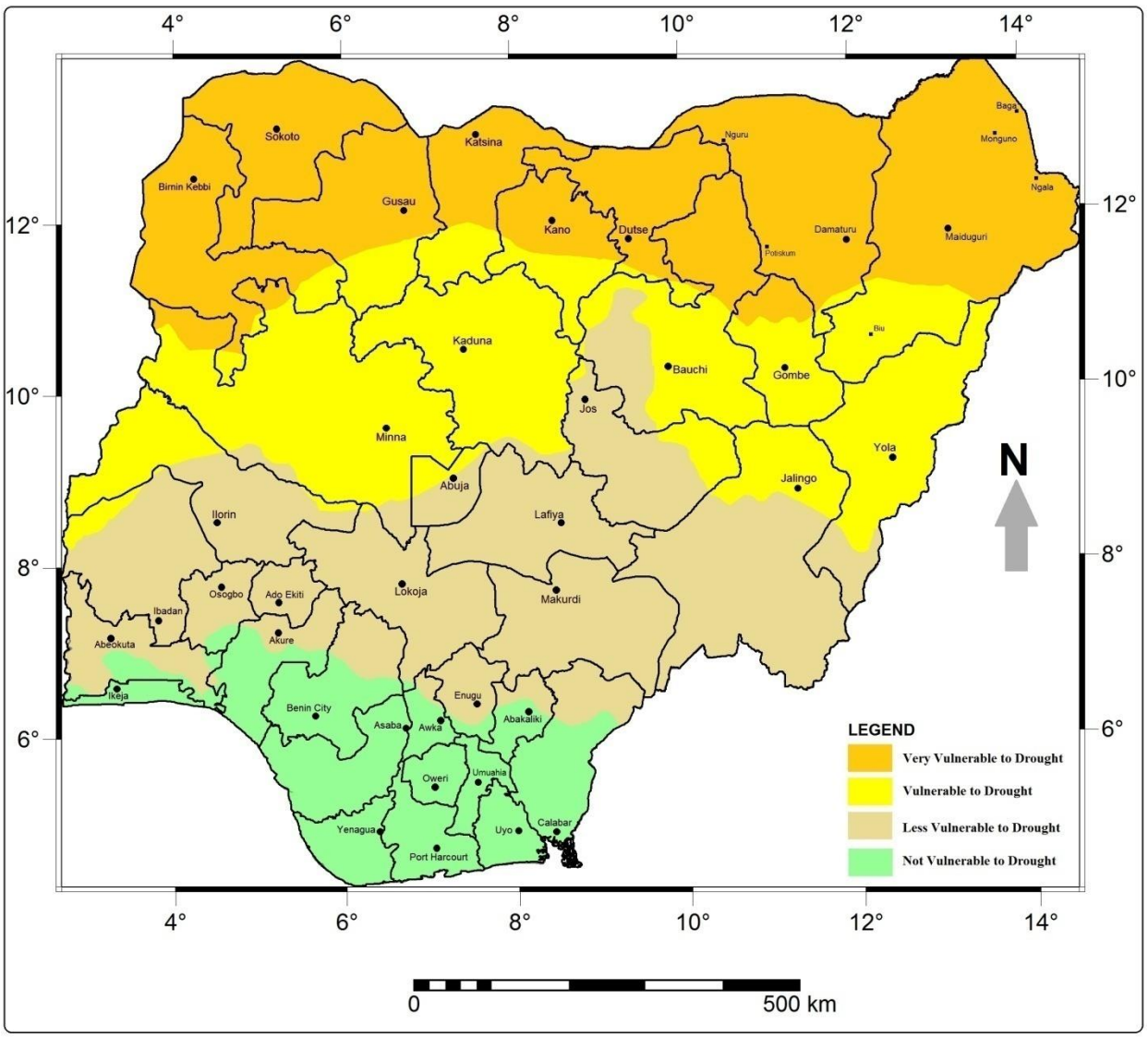


Figure 6.Nigeria showing drought vulnerability

3.1.1 Borno State

Borno State lies approximately between latitudes 10.4° and 13.6° N and longitudes 12° and 14.6°E in the sudano-sahelian ecological zone. It covers an area of about 70,898 km^2 and shares international borders with the Republics of Cameroun to the east, Niger to the north and Chad to the north east while internally sharing boundaries with Adamawa State to the south, Gombe to the south west and Yobe to the west. The state has 27 local government areas and the capital is Maiduguri.

The analysis of the recent rainfall data available for Maiduguri, Kukawa and Biu for the period 1994 to 2004 shows that the total annual rainfall range from 500 to over 1000 mm. Their averages were 644, 337 and 878 mm, respectively. The distribution of the rains within the year was such that over 85% of the rains fall in just three months (July, August and September) with the dry season extending from October to June (8 months). In

all stations, the total amount of rainfall was highest in July and August with about 29, 40 and 47%, respectively. Monthly totals also show high variability from year to year. Hess *et al* (1995) has shown that rainfall trend (1960–1990) in the northeast arid zone of Nigeria has steadily declined by about 8 mm/year.

The potential production capacity of the land and its component soils and natural resources in the Sudano-Sahelian Zone (SSZ) has declined over the years. The decline is as a result of a number of factors, some of which include soil degradation, excessive fuelwood exploitation (Plate 1) and reduced rainfall. Soil degradation implies the decline in soil quality and productivity brought about by physical, biological and chemical processes. These processes result from erosion, desertification and nutrient imbalance.

Plate 1. Fuelwood heaps at Nguroseye, Bama LGA, Borno State

Situated on the edge of the Sahara Desert, Borno state is amongst the most vulnerable states to drought in Nigeria with a large percentage of its landmass, especially in the north, located within the semi-arid to arid zone (Plate 2) and therefore subject to all the vagaries of climatic change including drought, floods, river desiccation and desertification. The main ecological problems of the state result from a combination of two main factors, namely the state's geographical location which exposes it to the vagaries of drought, desertification and wind erosion on the one hand, and the continuous shrinkage of the Lake Chad, on the other. It is estimated that the Sahara desert is encroaching at the rate of some 1 km per annum, with serious ecological and socio-economic consequences to the entire state, and especially the more northerly Sahelian parts.

Plate 2. Sahel Savanna Landscape around Damasak, Borno State

The most serious ecological problem of the state is drought, which is a recurring hazard throughout the history of the state. Some of the most serious episodes of drought and famine include those of 1913-14 (locally called *kangalekori* or 'short stalks'), which affected both sedentary cultivators and herders. Other subsequent years of poor rains and poor harvests in most parts of northern Nigeria, including Borno, were 1918, 1920, 1921, and 1927. However, the 1972-74 Sahelian drought and famine was the most devastating one in the ecological history of Borno and indeed, the whole of the Sahelian regions of Africa. During that drought, crop failure in some parts of Borno (including the present Yobe state) was estimated at between 80 and 100 per cent and millions of livestock were also lost. It must be noted, though, that three years earlier, in 1969, crops were reported to have failed and 70,000 heads of cattle had died of starvation in the northernmost parts of Borno (Apeldoorn, 1981). Since the 1972-74 Sahelian drought and famine, further drought episodes were experienced in 1983-84 and some localized occurrences continued to be recorded in the 1990s and beyond.

The communities of the region are thus vulnerable to different types of hazards, shocks and stresses which have over the years reduced their resilience. They are largely vulnerable to droughts which have led to crop failures and famines which are very frequent in the region. The communities in the region have witnessed decreasing rainfall amounts and shortening of the rainy season, and overall decrease in farm yields. Farmers and pastoralists in the region have experienced food insecurity and the increasing shortage of water and fodder affects the health of both humans and livestock leaving them more vulnerable to disease and epidemics.

Climate change adds a new dimension to community risk and vulnerability in the region. Current indications are that the soils, vegetation and rangelands where the farmers and pastoralists operate are highly degraded and it is suggested that the spate of farmer-herder clashes are reflections of the stresses and shocks that are being witnessed in the region in general and are compounding the problem of resilience.

The Sahelian zone recorded an average annual rainfall of 500mm, with dry season lasting for more than 8 months in a year. Severe droughts in the 1970's and 1980's coupled with overexploitations of water resulted in

the shortage of water for both ground water and surface water resources in the Lake Chad basin (LCB). The Lake Chad has reduced from 25 000 km^2 in 1963, to less than 2000 km^2 in the 2001(Figure 7).

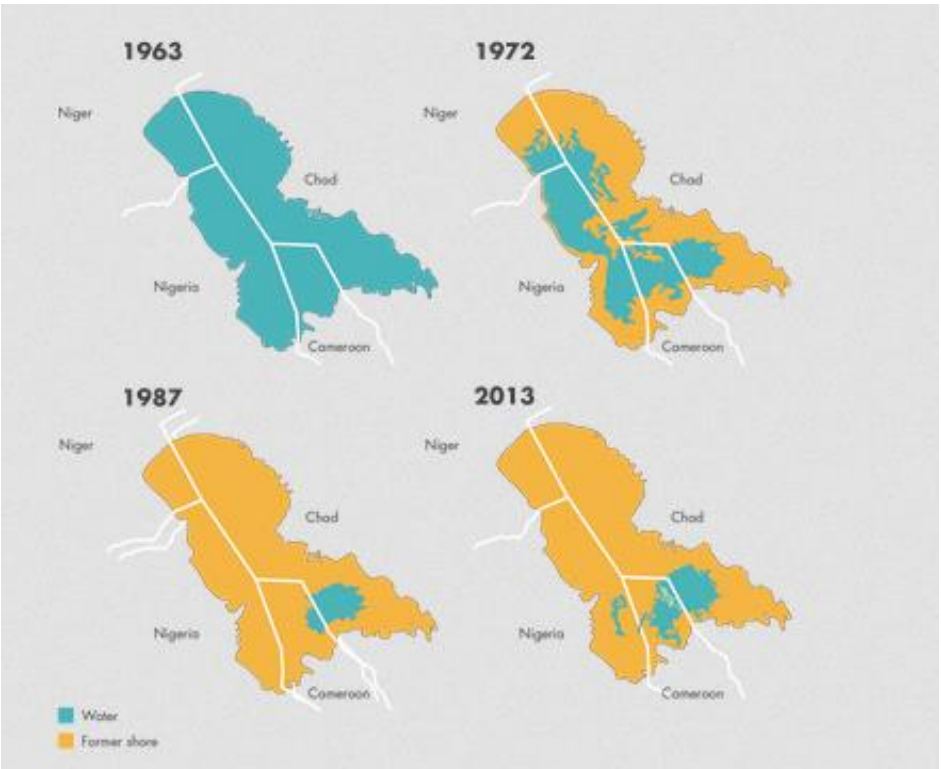


Figure 7. Showing Changes in the Size of the Lake Chad from 1963- 2013

Wildlife poaching and indiscriminate bush burning have affected wildlife population and conservation. Notwithstanding, small and isolated numbers of wildlife can be observed throughout Borno State particularly in the shores of the Lake Chad. The major wildlife sanctuary in the state is the Sambisa Game Reserve. The Game Reserve has an approximate area of 518 square kilometers which has since 2010 been turned into a theatre of war by the government force and the *Boko Haram* insurgents. It harbors a sizeable population of wildlife typical of Savannah environment like monkeys, antelopes, lions, elephants as well as bird species such as ostrich and bustard.

3.1.2 Kebbi State

Kebbi is a state in north-western Nigeria with its capital at Birnin Kebbi. The state was created out of Sokoto State in 1991. The state is bordered by Sokoto State, Niger State, Zamfara State, Dosso Region in the Republic of Niger and the Republic Benin. It has a total area of 36,800 km². It is located between latitudes 10^o 0' and 11°30'N and longitudes 4°0' and 6^{o}0'E.

Agriculture is the main occupation of the people especially in rural areas. The state has one of the most viable agricultural environments in northern Nigeria. Crops produced are mainly grains; animal rearing and fishing are also common. Kebbi State has become one of the major producers of rice in Nigeria.

Fishing is also a dominant activity carried out in the state. The Argungu Fishing Festival which is the most popular tourist attraction in the state attests to the prevalence of fishing in the state.

Agro-silvo pastoralism is practiced by herdsmen in the state. Excessive fuelwood exploitation, browsing and general overgrazing have caused a lot of damage to the vegetation in the state. Tree planting was one of the adaptations to drought in the state. Itinerant labor (*cin rani*) was also cited by respondents in the state to mitigate the effects of drought in the state.

The communities of the region are vulnerable to herder-farmer clashes because of the droughts which have degraded the soils and reduced the productive capacity of the farmlands. Farmers and pastoralists in the region have been having conflicts over grazing resources. There have been incidents of epidemics associated with inadequate water resources in the zone and the frequent droughts have degraded the vegetation and grazing areas.

3.1.3 Benue State

Benue State is located in the mid-belt region of Nigeria within latitudes 6° 25' and 8° 8'N and longitudes 7° 47' and 10° 0'E. It is bounded to the north and north east by Nasarawa and Taraba states, Enugu to the south west and by Kogi state to the west. The state also shares a common boundary with the Republic of Cameroon on the south-east. It covers a total area of 34,059 km^2. The state was named after the Benue River and was formed from the former Benue-Plateau State in 1976.

Based on Köppen climate classification, Benue State lies within the AW climate and experiences two distinct seasons, the wet season and the dry season. The rainy season lasts from April to October with annual rainfall in the range of 1000-2000mm. The dry season begins in November and ends in March. Temperatures fluctuate between 21°C – 37°C in the year. Owing to its location in the valley of River Benue, Makurdi experiences warm temperatures most of the year. The period from November to January, when the harmatan weather is experienced is, however, relatively cool. During the dry season, the water level in both the Benue River and Katsina-Ala River falls, giving rise to beautiful sandy river beaches and clean shallow waters. The south-eastern part of the state adjoining the Obudu-Cameroun mountain range, however, has a cooler climate similar to that of the Jos Plateau.

The State also boasts of one of the longest stretches of river systems in the country with great potential for a viable fishing industry, dry season farming through irrigation and for an inland waterway. The vegetation of the southern parts of the state is characterized by forests, which yield trees for timber and non-timber forest products. The state thus possesses potential for the development of viable forest and wildlife reserves.

River Benue is the dominant geographical feature in the state. It is the second largest river in Nigeria. The Katsina-Ala is the largest tributary, while the smaller rivers include Mkomon, Amile, Duru, LokoKonshisha, Kpa, Okpokwu, Mu, Be, Aya, ApaOgede and Ombi. The flood plains which are characterized by extensive swamps and ponds are good for dry season irrigated farming. Though Benue State has high drainage density many of the streams are seasonal. Hence, there is an acute water shortage in the dry season and during droughts in Local Government Areas such as Guma, Okpokwu, Ogbadibo, Gwer West and Oju. Generally, droughts are not very frequent in the state but the 1972 drought was severe in the region.

Important cash crops include soybeans, rice, peanuts, mango varieties, citrus etc. Other cash crops include palm oil, melon, African pear, chili pepper, tomatoes etc. Food crops include yam, cassava, sweet potato, beans, maize, millet, sorghum, vegetables etc. There is very little irrigation agriculture and water harvesting techniques to mitigate effects of drought, inadequate.

The communities of the region have been subjected to intense insecurity because of attacks from herders. The pastoral communities in their desire to have access to water resources and grazing areas have flooded the state particularly from 2017 and rendered the indigenous communities internally displaced persons (IDPs). As a result of its location in the middle belt of the country, most herders find the state as a buffer zone between the more arid north and the wetter south. Before the 1970s with heavier rainfall regimes, herders dreaded using the

region during the rainy season because of the tsetse flies which caused sleeping sickness to the livestock. With lower rainfall trends, the region with its rivers and good grazing areas has witnessed intense pressures from the herders and thus the incessant farmer herder clashes.

3.1.4 Enugu State

Enugu, is a state in southeastern Nigeria, created in 1991 from the old Anambra State. Its capital and largest city is Enugu, from which the state derives its name and lies approximately within latitudes 6° 30′ and 7°20′N and longtitude 7° 30′ and 8°15′E. It covers an area of about 7,161 km^2 (2,765 sq mi). The state shares borders with Abia State and Imo State to the south, Ebonyi State to the east, Benue State to the northeast, Kogi State to the northwest and Anambra State to the west.

Economically, the state is predominantly rural and agrarian, with a substantial proportion of its working population engaged in farming.

Droughts in the region are mild but have degraded the forest resources and turned the region from a rainforest to a derived savanna and this has increased the vulnerability of the region to gully erosion (Plate 3).

Plate 3. Soil and gully erosion in South East Nigeria

With the more open environment herders have found a new grazing environment. Farmer herder clashes have increased in the region. The communities in the region have witnessed decreasing rainfall amounts and overall decrease in farm yields.

3.1.5 Oyo State

Oyo State is an inland state in south-western Nigeria, with its capital at Ibadan. It is bounded in the north by Kwara State, in the east by Osun State, in the south by Ogun State and in the west partly by Ogun State and partly by the Republic of Benin. The state is bounded by latitudes 8°00' and 9°12'N and longitudes 4°00' and 5°32'E. It covers an area of 28,454km^2 with a landscape consisting of old hard rocks and dome-shaped hills, which rise gently from about 500m in the southern part and reaching a height of about 1,219m above sea level in the northern part. Some of the principal rivers in the state include the Ogun, Oba, Oyan, Otin, Ofiki, Sasa, Oni, Erinle and Osun rivers that originate from this highland.

The climate of the state is equatorial, notably with dry and wet seasons with relatively high humidity. The dry season lasts from November to March while the wet season starts from April and ends in October. Average daily temperature ranges between 25°C and 35°C.

In terms of agriculture, crops like maize, yam, cassava, millet, rice, plantains, cocoa, palm produce and cashew are dominant. There are a number of government farm settlements in Ipapo, Ilora, Eruwa, Ogbomosho, Iresaadu, Ijaiye, Akufo and Lalupon. There are also vast cattle ranches at Saki, Fasola and Ibadan, a dairy farm at Monatan in Ibadan and the statewide Oyo State Agricultural Development Programme with headquarters at Saki.

Many non-timber forest products (NTFPs) that are very fragile and sensitive (snails, mushrooms, spicy vegetables), can hardly withstand the incidence of extreme droughts, and may become unavailable to their gatherers and users. The loss of NTFPs as result of prolonged droughts will have a negative impact on the livelihoods of youths and women who gather and sell these for income than men.

The communities of the region are vulnerable to droughts and farmer/ herder conflicts. Current indications are that the soils, vegetation and rangelands where the farmers and pastoralists operate have been degraded and it is suggested that the spate of farmer-herder clashes are reflections of the stresses and shocks in the state are clear testimonies to the fact that the state is witnessing the conflicts that are being witnessed over the country in general.

3.1.6 Cross River State

Cross River State came into being on 23rd of September, 1987, when the then Federal Military Administration restructured the country from its nineteen states to twenty-one when Akwa-Ibom State also was carved out from it. The State lies between latitude 4°28' and 6°55' N and longitude 7°50' and 9°28' E. It shares common boundaries with the Republic of Cameroon in the East, Benue State in the North, Ebonyi and Abia State in the West, Akwa-Ibom State in the South West and the Atlantic Ocean in the South. Cross River State is located within the tropical rainforest belt of Nigeria.

The major sources of water in the state are rainfall, surface water, subsurface water, and pipe borne water. The Mean Annual Rainfall is put at 1760mm in the northern part of the state and 3100mm in the southern part of the state. Studies show that about 34 million cubic meters of water can be drawn from surface and subsurface sources. The ground water potential within the southern flank of the state is very good as it is tapped from the sandy aquifers. The central part of the state has fair ground water potential. The water sources here are principally secondary aquifers within the basement of complex rocks and the cretaceous hard sediments. Generally, water resource development from the subsurface is encouraging.

Droughts have been taking place in the region particularly during the August break which has been reported to be getting longer. As a result of the droughts salt water incursions into rivers and aquifers have been reported, thus degrading the quality of potable water. Rain water harvesting is a predominant source of potable water in the region.

From the foregoing analyses of drought vulnerability in Nigeria, a summary of the national picture of drought vulnerability and adaptation strategies are captured in Table 3.

Table 3.Drought impacts, vulnerability and adaptation strategies

Geopolitical zone	Drought Impacts	Vulnerability assessment	Adaptation options
North East (Borno)	Wilting of crops & pastures; Drying up of lake & rivers; forced migration; Increased mortality rates in livestock	Very severe in northern part; moderate in the southern part.	Diversification of livelihoods; crop livestock insurance; Agro-forestry; irrigation.
North West (Kebbi)	Wilting of crops and pastures; Increased bare ground.	Severely affected	Diversifying income generating activities; Environmental amelioration; re-vegetation.
North Central (Benue)	Drying up of rivers; Wilting of crops and pastures	Moderate	Agro-silvo-pastoralism; irrigation, dam construction.
South East (Enugu)	Increased bare ground; Disappearance of species	Slight/Mild	Reduction of soil and land degradation; bio-remediation to improve forest resources.
South South (Cross River)	Deforestation and depletion of species	Very mild	Bio-remediation to improve carbon sink; Mangrove Conservation; Reforestation and Multiple use Forest Management.
South West (Oyo)	Deforestation and depletion of species	Mild	Forest Resources Development and Management of land and soil degradation

3.2 HISTORICAL OCCURRENCES OF DROUGHT

The Nigeria Meteorological Agency (NiMET) is the government agency that is responsible for the monitoring of weather and climate variables in the country. Information pertaining to weather over the country is obtained through a network of *in situ* stations which is analyzed and interpreted. The seasonal rainfall prediction (SRP) is normally given at the beginning of the year. The SRP model makes use of the latest condition of El-Nino Southern Oscillation (ENSO), soil moisture information, a crop model which incorporates farming practices and historical weather data of minimum and maximum temperature, rainfall, solar radiation for a period of 30 years to produce the forecast.

The seasonal rainfall prediction (SRP) by NiMET is highly elitist and so retards the capacity of vulnerable populations to respond. According to the Nigeria Education Data Survey (NEDS, 2010), more than 65 per cent of the people in the northern region of Nigeria are illiterates and are considered as people from the drought high burden states where there are high levels of illiteracy and the attitude to western education is negative as indicated by the Boko Haram (western education is an abomination) phenomenon. The language of communication used in the SRP is English and beyond the comprehending capacities of local communities.

It is important to include traditional knowledge into early warning because the indicators from scientific assessments/warnings are still not effectively communicated, and not sufficiently acted upon. A warning should

be communicated in the form that it is understandable and provokes response action from the people to which the warning message was sent. As a result of the challenges in reaching the illiterate population there is a need to integrate the SRP and indigenous systems of drought impact assessments as shown in Table 4. The main requirement for early warning indicators of drought is that they should be accurate, responsive to changes in the moisture supply situation, comparable across space and time, and aids decision making for drought mitigation at a sufficiently early stage and in individual regions.

Table 4. Indicators of drought in Nigeria

Vulnerability	Consequences	Indicators		Elements at risk
		Scientific	Indigenous	
Drought	Reduced agricultural productivity; decreased vegetal and soil cover; decreased soil moisture; soil erosion; loss of soil fertility; sand dune burying of farmlands and other livelihood sources; food insecurity/famine; livelihood losses, livelihood changes; heat waves; increased poverty; mass migration; increased health problems.	Climatic Conditions; Soil moisture; humidity; wind speed/direction, Weather variables price of food commodities	Behavior of the animals; Environmental conditions; Animal reproduction; sky conditions; flowering of plants and ; Lunar movement, Prolonged sunshine; short harmattan duration.	Ecosystem and biodiversity; Agricultural Productivity; Soil; water; bio-fuel scarcity, livelihoods and social security human and animal health

Many historical droughts have occurred in Nigeria but the impacts have been more severe in the Northern region (Figure 8). There are indications that the Sahelian zone of Nigeria was affected by droughts and famine at about 1681-1687 and 1738-1756. Similarly, over a 12-year period, between 1828 and 1839, severe droughts were also experienced around Kano and Maiduguri cities. The droughts of the 1840s were called Darara (Hausa), while those that occurred in the 1850s were referred to as Bamga-Bamga.

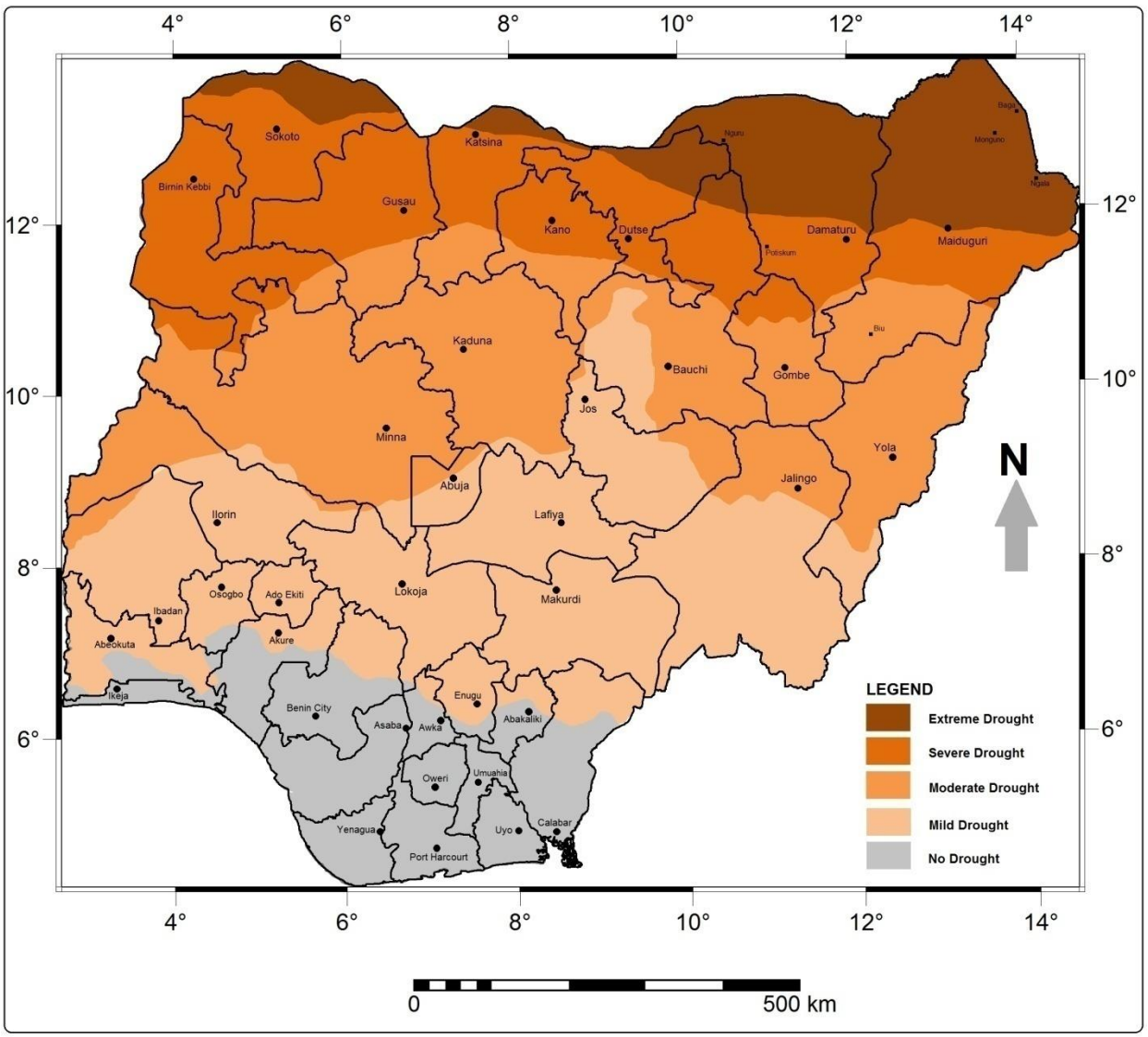


Figure 8. Nigeria showing drought severity

The moderate to severe drought of 1902-1904, referred to as Izenere (sale of children), appeared to have covered the whole northern region. Other drought incidences documented in the 1990s in locations north of latitude 11°N in Nigeria include that of 1913-16, 1942- 45, 1971-73, and 1983-84. These drought episodes caused massive famines. Each time drought occurs in Nigeria, the area that usually receives very severe impacts includes all areas north of 11°N parallel (mainly around Sokoto, Zamfara, Katsina, Kano, Jigawa, Yobe, and Borno States).The effects of the 1971-73 severe drought and the 1983-84 localized droughts on agricultural production prompted the Federal Government of Nigeria, through its various relevant agencies, to put in place some institutional arrangements and schemes to minimize drought impacts.

Table 5. Historical Impacts of Drought in Nigeria

Period	Name	Areas Affected	Impacts
1903/1905	-	Most of Northern Nigeria	• Described as mild. • Poorly documented but believed to have been caused by early cessation of the rains leading to poor harvests of grain crops and famines.
1923/1924	Mai Buhu	Katsina, Kano, Borno	Late onset of rainfall and poor distribution during the rainy season led to famine.
1942/1944	Yar'Gusau	Sokoto, Katsina, Kano.	Inadequate rain aggravated by World War 11 economic recession.
1954/1956	Yan Dikko	Sokoto, Katsina, Kano, and Borno, regions	Wilting of crops and drying up of grasses
1972/1973	-	Most of Nigeria but particularly very severe in the northern states	• Farmers recorded 10% of the expected yield. • 105,876 Cattle, 168,918 Sheep and Goats, 38,300 Donkeys, 4,422 died • Ground water level dropped everywhere in the Sudano-Sahelian part of the country. • Prices of food stuff rose by 400% •Severe hunger and famine all over the Sudano-Sahelian zone

3.3 DROUGHT IMPACTS BY SECTORS

Nigeria is increasingly being characterized by climate change impacts such as heat and cold waves, intense wind and sand storms, increasing amounts of evapo-transpiration, delayed onset and early cessation of the rains, decreasing amounts of rain per rain day, reducing number of rain days, dry spells and droughts. These are exacerbating the existing hazards and vulnerabilities that characterize the country such as receding lake water, dwindling fish catch and species depletion, deforestation, desertification and soil erosion, farmer-pastoralist conflicts, communal clashes and the festering *Boko Haram* insurgency.

While drought is a phenomenon of all ecological zones, its impact varies greatly from place to place. Thus, the people are exposed to varying degrees of vulnerability. This includes exposure to poverty and hunger. The resultant effect of which is the instability in social order and emergence of crime and insurgency.

Drought is a recurrent climatic feature that occurs in virtually every agro-climatic zone of Nigeria. Characteristics such as severity, duration, spatial extent, loss of life, economic loss, social effect and long term impact are used to categorize drought impacts. It adversely affects different types of systems and places various demands on the available water within the Nigerian society e.g. agriculture, hydropower generation, rural and urban water supply schemes and various industries.

An important sector where drought has significant impact is the gender sector. The impact that drought has had on men and women in the past needs to be properly understood, with a view to possibly using gender disaggregated data to ameliorate such impacts. This is particularly important because of the gender dichotomy in the severity and manner in which drought affects boys and girls as well as women and men. Understanding drought conditions, societal vulnerability, and their related effects on one another provide us with historical lessons that can aid in dealing with future drought conditions. The main sectors that are impacted upon by drought are as follows:

3.3.1 Agriculture (Crops, livestock and fisheries)

The most immediate consequence of drought is a decrease in crop production, due to inadequate or poorly distributed rainfall. During droughts drastically reduced rainfall and high temperatures in most parts of the country leads to high exposure rates to drought impacts. The agriculture and aquaculture sectors are among the most sensitive sectors to drought conditions and the most highly exposed to the impacts of drought. Crop, livestock production and fisheries are all critical to food security and nutrition, not only because they produce food, but also because they play an essential role in the economy of Nigeria. Agriculture accounts for about 40 percent of the country's GDP, and employs about 60 percent of the active labor force, with women representing about 65 percent. More than 70 percent of the Nations livestock are raised in the drought prone drylands of Nigeria. The poor crop yields or total crop failure due to drought result in mass poverty and starvation as agriculture is the mainstay of Nigeria's rural economy. Thus, if not checked, drought would lead to a catastrophe with unprecedented repercussions.

Due to the drying up of the water bodies in Nigeria, fishing activities were grossly hampered and the usual fishing could not be carried out along the river systems. Fishing activities and fishing festivals usually carried out under wetter conditions could no longer take place as a result of drying up of water bodies. Some fishermen migrated from their fishing grounds while others had to turn to alternative means of livelihoods.

3.3.2 Water Resources

Drought influences water availability, which is projected to be one of the greatest constraints to economic growth in Nigeria in the future. Reduced annual average rainfall and its run-off would increase desertification in Nigeria. The occurrence of droughts leads to the drop in the water levels of rivers and streams and the lowering of the water table, most of the rivers and streams in the drought prone areas flow into Lake Chad. Drought therefore exacerbated the shrinking of the Lake. The rivers in addition to contributing in recharging Lake Chad are catchments to several dams built for irrigation and domestic water supply. This means that the region will not have sufficient water resources to maintain the current level of per capita food production from irrigated agriculture - even at high levels of irrigation efficiency - and also to meet reasonable water needs for domestic, industrial, and environmental purposes. Besides physical scarcity, contamination of water sources can occur during drought conditions. Water reservoirs may experience increased pollutant levels and lower levels of oxygen, contributing to higher concentrations of illness causing bacteria and protozoa, as well as toxic blue green algae blooms, reduced flow levels in rivers and aquifers can allow saltwater to move inland and also contaminate the water supply. Most water treatment plants are not equipped to remove salts, which can cause problems not only for potable water but also for industrial uses.

3.3.3 Biodiversity

One of the most important effects of drought is the depletion of biodiversity. Plants and animals depend on water, just as people do. Drought can shrink their food supplies and damage their habitats. Existing fauna and flora that are not resistant to drought are likely to go extinct. Several animal and plant species are disappearing in the drought prone region of Nigeria. The combined effects of drought and bush burning (during dry season) have made the flora to go extinct and the animals to migrate to safer havens. Drought, land degradation and desertification have had serious impact on the richness and diversity of plants and animals in the region. Plant biodiversity will change over time, unpalatable species will dominate, and total biomass production will be reduced. Sometimes this damage is only temporary, and other times it is irreversible. Some species that are not drought resistant are lost while resistant ones (animals) migrate to safer places and adapt. Several animal and plant species are disappearing in Nigeria, especially in the arid and semi-arid areas that are more prone to drought. Drought also leads to decreased moisture level in vegetation and in detritus.

3.3.4 Energy Availability

The impacts of drought and desertification on the energy sector are felt primarily through losses in hydropower potential for electricity generation and the effects of increased runoff (and consequent siltation) on hydropower generation. In Nigeria, electricity is largely generated through hydropower thus drought is likely to reduce the volume of water in the dams and rivers and consequently lead to reduction in hydroelectricity generation and hence load shedding of electricity in the country. Load shedding as result of low water volume in Kainji and Jebba electricity projects has become more pronounced during the dry season thus compounding the energy crisis in Nigeria. Energy impacts can also be experienced through reduction in the growth rates of trees due to drought. Majority of peasants in Nigeria rely on fuel wood as source of energy. According to IPCC projection, unless drastic steps are taken, Nigeria will have more than three quarters of its population exposed to fuel wood crisis. Deforestation is likely to have far reaching effects on energy demand in Nigeria and so, posing a threat to its ability to attain the SDG 7"Ensure access to affordable reliable, sustainable and modern energy for all."

3.3.5 Population Movement-Migration

Large populations of the drought-affected states migrated southwards while some aliens from the neighboring Niger Republic migrated into the country and this led to unprecedented and drastic rise in the prices of food commodities.

The resilience of the rural productive systems is based on short term circulation from the rural areas to the urban environments (Hausa *cin rani*). By means of such mobility the necessary economic diversification is achieved, whereby the productive deficiencies of the home farm can be made good by exploiting alternatives elsewhere.

3.3.6 Peace and Security

Large populations of drought affected people and livestock migrated southwards towards the coastal zone and this has led to resource conflicts between farmers and herdsmen. The effects of drought on agriculture, water resources and other sectors have stripped people of their means of livelihood, making young men susceptible to recruitments into criminal gangs and armed militancy and other forms of criminality. Due to decrease in water, the need for water harvesting in the form of dams and reservoirs may be necessary, which will naturally alter the natural flow pattern of rivers and introduce changes to the environment and the livelihoods of the communities at the downstream. Some consequences of these changes are increases in inter-communal conflicts, vandalism, armed robbery, insurgency and proliferation of small arms.

3.3.7 Health and nutrition

The main source of water for agriculture in Nigeria is rainfall and so drought has tremendous effect on agriculture and natural resources. Malnutrition as a result of famines which usually follow droughts occur due to reduced food production, from spread of infectious disease and food- and water-borne illness, and from increased air pollution. The impact of drought on water resources, including reduced water availability in some areas causing contamination of water, will have a negative impact on the already poor sanitation situation in Nigeria.

3.3.8 National Parks and Biosphere Reserves

National parks are natural ecosystems with unique attributes. The national protected areas within which the nine National Parks are situated, represented 3.3% of the total National landmass. These parks play special tangible and intangible roles vital to national and regional well-being. Apart from acting as vehicles for development of eco-tourism, national parks enhance ecological processes and life support systems such as soil regeneration, protection of nutrient cycles, cleansing and purifying hydrological cycles etc. They also protect the environment and indigenous genetic resources, which are basic requirements for any meaningful improvement,

especially in agriculture, medicine, psychology and spiritualism. Consequently, the nation's high population density and dependence on natural sources for food, fiber and medicine demands that Nigeria pays more attention to the protection and conservation of its ecosystem.

Plants and animals depend on water, just as people do. Drought can shrink their food supplies and damage their habitats. Sometimes this damage is only temporary, and other times it is irreversible. Some species that are not drought resistant are lost while resistant ones (animals) migrate to safer niches and adapt. Several animal and plant species are disappearing in Nigeria, especially in the arid and semi-arid zones that are more vulnerable to drought.

The Nigerian National Park Service was established by Decree 36 of 1991 with five national parks namely: Kainji Lake, Gashaka Gumti, Old Oyo, Chad Basin, Cross River and Yankari (upgraded to a national park in 1992). With the promulgation of Decree 46 of 1999, now Act 46 (Cap 65 LFN 2010), two additional parks were established: Kamuku and Okumu. However, Yankari was returned to Bauchi State Government in 2006, leaving seven National Parks currently in existence. Figure 9 shows the distribution of National Parks in Nigeria.

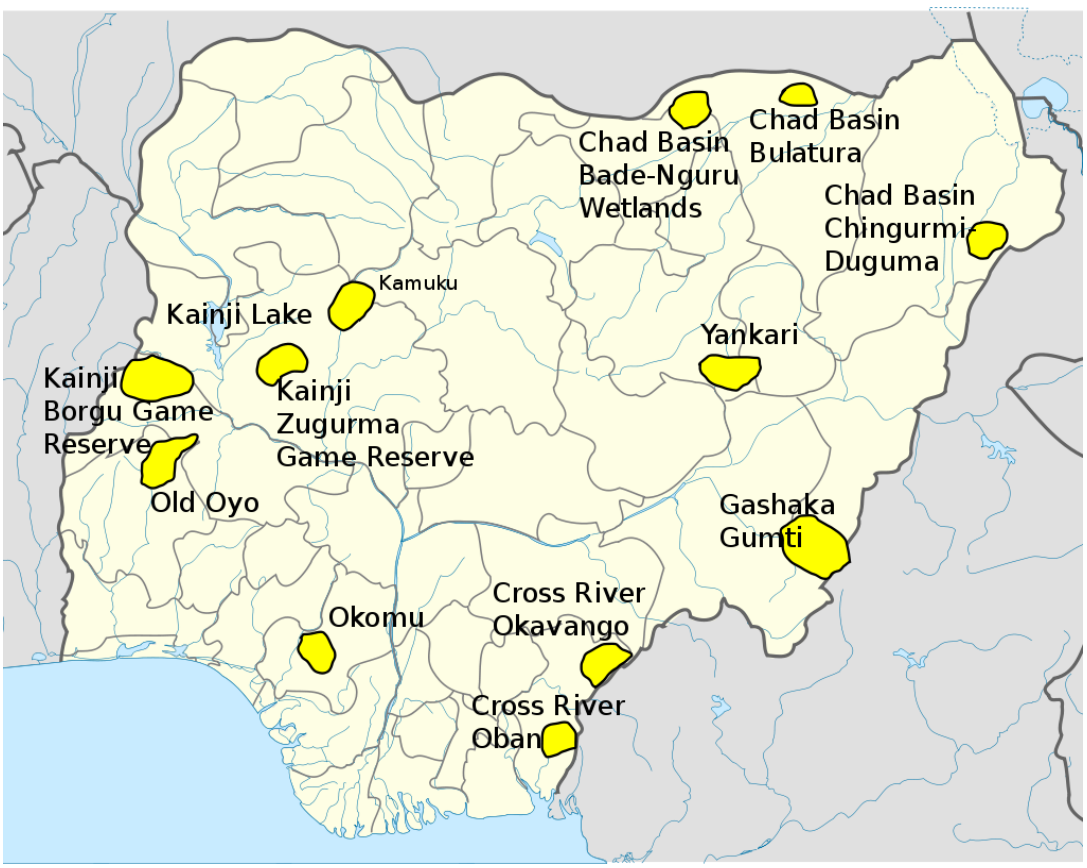


Figure 9. Nigeria showing National Parks

3.3.9 Forestry

Nigerian forests are already under great pressures arising from increasing populations and growing economic wealth leading to greater demand for forest resources. Drought is expected to add to these pressures, through direct impacts of the changing climate on forest growth and development and through greater demands on forests by populations adjusting to drought. Drought also increases potential for wildfires and increases the vulnerability of the nation's forests to wildfires.

3.3.10 Recreation and Tourism

Drought has direct and indirect impacts on the tourism/recreation sector, and can span all seasons. The most obvious are reductions in water-dependent activities, such as boating, rafting, canoeing or fishing from lower water levels and from shortened or shifted seasons. Water restrictions can also pose distinct challenges to water-dependent recreation. Intangible relationships are more difficult to quantify and link to drought, such as decreased visitations, cancellations in hotel stays, or a reduction in booked holidays. These could stem from negative perceptions of dryness, fire bans, or wildfires burning nearby vacation destinations (even if these are not in the vicinity). Wildlife viewing or hunting can also be affected through changes in animal and bird migratory patterns, causing reduced revenues for nearby towns and communities. Further, if drought results in negative experiences (for example, water restrictions or viewing a drought-stressed, brown landscape when visitors think it should be green), people may convey this to others, thereby reducing future visits from formerly interested visitors. The outcomes ultimately result in decreased tourist dollars for the local economy and a reduction of sales taxes, potentially even leading to unemployment or social and psychological impacts in the community. These may not be felt equally by all groups; seasonal workers, for example, might be disproportionately impacted.

Argungu fishing festival in Kebbi State which used to be an annual event that attracts tourist from all over the world, has not hold since 2008 because of the decrease in water level and stream flow in the entire Sokoto Rima river basin.

3.3.11 Commerce and Industry

Local industries depend to a large extent on locally available raw materials a substantial portion of which is agro-based. Consequently, drought poses a great threat to the production and availability of raw materials particularly if these are agro-based industries.

3.3.12 Transportation

Persistent drought conditions have the potential to limit port and inland waterway transportation operations by reducing routes available and limiting cargo carrying capacity associated with shallower depths, resulting in increased transportation cost. The cost could potentially be passed on to consumers, resulting in higher retail prices for goods normally moved by inland waterways. When high temperatures coexist with drought, drop in water level, can occur and affect additional transportation assets. Extreme heat and higher temperatures as has been observed in the European summer of 2018 can cause rail line buckling (sun kinks) causing derailments. Roads and airport runways are also, vulnerable to extreme heat and temperatures, which can soften and deteriorate asphalt as was reported in Turkey in summer 2018.

3.3.13 Communication

Communications equipment and information technology data centers use water for cooling. Data centers, for example, often use high tonnage heating, ventilating, and air conditioning systems that require potable water to operate in order to keep their computer systems cool. A sustained loss of water to a communications facility, which could happen during a drought, can cause equipment shutdown or failure, resulting in a degradation of communication capabilities. The loss of one Communications Sector segment data center is generally not critical to the operation of that segment, but it could disrupt some services for minutes to hours while requests for information are routed to operating data centers. In addition, submarine telecom cables in fresh water (rivers and lakes) could possibly be damaged if water levels are low, resulting in communication outages. Wildfires also pose a risk to the Communications Sector. In the Southwest, drought conditions make wildfires more likely and dangerous, damaging electric transmission and distribution systems as well as wooden electrical and communication poles and aerial equipment, including fiber optic and copper lines, microwave towers, and equipment in vaults.

4.0 ORGANIZATION AND ASSIGNMENT OF RESPONSIBILITIES

4.1 ORGANIZATIONAL OVERVIEW

Currently, there is no Drought Task Force in Nigeria. It is, however, strongly recommended that a Drought Task Force be constituted by the President. The Task Force should ensure:

- ✓ Timely and reliable monitoring of drought conditions and an assessment of potential impacts;
- ✓ An assessment of the vulnerability of key sectors, states, and community groups in the state and potential actions to mitigate those impacts; and
- ✓ The participation of all stakeholders in preparing for and responding to drought impacts, including development of countrywide water conservation strategy and public awareness programme.

A generalized organizational structure and membership of the recommended Drought Task Force (DTF) is presented in Figure 10. The functions of the task force include the following:-

- Policy: The Federal government is responsible for the strategic direction of emergency operations. Performs or supports the command function, which may include representations from other agencies.

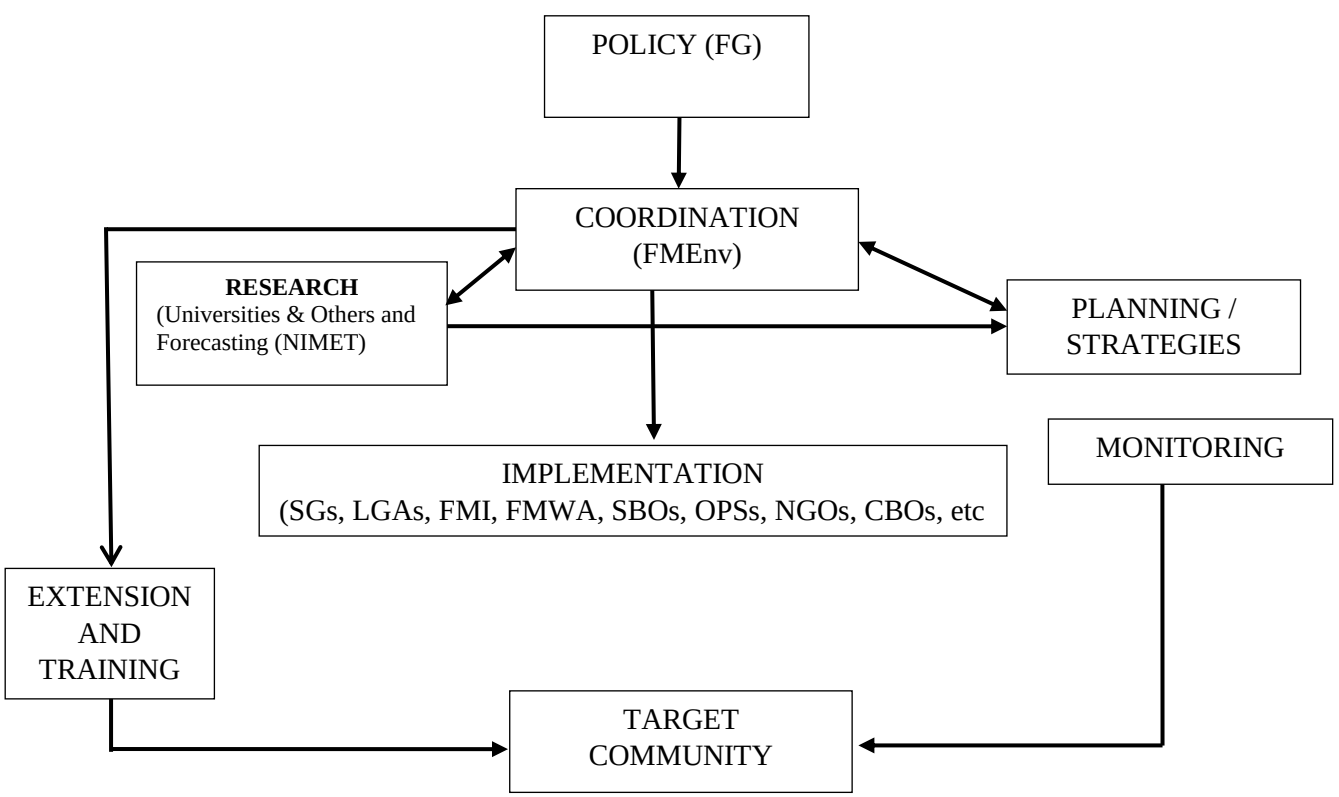


Figure 10. Drought Preparedness Strategy Organizational Structure

- Coordination: To provide staff support, leadership and inter-agency coordination to successfully implement the drought preparedness strategy in Nigeria. The Federal Ministry of Environment is the

coordinating agency for drought preparedness in Nigeria and so will coordinate the activities of the agencies identified to provide adequate preparedness, mitigation and response in the event that drought conditions emerge. It will also work in cooperation with the Monitoring Technical Committee (MTC) to prepare relevant reports, coordinate with media outreach, and provide the necessary technical oversight functions for long-term drought planning.

- Planning/Strategies: The group coordinates elements of information to provide focus for analysis relative to the incident. This group is responsible for monitoring and reporting the current status, as well as projecting and planning possible interventions in the future. Planning/Strategies has the primary responsibility for the production of action plans and to work directly with other units in order to coordinate operational requirement.
- Research: The Research component of the strategy will focus on the development of drought resistant crop varieties, livestock species and strains of grass for livestock grazing. It will also work directly with extension and training that is expected to guide the articulation of future research needs.
- Extension and Training: Extension and Training component is responsible for processing and dissemination of emergency public information to the implementation agencies and target communities.
- Monitoring: The monitoring unit of the drought preparedness strategy is the primary committee of the drought plan, that will provide an essential role in tracking changes in climate and physical conditions and providing forecasts of likely future conditions. The monitoring unit will serve as the on-going technical data collection and information dissemination group. It will monitor and identify conditions throughout the country on an on-going basis. The role of this unit is critical in early warning and detection of impending drought to facilitate preparedness at the federal, state and local levels.
- The monitoring unit is responsible for monitoring hydrological and climatic conditions and analyzing other relevant information necessary to determine the status of drought condition in Nigeria each year. It also reviews and reports long-term forecasts to assist state and local communities in their preparedness and response actions.

  The monitoring unit will issue alerts, as necessary, based on various stages of drought that will trigger action at the local, state government, the coordinating agency and the Federal Government levels. The monitoring committee will be required, statutorily, to meet monthly from October through May, or otherwise as necessary on the severity of conditions or drought status. The monitoring unit will each month give a climate status update to the coordinating Agency and will also provide Annual Report each year describing monitoring activities, drought status and recommendation for plan revisions related to their activities.
- Implementation: The primary role of Federal Ministry of Environment is mitigation and response. The coordinating Agency directs other agencies' actions to assess, implement and develop response options. The Coordinating Agency will identify pre-drought mitigation and adaptation options, and make recommendations to the Federal Government for resources necessary to provide assistance for continued implementation of the plan. The Coordinating Agency will provide the Federal Government with updates on annual basis. If drought conditions are present, the coordinating agency will advise the government of changes in drought status and will request a declaration of a drought emergency by October based on water supply situation, based on ancillary impact (e.g. crop failure, failure of wells to rebound following rainy seasons, etc.) The Organizational structures at the Federal and State levels are presented in Figures 11 and 12, respectively.

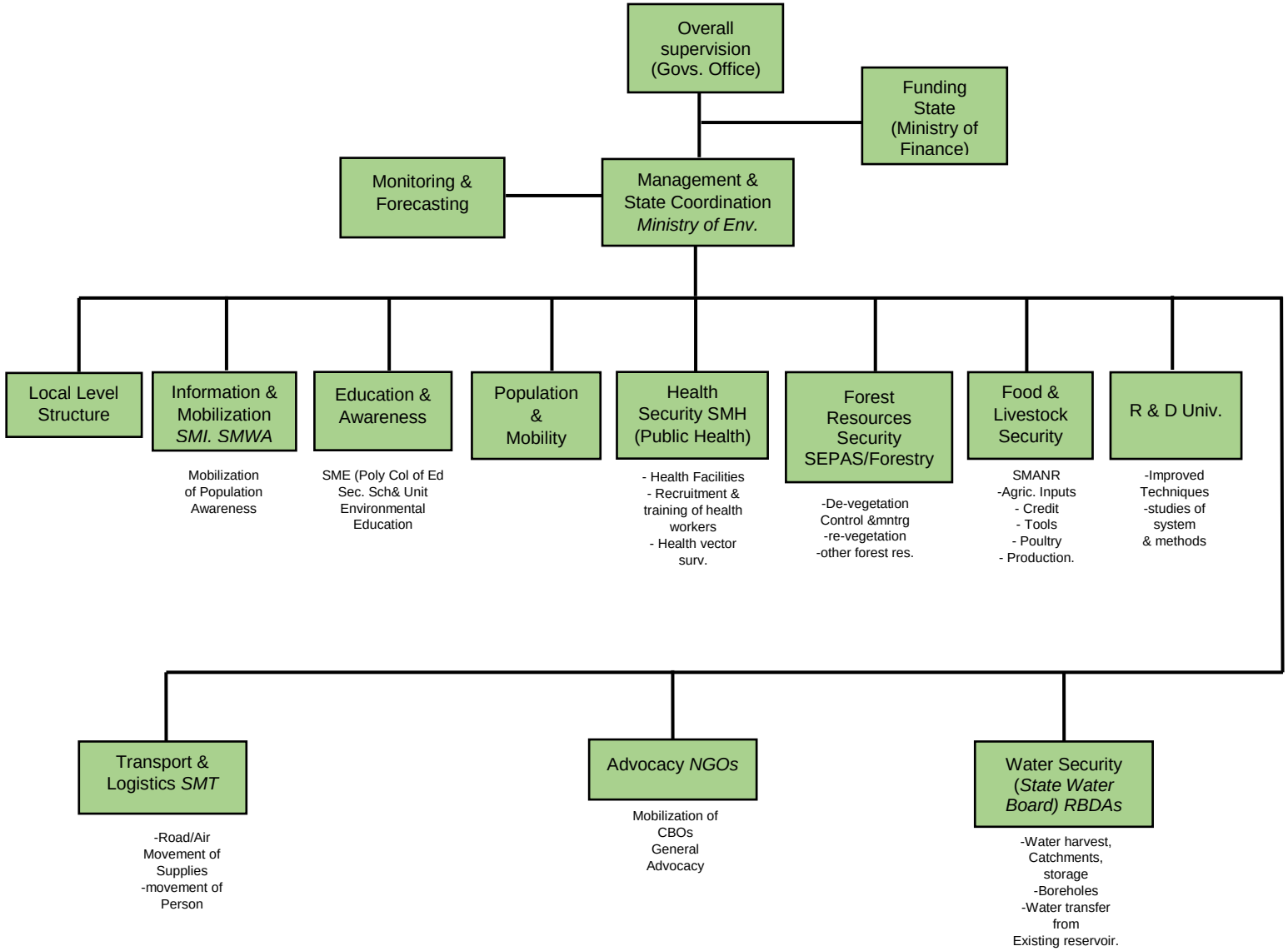


Figure 11. Function and membership structure of the Drought Response Task Force (state level)

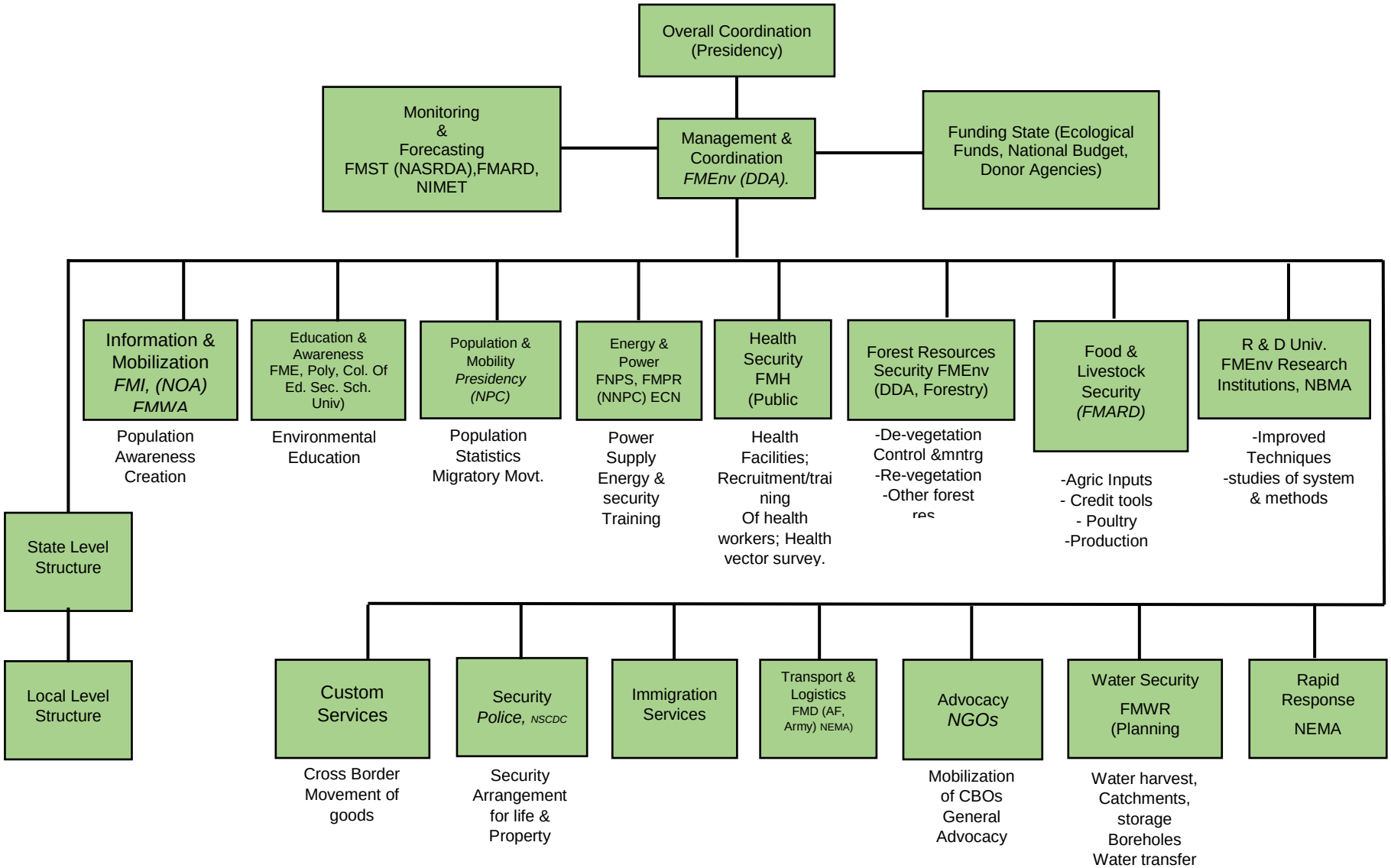


Figure 12. Function and membership structure of the Drought Response Task Force (Federal level)

4.2 ASSIGNMENT OF RESPONSIBILITIES

An effective drought plan should be based on an appreciation of the roles and responsibilities of the critical stakeholders in the system. The following are responsibilities to be executed by the stakeholders.

- COMMUNITIES: Particularly those that are most vulnerable are key to people-centered drought risk reduction strategies and actions. Their indigenous knowledge and ability to cope with drought and to respond will ultimately determine the extent of risk and drought impact. They should be aware of drought hazards and the related effects to which they are exposed and be able to take specific actions to minimize the threat of loss or damage. Local communities also promote the use of traditional knowledge and know-how.
- LOCAL GOVERNMENTS: Have direct responsibilities for citizen safety and considerable knowledge of the hazards to which their communities are exposed. They must be actively involved in the design and implementation of drought risk reduction programmes and projects, and understand all advisory and warning information received in order to be able to interpret, advice, instruct, or engage the local population in a manner that increases their safety and reduces the possible loss of resources and livelihoods on which the community depends. Local government also serves as the interface between local and national governments.
- STATE GOVERNMENTS: Are responsible for implementing policies and frameworks at state level. The state also provides early warning platforms and training of staff. Mainstream drought mitigation and adaptation strategies into all existing and new Development Plans and official Vision statements, and into all existing and new policies and programmes. Ensures that drought preparedness is taken into account when drawing up the State's Annual Budget. Actively and consistently strengthen inter-ministerial and inter-agency coordination and cooperation in drought preparedness and mitigation in the State.
- THE FEDERAL GOVERNMENT: Is responsible for policies and frameworks that facilitate drought risk reduction practices, as well as the technical systems required for preparing and issuing timely warnings. The Federal Government ensures coordination among different line ministries as well as with bilateral and multilateral partners through national platforms for disaster risk reduction and other existing mechanisms. They have responsibility at the national level to ensure the implementation of policies, develop mitigation and preparedness measures, and ensure that transition warnings and related responses address all of the population, particularly the most vulnerable. They also provide support to local governments and communities to develop coping capabilities and to translate drought risk policies into local drought risk reduction practices.
- REGIONAL INSTITUTIONS AND ORGANIZATIONS: Provide specialized knowledge and advice in support of national efforts to develop or sustain coping and operational capabilities of countries that share a common drought-prone geographical environment. Regional organizations are crucial to linking international capabilities to the particular needs of individual communities and in facilitating effective drought risk reduction practices among adjacent countries in regard to trans-boundary disaster risk reduction issues and response (e.g., drought-triggered refugees).
- INTERNATIONAL BODIES AND BILATERAL ENTITIES: Provide support for national drought risk reduction programs and projects and foster the exchange of data and knowledge between countries. Support may include provision of advisory information, technical assistance, and policy and organizational support necessary to ensure the development of the operational capabilities of national authorities or agencies.
- CIVIL SOCIETY ORGANIZATIONS: Will be responsible for raising awareness among individuals and organizations involved in disaster risk reduction and in the implementation of drought risk reduction policies and practices, particularly at the community level. This includes religious leaders and organizations that have a very powerful voice in communities and can help in raising awareness and public information dissemination. In addition, these individuals and groups play an important advocacy

role to help ensure that drought risk stays on the agenda of government policy makers. Some actions promoted by NGOs are at the cutting edge of people-centred drought risk reduction practices. They sometimes have some level of flexibility in accessing funding and developing and implementing new pilot strategies that can inform national and global drought risk reduction policy and practice.

- THE PRIVATE SECTOR: Has a diverse role to play in disaster and drought risk reduction, including developing coping capabilities within their own organizations. In addition, the private sector has a large untapped potential to help provide skilled services in the form of technical resources, knowhow, and donations (in-kind and cash) of goods or services, especially for the communication and dissemination of mitigation and preparedness measures, as well as to develop and communicate early warnings to reduce drought impacts. Positive contributions and interventions of the private sector that augment and comply with international best practices are encouraged.
- THE MEDIA: Should develop programmes that will improve the "disaster reduction consciousness" of the general population and disseminating early warnings. In many cases, the media is the primary means of communication between policy makers, practitioners, and the public. In this regard, the media carries a great responsibility to serve the need of their audiences, and policy makers and practitioners are tasked with improving ways to formulate messages that are "newsworthy" and attract the media.
- THE ACADEMIA: Will provide specialized scientific and technical input to assist governments and communities in drought risk reduction. Their expertise is fundamental to analyzing natural hazard risks facing communities; identifying and analyzing vulnerability of people and livelihoods; supporting the design of scientific and systematic monitoring, communications, and warning services; supporting data exchange; translating scientific or technical information into comprehensible messages; and disseminating understandable warnings to those at risk. Scientists also analyze and promote the use of traditional knowledge as well as the transfer and adaptation of appropriate technology. They assess, promote, and further develop a body of knowledge based on lessons learned from concrete experiences in the field.

4.3 COMMUNICATION AND COORDINATION GUIDELINES

Several agencies will be involved in the management and coordination activities of the Drought Task force. In organizing and assigning responsibilities and composition of committees in a drought plan, men and women must be assigned responsibilities as equal participants in the planning process. The composition of all committees must also be gender sensitive. This is because of the need for women and men to be equally represented in committees in a bid to ensure that gender equality considerations are infused into the planning stage.

Their functions/roles are as presented below:

- The overall leadership of the Task Force shall be based in the presidency.
- The Federal Ministry of Environment shall be responsible for the overall supervision of the Drought Response Strategy Task Force. The Ministry will also be responsible for linking up with sources of funding, which shall include the Ecological funds office, Federal Ministry of Finance, and the International Donor Agencies.
- The responsibility for organizing appropriate preparedness and responses to warnings rests with National Emergency Management Agency (NEMA), but it also requires interaction with forecast institution particularly NIMET and NASRDA.
- The Federal Ministry of Information and National Orientation Agency (NOA) and the Federal Ministry of Women Affairs as well as the print and electronic media will be responsible for mobilization of the population and awareness creation of drought Conditions and Mitigation Measures etc.
- The Ministry of Women Affairs should be the lead agency for gender issues, the ministry will be responsible for the provision of technical assistance on gender issues.

- The Federal Ministry of Education, including Secondary and tertiary institutions will carry the task of environmental Education and awareness creation.
- The National Population Commission will provide population Statistics and Information on migratory movements of the population, which is vital for planning and mitigation measures.
- The task of energy and power supply will be the responsibility of Federal Ministry of Power and Steel, Electricity Distribution Companies, Nigerian National Petroleum Corporation, Federal Ministry of Petroleum Resources and the Energy Commission of Nigeria.
- The provision of health facilities, recruitment and training of health workers and health survey and monitoring will be the function of the Federal Ministry of Health.
- The Federal Ministry of Environment will undertake the function of de-vegetation control and monitoring, re-vegetation; ensure optimum grazing of land establishment and conservation of fodder banks and management of other forest resources.
- The Federal Ministry of Agriculture and Rural Development, specifically the Federal Department of Agriculture, Federal Livestock Department, Strategic Grain Reserve and Federal Agricultural Land Resources will be responsible for ensuring food security, supply of agricultural inputs, credit, livestock feed, among others.
- The Nigerian Agricultural Insurance Corporation (NAIC) and The Nigerian Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL), will be responsible for providing credit facilities and insurance.
- National Biosafety Management Agency (NBMA) will be responsible for endorsing improved variety of seeds, trees and other modern biotechnology during drought disasters.
- Nigerian Customs Service will be responsible for cross-border movement of goods, while the Nigerian Immigration Service will be responsible for cross-border movements of persons.
- The Federal Ministry of Water Resources will be responsible for the provision of boreholes, water transfer from existing reservoirs, water harvesting, catchments and storage.
- The Police and the Nigerian Civil Defense Corps will ensure security arrangement for life and property.
- Ministry of Defense and the National Emergency Management Agency (NEMA) will be responsible for the movement of supplies and persons by road, rail and /or air.
- Research and Development will be the responsibility of Universities and research Institutions.
- Data specific to drought will be acquired from NIMET, NIHSA, National Bureau of Statistics, Ministry of Water Resources and Center for Climate Change and Freshwater Resources.
- NIMET is strictly responsible for collection, analysis and forecasting meteorological data relevant to drought and drought forecasting
- Each ministry, department and agency, should have its own gender strategy and a gender and drought focal point, the Ministries of Finance and National Planning should have a gender unit specialized in gender budgeting and to assess gender mainstreaming by different sector plans and budgets.
- Relevant institutions, ministries and agencies will be responsible for collection of other relevant data associated with their respective statutory responsibility needed for drought monitoring, analysis and impact assessment.

5.0 DROUGHT MONITORING, FORECASTING, AND IMPACT ASSESSMENT

5.1 STANDARD FORECASTING SYSTEM

The Nigerian Meteorological Agency is the government agency vested with responsibility of forecasting climatic and weather events including drought. NiMET uses the WMO recommended Standardized Precipitation Index (SPI) technique for drought monitoring and forecasting.

The SPI is a popular meteorological drought index that is also solely based on precipitation data. Similar to the percent of normal, SPI compares precipitation with its multiyear average. SPI overcomes the discrepancies resulting from using a non-standardized

distribution by transforming the distribution of the precipitation record to a normal distribution. For this, the precipitation record is first fitted to a gamma distribution that is then transformed into a normal distribution using an equal-probability, transformed values below zero indicate dry periods (Table 6).

Table 6. Standardized Precipitation Index (SPI) Values and Categorization

Class No.	SPI value	Drought Category
1	>= 2.00	Extreme wet
2	1.50 to 1.99	Very Wet
3	1.00 to1.49	Moderate Wet
4	0.0 to - 0.99	Mild Drought
5	-1.00 to -1.49	Moderate Drought
6	-1.50 to -1.99	Severe Drought
7	<= -2.00	Extreme Drought

Source: McKee, *et al*., (1993); and NDMC (2006)

For any given drought, its score in SPI represents how many standard deviations its cumulative precipitation deficit deviates from the normalized average. If a value of less than zero is consistently observed and it reaches a value of –1 or less, a drought is said to have occurred. An important aspect in the development of the SPI is its ability to calculate drought levels for different time scales. McKee's index can be computed for any time period, however typically it is applied for the 3, 6, 12, 24, and 48 month periods. Overtime precipitation deficit gradually and variably affects different water resources (e.g., stream flow, groundwater, and snowpack), the multitude of SPI durations can be used to reflect change in different water features. In December 2009, the Inter-Regional Workshop on Indices and Early Warning Systems for Drought was held (Lin-coln Declaration on Drought Indices, WMO 2009). One of the goals of the workshop (attended by representatives from 22 countries), was to help determine the best "meteorological" index to be used by national meteorological services to facilitate comparisons of drought severity among countries in the same region, and also among regions possible. The SPI was chosen by participants as the one to use.

5.2 The Lake Chad Flood and Drought Monitor

Recently an updated groundwater model of the Lake Chad Basin that integrates all the existing data and knowledge was developed. In addition, the Remote Sensing Initiative of the Global Water Security and Sanitation Partnership (GWSP), is also supporting these CIWA-funded efforts by leveraging the power of satellites to monitor surface water dynamics. With real-time satellite rainfall estimates, weather predictions,

seasonal forecasts, and a hydrologic model, water resources are monitored and hydrologic predictions are displayed through a user-friendly interface called: **The Lake Chad Flood and Drought Monitor.**

The development of linked surface and groundwater modeling systems, with data from multiple organizations, will help establish a foundation to inform the good management of the Lake Chad basin's water. This system, transparent and collaboratively developed, will let decision-makers assess the impacts of potential future projects and investments as well as their sustainability and resilience under different climate scenarios. In other words, it can inform a common view of what a sustainable, balanced basin would be in terms of abstractions from surface and groundwater for development purposes.

5.3 Drought Severity in all Relevant Sectors

Understanding trends in drought-related severity over time is important for projecting future impacts and understanding changing vulnerabilities. Each drought produces a unique set of impacts, depending not only on the drought's severity, duration, and spatial extent but also on ever-changing social conditions. For practical purposes, the drought impacts can be classified as economic, environmental, or social, even though several of the impacts may actually span more than one sector. These impacts are symptoms of underlying vulnerabilities. Therefore, impact assessments are a good starting point to determine underlying vulnerabilities to target response measures during drought. An impact assessment highlights sectors, populations, or activities that are vulnerable to drought.
The Following are Impacts of drought in various sectors:

Table 7. Sectoral Impacts of Drought

S/N	SECTOR	IMPACTS
1	Agriculture	•Land Degradation ✓ Soil Infertility. ✓ Erosion ✓ Desertification. • Low crop yield. • Increase in pest infestation. • Degrading grazing area and lack of pasture. • Decline in water availability for livestock and in Fadama areas.
2	Water resources	• Decrease in water level. • Siltation. • Reservoir depletion • Drying of water bodies. • Contamination/pollution of water sources. • Eutrophication. •Migration of affected population.
3	Biodiversity	• Deforestation and land degradation. •Decreased moisture level. •Decline in Pollinators. • Decline in number and diversity of aquatic plant and animals. •Introduction of invasive weeds. • Migration of Animals.

4	Energy Availability	• Losses in hydropower potential for electricity generation. • Inadequate fuel wood availabity.
5	Peace and Security	• Resource conflict. • Vandalism. • Militancy. •Insurgency.
6	Health and nutrition	• Malnutrition as a result of famines. • Air pollution. • Increase in prevalence of infectious diseases. • Food and water borne diseases.
7	Forest	• Deforestation. • Increase in frequency and intensity of Wild fires.
8	Recreation and Tourism	• Reductions in water-dependent activities, such as fishing festivals, Boat Regattas etc. • Decreased tourist traffic. • Cancellations in hotel stays, or a reduction in booked holidays. • changes in animal and bird migratory patterns • Reduced revenues.
9	Commerce and Industry	• Scarcity of raw materials. • Destruction of plant and equipment. •Scarcity of water for cooling of machines.
10	Transportation	• Limits port and inland waterway transportation operations. • Reduction in available routes. • Shallow depths which limits cargo carrying capacity. • Increase in transportation cost. • Rail line buckling (sun kinks) causing derailments. • Soften and deteriorate asphalt, which affects Roads and airport runways.
11	Communication	• Scarcity of water for cooling of machines. • Degradation of communication capabilities. • Damaging electric transmission and distribution systems.

5.4 A DROUGHT IMPACT ASSESSMENT METHODOLOGY

Drought impact assessments begin by identifying direct consequences of drought, such as reduced crop yields, livestock losses, and reservoir depletion. These direct outcomes can then be traced to secondary consequences (often social effects), such as the forced sale of household assets or land, dislocation, or physical and emotional stress. Impacts should be examined for their occurrence in past or recent droughts, but consideration should also be given to the question "What drought impacts will be seen in the future?" Impacts are occurring or have occurred in their region Impacts are grouped by category, such as agriculture, water, energy, environment, fire, social, etc. This type of activity will help planners identify the range of impacts that are important in a region.

It is essential that impacts are assessed and archived in some manner. Institutional memory is often short and people's recollections biased. Accurate records of drought impacts will help provide more objective information on which to base planning decisions.

Once a drought impact assessment has been performed, the next step is to rank the highest priority impacts. Drought can result in many direct and indirect impacts. Some of these may be more important than others in terms of values and interests. Addressing the most significant impacts first will help target limited resources and hopefully have a larger effect in reducing drought impacts.

To assist in the ranking and ensure equitable policy formulation, the general public, community advisory committees, and groups of relevant scientists and policy makers should be included in the process.

5.5 VULNERABILITY ANALYSIS:

Vulnerability analysis provides a framework for identifying the social, economic, political, physical, and environmental causes of drought impacts. It directs attention to the underlying causes of vulnerability rather than to its result, the negative impacts, which follow triggering events such as drought.

A vulnerability analysis begins with asking why significant impacts have occurred (or why they might occur). It is important to realize that a combination of factors (e.g. environmental, economic, and social factors) or underlying causes (e.g., livelihoods at risk, incentive preferences, and inappropriate crops) might produce a given event. In assessing vulnerability, it might also be beneficial to draw these causal relationships in some form of a tree diagram.

Other resources for gathering information on vulnerable populations, particularly in regard to drought and famine, include programs such as:

- The Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS),
  FIVIMS are networks of national information systems that assemble, analyze, and disseminate data on food insecurity and vulnerability. Their objectives are to raise awareness about food security issues, improve the quality of food security related data and analysis, facilitate integration of complementary information, promote better understanding of users' needs and better use of information, and improve access to information through networking and sharing.
- The World Food Programme's Vulnerability Analysis and Mapping (VAM) system, VAM uses a wide array of technological sources and analytical methods: satellite imagery and spatial analysis, monitoring of food prices in local markets, exhaustive household surveys, and discussions with members of poor and food-insecure households to understand the nature of food insecurity and the risks to livelihoods.
- The Food and Agriculture Organization of the United Nations food security system. FAO is the UN Food and Agriculture Organization, which also supplies food security statistics and maps, such as a map of the percentage of undernourished population by country around the world. Gathering and sharing this type of information is essential for analyzing drought vulnerabilities and helping decision makers target mitigation actions that will help address the real causes of drought impacts.

The severity of drought is often not lost to the level at which drought impacts men and women. The impact of any drought can only be measured when gender aggregated data and analysis on how men and women, boys and girls assess the severity of the drought and its impact on themselves and their households are in the measurement tool. Such data help mitigation planners to recognise the peculiar challenges of the genders in order to come up with effective, gender transformation solutions. The importance of women as key agents of change must be exploited by giving them opportunity for equal participation in planning with a view to having them contribute to drought response.

6.0 DROUGHT RISK AND VULNERABILITY

Drought risk is the probability of harmful consequences or expected loss of lives, injuries, property, livelihood, economic activities disrupted or environment damaged resulting from interactions between drought -induced hazards and vulnerable condition.

The relationship between risk and hazard is generally illustrated by the equation:

$$H \times \frac{V}{C} = R$$

Where H is the drought hazard inh erent in a given community
V is vulnerability to drought hazards
C is a capacity attribute of the drought to become a disaster
R is the Risk factor

Vulnerability refers to the inability of an individual or a group to prepare, respond, cope and recover from a disaster. It is determined by a variety of social, economic, cultural and political factors which define individuals or group's status, position and power in a society.

Risk becomes a disaster when people are overcome by its effects, lives and livelihoods are lost and property is destroyed. Poverty, education, livelihoods, and culture of the people are directly linked to vulnerability. Official actions taken to achieve disaster reduction and mitigation by states and communities are often targeted at reducing vulnerability.

6.1 THE DROUGHT RISK, VULNERABILITY ASSESSMENT AND GIS MAPPING

Drought is typically a slow-onset phenomenon, which means that it is often possible to provide early warning of an emerging drought. Such information allows for a shift from reactive to proactive drought hazard management and represents a change in focus from disaster recovery to disaster prevention. Because there is no single definition for drought, its onset and termination are difficult to determine. We can, however, identify various indicators of drought specific to sectors or water uses, and tracking these indicators provides us with a crucial means of monitoring and providing early drought warnings.

Drought by itself does not trigger an emergency. Whether it becomes an emergency or not depends on its effect on local people, communities and society, and this, in turn, depends on their vulnerability to the stress of the drought.

Drought risk and vulnerability assessment and mapping are key elements of drought management because they help identify the areas that are most at risk of droughts, allowing communities to plan, as well as prepare for and mitigate possible impacts. Risk and Vulnerability assessment provide comprehensive, participatory, gender-sensitive analysis of drought risk and vulnerability.

6.1.1 Participatory Vulnerability Capacity Assessment (PVCA)

A Participatory vulnerability and capacity assessment is a method of investigation and data gathering that uses various participatory tools in order to understand:

- The natural hazards people face in their locality.
- Their vulnerability to hazards and to other threats, stressors and shocks.
- Their capacity to cope with and recover from disasters.

It is also a **process** that allows the people to identify, analyse, prioritise and design actions that contribute to disaster risk reduction.

PVCA has also several other functions. It helps mobilize communities and raises awareness of the risks they face. The PVCA results can support advocacy efforts and even resource mobilization.

Plates 4 (a&b). a. Community Resources Mapping at Abdallawa Community (Katsina). b. Community Resource Mapping at Uchiri Community in Fakai (Kebbi)

The PVCA process enabled communities and those most vulnerable to droughts to map their hazards, analyze their own problems and risks and to find solutions. It also helped organizations and local authorities to understand community level risks and how community members perceive the hazards and respond to these threats to their lives and livelihoods. Communities in the CDAs identified the obvious risks they faced, such as drought and food insecurity.

The PVCA created a common understanding of the basic disaster risk reduction (DRR) concepts such as hazards, risks, disasters and resilience and how to present these concepts in accessible way in local languages. This was done in an interactive process which encouraged the sharing of lessons and experiences. Assessment tools were adapted, taking into account various community development challenges such as community project ownership and sustainability, incentives and motivation, community expectations and dependency.

Through the PVCA, identification of the key resources and capacities available in the area to help reduce risks and mitigate vulnerabilities of individuals and communities were made possible. It also addressed gender issues by:

- Providing vulnerable women with a chance to develop and voice their unique concerns.
- Analyzing differences in vulnerability between men and women.
- Providing information on gender aspects of vulnerability to communicate to local stakeholders, including community leaders, government and NGO's.
- Allowing the design of adaptation strategies that meet women's needs and priorities.
- Building evidence of women's particular vulnerability to drought and disasters.

The key gender issues underpinning the PVCA design for the National Drought Plan were:

- The particular vulnerability of women to drought
- Women's role in providing food and water for the family.
- The knowledge of environmental change and livelihood alternatives that women have as a result of their role in the household.
- Women have limited power in household and community decision-making process.
- The potential of women to make positive change in their households and communities which increase their adaptive capacity to droughts.

Men and women benefited from the PVCA process because gender differences in vulnerability are recognized and communicated to local stakeholders. This also means that adaptation strategies can be designed to meet the needs of the most vulnerable particularly poor women. Helping women increase their adaptive capacity has lasting benefits for their families and communities.

The PVCA provides a tremendous potential for governmental agencies and development partners who may have resources to support community-based mitigation and response measures but may not have the time to undertake detailed investigative studies on the bases of which investments could be made. Efforts may be required to develop the capacity of these entities to more fully explore and implement mitigation and response strategies in drought vulnerable communities in the country. This includes the ability to inventory national capacities to identify, assess, and implement mitigation and preparedness measures.

The ability to assess and incorporate local indigenous knowledge, capacities, and needs into drought mitigation and preparedness strategies is also essential in order to develop and implement equitable and community-based solutions. Planning at all levels should be collaborative and inclusive which has been a hallmark of the PVCA. As gaps in capacity are identified, resources and expertise should be targeted to meet these needs. Appropriate long-term investment of financial and technical resources into capacity development and drought mitigation and preparedness activities will be required to sustain these efforts.

6.1.2 Geographic Information System Mapping

Monitoring and modeling local environmental changes has been an environmental challenge in the past. Different methods have been used to assess land use and land cover change pattern particularly in inaccessible environments, including both conventional ground survey methods remote sensing techniques. Studies have shown that monitoring land use and land cover change with conventional ground survey methods takes much more time and it is labour intensive. It is very difficult also to monitor spatio-temporal changes with conventional methods.

Remote sensing and geographical Information systems are known for technological robustness to meet challenges of spatial and temporal monitoring of land use and land cover change. It has been shown that the use of GIS is not only good for preparing precise land use and land cover maps, and observing changes at regular intervals of time but it is also cost effective and time efficient.

The insecurity issues all over the Nigerian landscape have made accessibility to different parts of the country a major challenge and so conventional ground survey methods have been rendered virtually impracticable. With the Niger Delta restiveness (South South geo-political zone), the Farmer/Herder Conflicts (North West, North Central and South West geo-political zones), Kidnapping and Cessation Struggles (South East geopolitical zone) and the *Boko Haram* insurgency (North East Geopolitical zone) there is no part of the country that is safe for conventional ground survey for mapping land use and land cover associated with droughts monitoring. Multi-dates Landsat images could be used to map different parts of the country. Both remote sensing and GIS techniques could be used to quantitatively assess spatio-temporal change in land use and land cover in the country. For this PVCA exercise the ArcGIS software can be used to Geo-reference drought prone communities.

It also facilitated the development of locally owned action plans and collaborations and provided suggestions on how to address the problems.

6.1.3 Effective Response to Early Warning

The National Emergency and Management Agency is the institution mandated to handle disasters in Nigeria. The institution is responsible for providing relief in times of drought.

NiMet produces monthly Flood and Drought Monitoring Bulletin as a standard drought monitoring tool in line with World Meteorological Organization (WMO). The bulletin is one of the Agency's important early warning tools which provide adequate information line with different types of drought. These are;

- ✓ Monthly (meteorological and agricultural drought),
- ✓ Monthly (groundwater drought),
- ✓ 12-Monthly (stream-flow and lake storage drought)

For drought early warning (DEW) to be effective, the State Ministries of Agriculture and Rural Development should take an active role in communicating the warnings. With the aid of the Extension Officers (EOs) that are well distributed in all the ADPs, it is expected that DEW could be very effective as many of the farmers over the years have started to adopt new ideas about drought risk management. In all the communities visited during the advocacy and vulnerability capacity assessments men, women and youths were eager to know how to mitigate the effects of droughts on agriculture.

6.1.4 Drought Risk Information Systems

NIMET and other similar agencies that have a lot to do with physical wellbeing of the country is indispensable for early warnings in all aspects ranging from flood disasters to perhaps occurrence of meteorite showers in the firmament. Drought risk which is an insidious aspect of the climate variability has to be accentuated because its effect could be more devastating than all other climate disasters put together. Persistent drought over several decades and perhaps centuries has led to the formation of sand dune land forms in Northern parts of Nigeria.

For effective drought management, there is a need for synergy among all the agencies to link theory/science and practice. For instance the climate data from NiMET should be linked with the ones from NASRDA in order to overlay the data and monitor/predict progression of drought in a year or a period of interest. This would help if the information is disseminated in good real time and in a manner that is understandable for early response by stakeholders particularly the farmers and the herders.

6.1.5 Benefits of Drought Risk Assessment

Drought risk assessment is a very important exercise in managing drought impacts because it:

- ➢ Protects vulnerable ecosystems against effects of droughts in high-risk areas where drought impacts are exacerbated by human activity.
- ➢ Reduces land degradation and desertification.
- ➢ Improves drought mitigation and management in high-risk areas and in consideration of factors that may exacerbate the impacts.
- ➢ Creates visual products that may improve the understanding of climate-related risks and threats amongst key stakeholders.
- ➢ Informs better identification of response measures, e.g. water-retaining agricultural practices, water storage, fixing leaks in municipal water supplies, promotion of water-saving techniques in households.

6.2 DROUGHT IMPACT ASSESSMENT METHODOLOGY

Drought impact assessment highlights sectors, populations, or activities that are vulnerable to drought. Impact assessment methodologies, maps, and standards should continue to be tested and modified to meet the needs of stakeholders. They should also become an integral part of national and local planning strategies.

Institutionalizing the processes will help ensure they are carried out as administrations and initiatives change over time.

In order to enhance impact assessment efforts, it is recommended that researchers and planning entities support the development of common methodologies for defining and assessing risks, thereby encouraging the identification and adoption of best international practices. This includes the adoption of drought hazard and vulnerability indicators and using metrics most relevant to decision makers and clients (e.g., identifying the agricultural drought hazard rather than simply the climate hazard).

In addition, researchers and practitioners should develop, update periodically, and disseminate risk maps and related information on drought exposure and vulnerability, with special emphasis on those populations most at risk. Institutions must also cooperate regionally and internationally, as appropriate, to assess and monitor regional and trans-boundary hazards and vulnerabilities and exchange relevant information.

Similarly, understanding trends in drought-related impacts over time is important for projecting future impacts and understanding changing vulnerabilities. Each drought produces a unique set of impacts, depending not only on the drought's severity, duration, and spatial extent but also on ever-changing social conditions. For practical purposes, the drought impacts can be classified as economic, environmental, or social, even though several of the impacts may actually span more than one sector. These impacts are symptoms of underlying vulnerabilities. Therefore, impact assessments are a good starting point to determine underlying vulnerabilities to target response measures.

6.3 HAZARD ASSESSMENT

The frequency of occurrence of meteorological drought at various levels of intensity and duration defines the drought hazard for drought-prone regions of the country. It is critical for the agencies charged with drought management to better understand this hazard and how it varies temporally and spatially, and to establish comprehensive and integrated drought early warning systems that incorporate climate, soil, and water supply factors such as precipitation, temperature, soil moisture, snowpack, reservoir and lake levels, ground water levels, and stream flow.

It is also essential to identify trends in temperature and precipitation amounts, changes in the seasonal distribution and intensity of precipitation events, and other changes in climate that might be helpful in understanding how the hazard may change in duration, frequency, and extent in the future.

6.3.1 Drought Monitoring and Early Warning

Drought early warning system (DEWS) refers to the set of capabilities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by drought to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss. It is a process of reading specific indicators as signals and patterns of signals, and translating those patterns into some kind of anticipation of the likelihood of the emergence or escalation of a disaster.

A people-centered drought early warning system comprises of four elements:

- Knowledge of the drought risk
- Monitoring of the drought elements,
- Analysis of the elements
- Forecasting of the drought hazards.

- Communication and dissemination of alerts and warnings and local capacities to respond are keys to a successful early warning system. In Nigeria, DEWS can be formal, (scientific) or indigenous (based on traditional practitioners). A good practice in an effective DEWS needs the following:

- Have local networks of multiple local monitors
- Make information available for both local and international response
- Be consistent in providing resources
- Have strong inter-linkages and effective communication channels between all the elements.

Effective DEWS allow people to prepare in good real time before the onset of a drought so that they are much more resilient to it. Knowing the hotspots of drought risk, and quantifying the level of risk for individual locations, can ensure local populations are well equipped to cope with drought-related events. Improved water resources management provides a means to achieve the SDGs. Methods for managing water variability are especially relevant to the SDGs for food security, water security, economic growth, and climate change adaptation, with an emphasis on basin-scale hydrological management techniques

6.3.2 Tracking Progress

Planners should develop performance indicators and institute a monitoring process to measure progress in drought risk identification, impact assessment, awareness, and knowledge through engagement with the communities and stakeholders, and further engage in effective mitigation and preparedness measures. In Nigeria, drought monitoring and management is under the authority of the NiMET and FMEnv. and policy makers in line ministries. NGOs provide an important link to stakeholders that are ultimately affected by drought and benefit from risk reduction efforts. They are also the experts in social capacity development and policy analysis, who are needed to implement and review risk assessment methodologies.

Monitoring and evaluating the effects of risk assessment programs requires an extensive review of on-the-ground projects, the development of case studies, and discussions with a wide range of stakeholders affected by drought. The PVCA (Section 6.1) provides a good opportunity for the integration of physical and social sciences

6.3.3 Enhancing Drought Monitoring and Early Warning Capacities

Drought monitoring could be enhanced through use of greater density of *in situ* meteorological observations that are undertaken from meteorological station or through remotely sensed equipment that provide relevant data on meteorological variables (Plate 5).

Plate 5. Automatic Weather Station

To improve drought monitoring and early warning systems in Nigeria the following areas need to be addressed:

- The set of capacities needed to generate and disseminate timely and meaningful drought warning information to enable individuals, communities and organizations threatened by drought hazard to prepare and act appropriately and in sufficient time to reduce the possibility of harm or loss.
- Indigenous early warning knowledge, skill and practices should be identified and how they relate to modern systems of early warning.
- Gender-responsive monitoring and evaluation indicators should be used to help assess the overall effectiveness of the national drought plan.

Source: UNCCD/FMenv Report, 2017

Plate 6. Indigenous weather forecaster predicting rainfall using lunar cycle at Maigatari, Jigawa State, July 2017

It is generally believed that the integration of indigenous knowledge with scientific early warning systems can address the early warning communication challenges of at-risk communities often ignoring or not responding to formal forecast messages. The international DRR frameworks, including Hyogo and particularly Sendai, promote the value of indigenous DRR knowledge. In addition, the SFDRR endorses the use of multi-hazard EWS as a sound disaster risk reduction investment strategy and promotes the incorporation of disaster risk reduction in development and planning processes in the country. One of the major goals declared in SFDRR is to ''substantially increase the availability of and access to multi-hazard EWS and disaster risk information and assessments to the people by 2030''. The premise of this goal is that when people become more resilient to hazards and risks they are able to protect themselves better.

In the context, of Nigeria, one way of achieving this is by incorporating African indigenous knowledge to the Seasonal Rainfall Predictions (SRPs) that NiMET makes at the beginning of each year. The utilization of the EW information from the SRPs by the small-scale farmers, whose crops/livestock depend largely on the rainfall which has been decreasing in some parts of the country, is still below average. The perspective of the interface is that Indigenous knowledge (IK) and modern science based weather forecasts are not mutually exclusive.

Through the interface a careful integration of the two systems will offer opportunities especially in the dissemination process of weather forecasts to farmers in the country because this will support ways that are culturally appropriate and locally relevant.

It is important to include traditional knowledge into early warning because the messages from scientific warnings are still not effectively communicated, and not sufficiently responded to. A warning should be communicated in the form that it is understandable and provokes response action from the people to which the warning message was sent.

Scientific Early Warning as given in the seasonal rainfall prediction (SRP) in Nigeria is highly elitist and so retards the capacity of vulnerable populations to respond. This is particularly true in the northern part of the country where there are high levels of illiteracy and the attitude to western education is negative as indicated by the *Boko Haram* (western education is an abomination) phenomenon. The language of communication used in the SRP is English and the concepts too technical and so beyond the comprehending capacities of local communities.

The adoption of the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters has given impetus to disaster reduction activities worldwide including drought early warning systems.

The United Nations International Strategy for Disaster Reduction (UNISDR) conference in Sendai, Japan, (2015-2030) replaced the Hyogo Framework for Action (2005–2015) as a guiding policy document to steer disaster risk governance. Although the Hyogo Framework for Action was able to bring disaster risk reduction (DRR) to the attention of international and national development agencies for investment priorities, the Sendai, promoted the value of indigenous DRR knowledge in the management of disasters.

Further, Priority 2 of the HFA: know the risks and take action urge nations and communities to identify, assess and monitor disaster risks and enhance early warning. This priority promotes that the understanding of risk is critical for reducing vulnerability to natural hazards. It is essential that communities understand the cause and effect of risk, that they can identify risks and have the knowledge of how they can reduce them. It involves observing, forecasting, recording, analyzing and mapping of hazards and vulnerability at all levels – from village to national level – in order to inform appropriate evasive actions.

Tools are needed to enable this to be done in a way which is inclusive and fully involves citizens and government alike, in decision-making and design. Most importantly, countries and people need to use this knowledge to develop effective early warning systems. When effective early warning systems provide information about a hazard to a vulnerable population, and plans are in place to take action, thousands of lives can be saved. Early warning is therefore widely accepted as a crucial component of disaster risk reduction (DRR).
The local community has built this knowledge over the years from their understanding of the forecasting and the probability of future rain based on variance in wind, humidity and temperature. Secondly, based on the kind of social-economic activities the community indulges in interpretations of animals, insects, birds, and plants behavior is performed. These generally affirm the rainy season indicators because the plants/creatures observed exhibit subtle fluctuations in temperature and humidity.

Studies on early warning systems today, generally, concur that indigenous knowledge and modern science complement each other. In order to develop sustainable strategies, it is therefore important to take into account of, and learn from, what local people already know and do, and to build on this. Scientific and indigenous knowledge systems have increasingly been accepted as two areas of expertise that complement each other.

For Drought monitoring and early warning systems to be enhanced, planners and scientists should work together in order to promote the development of systems that are timely, relevant, understandable, affordable, and people- centered. In order to achieve this goal, it is essential to develop the appropriate social and technological capacity to research and implement programs to better understand, monitor, and communicate drought occurrences and their related effects. This includes fostering the ability of federal government's agencies such as NIMET, NIHSA, NASRDA, NBMA and other planning entities to support the development and sustainability of the required infrastructure and scientific, technological, and institutional capacities needed to research, observe, analyze, map and, where possible, forecast drought hazards and impacts.

Development and improvement of relevant databases remain a key aspect of drought preparedness in Nigeria. NIMET should be encouraged to provide and disseminate data for assessment, monitoring, and early warning for drought at all levels. This includes: the development of decision-support models for the dissemination of drought-related information to end users and appropriate methods for encouraging feedback on climate and drought assessment products, and on other forms of early warning information. Effectively gathering and sharing this information will require the promotion of institutional development and the skills necessary for effective collaborative research and planning among relevant scientific groups (i.e., physical and social scientists), policy makers, and stakeholders.

Where possible, scientists should also encourage the prudent adoption of climate and forecast information to foster a shift from reactive to proactive management of drought risks. In this regard, changing climate and the associated changing nature of drought pose a serious risk to sustainable development, the environment, and society. Climate change will lead to changes in the dynamics of drought, with associated (but somewhat uncertain) changes in drought hazard and exposure.

Therefore, it is essential that agencies in Nigeria always compile and analyze, in a consistent manner, information on the occurrence of drought hazards, to enable a better understanding of past and future changes. With this information, planners can begin to research, analyze, and report on long-term changes in drought risk, and in particular those aspects that might increase vulnerabilities and the capacity of authorities and communities to respond to drought. Promoting the inclusion of indigenous or local groups and knowledge in drought monitoring and early warning systems is essential for developing appropriate local drought indicators, verifying the occurrence of drought, and communicating the warnings to local populations. Networks should also continue to be established to support the sharing of basic climate and early warning across borders and regions.

7.0 DROUGHT COMMUNICATION

This section provides guidelines on drought communication. It provides global best practices/ strategies and protocols in communicating drought conditions.

7.1 DROUGHT COMMUNICATION PROTOCOL

Drought early warning information dissemination is paramount for effective drought risk management in Nigeria. There are several information dissemination outlets that should be leveraged upon in informing the stakeholders of the impending drought situations (Table 8). These include: The electronic media, namely: radio, television and the internet. The print media would communicate in both local languages and English language through the use of bill boards, leaflets and other forms of jingles. This is particularly important in the rural areas where the village heads can use the town criers to pass information to the people.

The federal government of Nigeria can at the same time come up with legislative policy that will facilitate information dissemination using information dissemination units of the FGN such as National Orientation Agency, the Federal Radio Corporation of Nigeria and the NTA. Improvements in satellite communication have helped decrease the lag time between drought data collection and warning.

Table 8. Stakeholders for effective drought communications

Local Stakeholders	Community-Based Organizations (CBOs), Local government drought monitoring committee Local government agric. and climate change desk officers etc.
Media Stakeholders	News Outlets: Television; Radio; Print media. Other Outreach Platforms: Social media; Emergency alerts, Town Criers etc.
State & Federal Agencies	FMEnv, NIMET, NIHSA, NASRDA, NEMA, FMARD, Energy Commission of Nigeria, FMI, NOA, State Governments etc.
Non-Governmental Organizations	UNCCD, UNICEF, Nigerian Environmental Study Action Team (NEST), Savanna Conservation, Nature Trust International (NTI), Dry Lands Sustainable Resource Management and Capacity Building Initiative and Sahel Conservation (SC) etc.

Mobile phone technology has improved the global acceptance of mobile phones and networks and encouraged the use of the technology for communicating warnings (Figure 13) and coordinating preparation activities for example, the use of tablets by farmers and extension staff which was a policy in the Federal Ministry of Agriculture and Rural Development during the administration of President Goodluck Jonathan.

Mobile phones have become tools of immense importance in drought management protocols as farmers can receive real time early warning messages, insights into market conditions and policies, price levels of farm products and information transfer about price levels of livestock. The lack of such information in the past has posed serious setbacks to farmers', pastoralists' and traders' capacity to compete favorably in urban markets in the country.

Figure 13. Communication gadgets

7.1.1 Effective Information Management and Exchange

Enabling effective information management and exchange requires the collection, compilation, and dissemination of relevant knowledge and information on hazards, vulnerabilities, and capacities and linking that knowledge to community drought risk reduction awareness campaigns, programs, and projects.

Interaction between the generators of information such as NIMET and NIHSA and users of information such as farmers, livestock breeders and fisher folk is essential for developing useful messages and helping to ensure the use of that information. Specifically, this interaction and networking can help ensure that awareness programs are designed and implemented with a clear understanding of perspectives and requirements that reflect local conditions and target all sections of society, including decision makers, educators, professionals, members of the public, and individuals living in drought threatened communities.

In these efforts, it is essential to identify the information users and their particular needs so that programs, information products, and technologies will be packaged in such a manner that the messages are useful and applicable. Different types of messages, locations, and delivery systems are necessary to reach the broad range of target audiences.

These messages must also provide easily understandable information on drought risks and mitigation options, especially to citizens in high-risk areas, to encourage and enable people to take actions to reduce risks and build resilient communities.

Involvement of the media is often crucial in this process, and to stimulate a culture of disaster resilience and strong community involvement in sustained public awareness campaigns and public consultations at all levels of society. Efforts should be made to bring together development practitioners involved in agriculture and environmental management to promote indigenous knowledge systems and drought mitigation activities in Nigeria.

For effective strategy to combat drought there is need for collaboration among all the geo-spatial agencies of government charged with the responsibility of managing both land and space of Nigeria. However, it is to be noted that there is grossly inadequate base/ground stations for capturing data for forecasting all varieties of elements of weather and factors of climate. For instance where there is a distance of 200km or more between base stations then the predictions for the locations in between would be fraught with significant errors. Therefore, the Federal Government of Nigeria has a huge task of providing funds for acquiring more well equipped base stations for effective data gathering and processing for more accurate predictions of all forms of weather conditions particularly drought conditions. Also very important training and empowering of meteorological supervisors and increasing the intakes for managing the base stations scattered all over the country will improve information management.

Preparing for drought is the best way to deal with its occurrence. This requires first and foremost forecasting the likelihood of drought in a particular year and disseminating the information to the stakeholders ahead of time. Provision of relief material should be provided ahead of its occurrence and the distribution logistics should be perfected at the level of NEMA while it is appropriate for all agencies to network and come up with a modality for solution to the impending drought if one is in the forecast. The role of the local monitoring group is vital to distribution of relief materials and advocating on mitigation actions by the stakeholders, mainly the farmers and herders.

For effective and all-encompassing drought early warning system, the application should be in separated units. The monitoring for each sector should be carried out independently by the specific monitoring group. While the activities in each sector vary, it would be expedient to have those that are knowledgeable in a particular sector to form the monitoring group for that particular section. The formation of such grouping would be better carried out by the agency within the Ministry of Agriculture and Rural Development or as the structure may be in a particular State.

If DEWS would be of value, then it has to be communicated in timely manner to the stakeholders without any form of encumbrance. The local farmers are always apprehensive of government officials making demands or kickbacks on them. Therefore, it is imperative to make DEW information and advocacy available to them without charge.

7.1.2 Education and Training

Education takes many forms in Nigeria from formal schooling to mentoring of children and youths by family members and community leaders. Although education improves the likelihood of someone enjoying increased economic opportunities and quality of life, it does not necessarily safeguard them from the impact of drought hazards and other adverse conditions. Through the DEWS information dissemination exercise youths and teachers will be encouraged to analyze drought hazard events and disasters and incorporate lessons into school level disaster preparedness plans.

Schools are ideal settings for learning to take place as they serve as a hub for community activity, but other local structures could also be used as avenues for education about drought early warning and climate change risk advocacy. Students, teachers and administrative staff of schools and other educational institutions will be involved in community level drought risk assessments.

Education for drought disaster risk reduction is an interactive process of mutual learning among people and institutions. It encompasses far more than formal education at schools and universities and in training courses. It involves the use of traditional wisdom and local knowledge to safeguard against the drought hazards as well as the active and informed participation of the mass media. The effects of drought can be substantially reduced if policy makers, scientists, media, and the public are well informed and motivated toward a culture of drought disaster prevention and resilience. This requires sustained efforts to educate all segments of society that are vulnerable to the disastrous effects of drought.

Education is also a crucial means within society to communicate, motivate, and engage, as much as it is to teach DRR issues. Awareness about drought risks and dangers need to start in early education to create a culture of disaster reduction. The various dimensions of disaster risk within a community can be addressed and continuously reinforced and passed between generations through formal educational programs and professional training, which is part of knowledge management.

7.1.3 Tools for Drought Early Warning Systems (DEWS) in Nigeria

The tools that could be used for drought early warning in Nigeria include the **i**nformation dissemination outlets such as the electronic media; namely radio, television and the internet. The print media in both English and local languages should form the medium of communication in bill boards, posters and bulletins to disseminate DEWS information at the local level. Community Development Associations (CDAs) such as the village-based associations, farmers' associations and water users' associations can be very useful tools in the DEWS dissemination at the local level.

At the state level, DEWS message dissemination should be based on extension workers in the Ministries of Agriculture and Rural Development. Associations such as the Miyetti Allah Cattle Breeders Associations, Transport Users Associations can be used for the dissemination exercise. The State Assemblies should formulate legislations that will empower DEWS practitioners pass the message to the rural communities.

At the national level, legislations can be used as tools for DEWS dissemination and advocacy on drought management.

7.1.4 Gender Based Considerations of Drought Early Warning Systems (DEWS) in Nigeria.

Drought disasters and climate change risks are not gender neutral and so the nature and extent of their vulnerability is different for women, men, boys and girls because of their different roles, responsibilities, access to resources, domestic and traditional law and cultural issues.

For an effective drought early warning system in Nigeria, special consideration must therefore be given to the issue of gender because of the age long traditional thinking of inequality between sexes and age groups. Women's and men's capacities for building drought disaster and climate resilience are shaped by their, social, cultural and natural resource management roles.

Both mothers and fathers in Nigeria pass on traditional livelihoods knowledge and skills to their sons and daughters including how to manage drought risk through diverse activities. To ensure that the DEWS in Nigeria is successful, drought risk assessments should be disaggregated by sex as well as other variables such as age and livelihood type to the greatest extent possible. This is because most communities in Nigeria particularly in the north are patriarchal and do not allow women to feel empowered to put forward their views, particularly in public. For women to be able to participate in disaster risk reduction and DEWS activities gender analysis should be conducted at the initial stages of community engagement.

7.2 DECLARATION OF DROUGHT CONDITIONS

Data and integrated analysis and decision making are critical in identifying the onset of droughts. The Nigerian Meteorological Agency should ensure at all times that data collection networks and associated instrumentation are calibrated and are functioning effectively and efficiently. NIMET should also ensure that data collected from such networks are made available to national and regional institutions to support a broad range of investigations including drought analysis and the impacts of drought on water resources and sectors sensitive to water availability. The Federal Ministry Environment should be updated regularly on the status of drought in the country, and in the event of severe drought the FMEnv should inform the President of the onset of the drought. The President should then declare drought and mandate the National Emergency Management Agency to respond to the drought condition while the Federal Ministry of Environment should be responsible for the overall supervision of the Drought Response Strategy Task Force.

7.2.1 Communication and Coordination Guidelines

The National Emergency Management Agency (NEMA) is the lead agency for disaster risks management at the national level, whereas SEMA and LEMA coordinate at state and local government levels, respectively. To fulfill their statutory mandates to coordinate the management of all emergencies and disasters over the country, the

agencies through NEMA have developed various policy and programming instruments to guide disaster risk reduction management and resilience building. The general approach to DRR management in the country has thus been hinged on preparedness, response and recovery which are embodied in three programme documents for disaster management namely:

- National Disaster Response Plan (2001)
- National Disaster Management Framework (2010)
- National Action Plan for Emergency Preparedness and Response (2013-2015)

All these programmes were designed to minimize the escalation of the consequences of disasters, regenerate social, emotional, economic and physical well-being of individuals and communities following a disaster such as droughts and reducing future exposure to hazards and their associated risks.

Several agencies will be involved in the management and coordination activities of the Drought Preparedness Task force as has been shown in section 4.3. In organizing and assigning responsibilities and composition of committees in a drought plan, men and women must be assigned responsibilities as equal participants in the planning process. The composition of all committees must also be gender sensitive. This is because of the need for women and men to be equally represented in committees in a bid to ensure that gender equality considerations are infused into the planning stage.

7.2.2 Rapid Response Measures:

It should be the responsibility of the National Emergency Management Agency to respond in the case of emergencies. A drought rapid response system will include:

- Identifying the vulnerable areas and vulnerable groups such as, women, children, the old and the physically challenged, population of the affected areas, as well as economic and environmental sectors affected. All data collected must be sex disaggregated. The gender sensitive risk assessments task-force should be set up to carry out this function.
- Mobilizing the personnel, fund and partner organizations into action. The composition of all teams, committees or task force must be gender sensitive.
- Response action to meet the food, water, Medicare, shelter and other basic necessities of life of the vulnerable groups and communities.

The federal and state emergency management agencies of affected states will need to work in harmony to respond to the situation that may arise. The goal of the systems is to reduce drought impact on the children, women and men in the country.

The specific emergency response programmes should include:

- Establish alert procedures for water quality problems.
- Augment water supplies by identifying alternative sources.
- Provide emergency food relief.
- Provide emergency funding (loans, grants, credits etc).
- Prevent wild fires to safeguard the limited vegetation.
- Provide livestock feed and watering points.
- Proper coordination of aid distribution and utilization through an ad hoc advisory subcommittee.
- Ensure that women, girls and other identified vulnerable groups are given priority.

When drought occurs covering large areas, the National and state emergency management agencies should undertake relief measures by providing drinking water, food grain and fodder and food subsidies to special and vulnerable groups. The work plan for the emergency relief arrangement is as follows:

A. Alert on the drought (based on early warning systems).
B. The president will give an instruction for NEMA to act (i.e. triggering plan)

- Long-term warning – 3 months minimum.
- Short-term warning – 2 weeks minimum.

The emergency relief arrangement is a short-term arrangement to mitigate the effect of drought.

C. Rapid Assessment
   - First, there should be a tour to the affected areas to obtain all possible information about the situation (i.e. determine the extent of damage).
   - Decide on the type of assistance including relief material to be rendered and distributed to the areas. Prior to the deployment of resources, the following questions must be answered:
     -Who needs the resources?
     -Identify vulnerable groups?
     -What is needed?
     -When is the resource required?
     -When is the resource needed?
     -Why is the specific resource required? Are there other options?
     -Explain why this is the most appropriate resource for the mission?
     -How will the resource be delivered?
   - Women and children should be asked separately and their needs should be separated from that of men.
   - Ensure equal and equitable distribution of resources.
   - Prepare, store, move and distribute the relief materials to the affected areas and ensure vulnerable groups are given priority.
   - Early warnings should be multi-lingual and work across various platforms. They should include information on what to do when drought strikes. Most importantly, they should be simple!

Principles on the sharing of early warnings:

- Keep it simple.
- Create brand and message ambassadors. Make sure village leaders, regional leaders, the Agricultural Development Programmes (ADPs), the Community Development Associations (CDAs), National Orientation Agency (NOA), the Academia and Research Institutions have early warnings and can activate local response and further distribution of messages.
- Maintain constant contact.
- Create threat levels and types of alerts. For instance, yellow, orange and red.
- Integrate with other alerting systems for example, infrared satellite images, monitoring winds and atmospheric stability, weather forecast using computer model, soil moisture and availability.
- Create a community response plan (i.e. training, simulation, awareness building).
- Does the alert dissemination plan work with and without electric power?
- Is the dissemination/communication technology sustainable? Are you building a dissemination strategy that will work long-term, say for a decade or more?

8.0 DROUGHT MITIGATION AND PREPAREDNESS

The goal of mitigation and preparedness is to reduce drought vulnerability and foster drought-resilient communities in the country. Before drought, mitigation actions can be implemented to build resilience into an enterprise or system so it will be less affected when drought eventually occurs. Some mitigation actions require relatively small changes in the national and individual assets, lives and livelihoods, while others may require the re-evaluation and modification of more basic elements of our livelihoods and production systems. An important mitigation measure is the development of drought preparedness and contingency plans that detail specific measures to be taken by individuals or responsible agencies both before and during drought. Effective drought mitigation and preparedness planning is based on established policies and institutional capacity, sound drought risk identification and EWS, and drought awareness and knowledge management.

Benchmarks or milestones should be developed for determining "success" in mitigation and preparedness to determine if measures are working. Such benchmarks should include methods of evaluation for different scales and sectors with both qualitative and quantitative measures. Potential examples include:

- Use of agricultural monitoring data to analyze the reduction in drought impacts on crop production due to the use of early warning information
- An increase in the establishment of institutions with a specific mandate for drought mitigation and preparedness
- An increase in the development and use of early warning systems and contingency plans
- Demonstrations and piloting of new technologies for resource conservation in selected drought prone areas

The main target in developing the benchmarks or milestones is to show that drought impacts and losses can be substantially reduced if authorities, individuals, and communities are well prepared, ready to act, and equipped with the knowledge and capacities for effective drought management. It should be recognized that mitigation and preparedness have a greater impact on reducing the scale and effects of drought disasters than ad-hoc emergency response measures.

8.1 DROUGHT RESPONSE ACTIONS

Until recently with the establishment of the Nigeria Meteorological Agency (NIMET) and National Emergency Management Agency, little effort has been devoted to drought preparedness in Nigeria. Previously, drought responses were chaotic reactive or crisis- management driven. Strategies for responding to and preparing for droughts are numerous and range from household or community level to regional or national level. At the local level, people and communities possess detailed knowledge of the likely occurrence of drought and its effects and have developed a broad range of adaptation strategies over the years to help them reduce the effects of drought and promote recovery once the rains have returned.

The following are mid- and long-term response actions by sector. These response actions are not only relevant to the immediate short-term crisis, but also support reducing vulnerability during future crises if properly implemented. In many cases, these actions support longer-term policy measures that revolve around a more holistic approach towards responding to drought disaster. To ensure effective preparedness to drought, great efforts need to be made to strengthen the capacity of all stakeholders to increase awareness about the options available and ways of incorporating drought mitigation and response actions in their programmes and activities.

Gender experts, local women's groups and minority groups should be consulted to ensure that public awareness, education, and capacity building campaigns are tailored to the specific needs and social behavior of women and men. Planners should also make sure that both women and men are equally reached and carried along in the design and implementation of drought issues.

The proposed drought response actions are as follows:

8.1.1 Response Actions for Arable Farming

- Remove gender- based barriers and hardships that limit access to production capital
- Adopt improved agricultural systems:
  - Increase access to drought resistant crops
  - Adopt better soil management practices.
  - Adopt conservation agricultural practices such as Climate Smart Agriculture.
- Raising farmer awareness to implement water conservation measures.
- Encouraging farmers to use treated wastewater for irrigation, which will reduce the pressure on groundwater.
- Provision of credit facilities and inputs to farmers at reasonable cost to increase their capacity for production and minimize losses.
- Identify suitable insurance policies for risk-prone farmers.
- Improvement in agricultural extension services to farmers, especially on issues relating to drought mitigation.
- Provide early warning/meteorological forecasts and related information.
- Integrate indigenous and scientific early warning systems.

8.1.2 Response Actions for Livestock Husbandry

- Adopt improved agricultural systems:
  - improve range management;
  - Increase access to drought resistant livestock feeds and
  - Establishment of forage silos.
- Establishment of clear ownership/right.
- Improve veterinary services.
- Control of unpalatable/invasive alien species of grasses
- Provision of low interest credit facilities to support off-farm economic activities.
- Identify and provide suitable insurance policies for risk-prone herders.
- Provision of early warning/meteorological forecasts and related information.

8.1.3 Response Actions for Fisheries and Aquaculture

- Proper management of fisheries and adaptation measures to prevent the damage caused by the severe impacts of drought will be essential to enable communities to continue to build resilient livelihoods in the fisheries sector.
- Enhance artisanal fisheries and encourage sustainable aquaculture as adaptation options for fishing communities.
- Promote incentive–based and participatory ecosystem management with more efficient enforcement measures, which will help ensure that fish stocks can better withstand bio-physical impacts and that fisheries ecosystems will be more resilient to drought and other environmental changes.
- Prepare public service announcements, press releases, and magazine articles to inform the public about drought effects on fisheries and how to minimize these stresses through voluntary practices.

8.1.4 Response Actions for Water Resources:

- Water demand management should be a driving force in water resources management during droughts
- Controlling groundwater abstraction from upper and lower aquifers to be within the sustainable yield limits.
- Capturing rainwater by harvesting and building micro- and macro-dams for storing water, a control measure should however be put in place to ensure communities at the downstream are not deprived of water.

- Explore water efficiency and management of water demand, particularly in Sahel and Sudan savanna areas of the country.
- Raising farmer awareness to implement water conservation measures
- Educating the public to alter their water usage practices from casual habits and taking initiatives to organize public awareness meetings and workshops on a regular basis targeting the whole country.
- Build capacity and strengthen local expertise on the concepts of Integrated Water Resources Management (IWRM).

8.1.5 Response Actions for Peace and Security:

- Establishment of conflict resolution mechanisms to address grievances.
- Set up of a special task force to monitor the activities of farmers and herdsmen across the nation.
- Encourage building the capacity of herders and farmers on new trends in marketing.
- Encourage Community-Based Participatory Planning to allow contentious parties find solutions to their grievances.

8.1.6 Response Actions for Health and Nutrition:

- Strengthen disease prevention and treatment for those diseases expected to increase as a result of drought/climate change.
- Reinforce programmes to build and maintain wastewater and solid waste management facilities.
- States should ensure that bio-fortified food and nutritionally enhanced food materials are made available at affordable rates, to provide needed nutrients to the people, to cushion the effects of drought during critical periods.
- Promote and facilitate the adoption of practices and technologies that reduce exposure and health impacts from extreme heat.
- Establish early warning and health surveillance programmes**.**

8.1.7 Response Actions for Biodiversity:

Women and children gather and harvest diverse products from the wild and so could play a vital role in the conservation and sustainable use of biological diversity. There is thus a need for women to participate at all levels of policy making and implementation for biological diversity. In this regard, to enhance biodiversity and reduce depletion of threatened species the government should:

- Provide alternative livelihoods for women in order to minimize unsustainable resource use that contributes to biodiversity loss.
- Establishment of more protected areas across the country.
- Establish community-based land use teams to ensure sustainable resource use.
- Encourage the use of well-regulated modern biotechnology techniques to produce fast growing tree crops and grasses to improve vegetative cover, provide sustainable grazing for livestock and protect soil from excessive loss of moisture.

8.1.8 Response Actions for Forestry:

- Development of forestry scheme for each ecological zone;
- Training and re-training of forestry staff;
- Establishment of more protected areas across the country.
- Selection of suitable afforestation sites, survey and preparation of land for planting in the rainy season of a particular year.
- Development and upgrading of forestry management skills.
- Establishment of a scheme for dry farm development and management for forest and wild life.
- Comprehensive review of the national forestry policy.

- Improve management of forest reserves.
- Enact laws that will prohibit uncontrolled logging.
- Adequate control of bush fires through enforcement of bush burning edict.
- Reduction (through clearing) in volume of dead or dying trees due to insect damage.
- Increased public awareness on the dangers of bush burning.
- Implementation of a coordinated programme for wildfire protection.
- Identification of potential fire hazard areas.
- Provision of funds for wildfire control.
- Provision of water sources for controlling wildfires.
- Promotion of afforestation efforts using drought resistant and fast growing tree species.
- Promotion of the use of waste water for watering woodlots and shelterbelts.

8.1.9 Response Actions for Recreation and Tourism:

- The conservation of selected and representative examples of wildlife communities in Nigeria;
- The establishment of ecological and geographically balanced network for protected areas under the jurisdiction and control of the federal government;
- The protection of endangered species of wild plants and animals and their habitats;
- The conservation of wild life throughout Nigeria so that the abundance and diversity of their species are maintained at optimum levels commensurate with other forms of land use, in order to ensure continued existence of wildlife for the purpose of their sustainable utilization for the benefits of the people.
- The preservation of outstanding science, natural, scientific, recreational and other values in the National Parks;
- The protection and maintenance of crucial wetlands and water catchment areas;
- The control of dangerous vertebrate species;
- The implementation of relevant international treaties agreements or other arrangements relating to or connected with protected areas and wild life management to which Nigeria is a party , in so far as power is to implement those international treaties, agreements of arrangements is conferred on the service by the Federal Government;
- The promotion and provision of education about wildlife and nature conservation; and
- The conservation of biological diversity in Nigeria.
- Establish a plan for managing tourism expectations and impact
- Refocus planning away from mass tourism to low-impact, high-revenue tourism

8.1.10 Response Actions for Energy:

- Develop and diversify energy backup systems to ensure both civil society and security forces have access to emergency energy supply.
- Integrate other renewable sources of energy into its national energy mix.
- Provide access to Energy Efficient stoves.
- Encourage use of Liquefied Petroleum Gas (LPG), as an alternative and efficient energy for domestic and industrial use.
- De-risk and expand renewable energy sources and decentralize by providing off-grid transmission in order to reduce vulnerability of energy infrastructure to climate impacts.

8.1.11 Response Actions for Transportation:

- Include increased protective margins in construction and placement of transportation (i.e. higher standards and specifications).
- Undertake risk assessment and risk reduction measures to increase the resilience of the transportation sector.

- Strengthen existing transportation infrastructure, in part through early efforts to identify and implement all possible 'no regrets' actions.

8.1.12 Response Actions for Commerce and Industries:

- Increase knowledge and awareness of drought risks and opportunities
- Undertake and implement risk assessments and risk reduction measures
- Incorporate drought into ongoing business planning
- Review and enforce land use plans in industrial areas in light of climate change
- Encourage relocation of high risk industries, facilities and markets
- Promote and market emerging opportunities from drought.
- Encourage informal savings and insurance schemes, and arrange for the availability of medium term credit (especially for industries in crisis).

8.1.13 Response Actions for Vulnerable Groups:

- Enable inclusive gender responsive stakeholder engagement mechanisms and inter-institutional arrangements across relevant levels of government and sectors, including with women-lead groups, indigenous peoples' organizations, minority communities, youth and the physically challenged.
- Create awareness among government staff, including disaster and emergency management personnel, about the impacts of droughts and how these impacts affect vulnerable groups.
- Provide basic training for government staff on gender awareness tools to enhance implementation capacities.
- Adapt government programmes, including emergency response plans and programmes directed at vulnerable groups, to better address the impacts of drought on these groups.

8.1.14 Response Actions for Communication:

- Include increased protective margins in construction and placement of communications infrastructure (i.e. higher standards and specifications).
- Undertake risk assessment and risk reduction measures to increase the resilience of the communication sector.
- Strengthen existing communications infrastructure, in part through early efforts to identify and implement all possible 'no regrets' actions.
- Develop and diversify secure communication backup systems to ensure both civil society and security forces have access to emergency communication methods.

8.1.15 Indigenous Coping System:

Although local, state and federal governments will usually respond to drought and other hazards, due cognizance must however be given to the time-tested indigenous coping systems of the communities of the affected areas. Communities should therefore be actively involved in the planning and implementation of response actions.

8.2 DEVELOPMENT OF NEW AND ALTERNATIVE WATER RESOURCES

Drought is a climatic event that cannot be prevented, but interventions can be made to:

a) be better prepared to cope with drought;
b) develop more resilient ecosystems to recover from drought; and
c) mitigate the impacts of droughts.

Water is the most abundant natural resource and Nigeria is blessed with water resources. Water is a basic natural resource for socio-economic development. However, this resource has dwindling over the years. This decrease in water resources has been attributed to:

- population growth;
- unsustainable water use practices; and
- drought and climate change.

As a result, it has become pertinent that alternative sources of water resources be sought for. These additional sources of water include rainwater harvesting, storm water, gray water, centralized wastewater recycling, decentralized recycling and desalting of sea water.

Government shall provide and maintain water facilities to promote rational utilization of the scarce water resources during and after droughts in the country. The following strategies should be adopted and implemented:

a) Geographical shifts of agricultural systems: With the expected increase of aridity, shifts are likely in the geographical location of the agricultural systems. The derived Savanna zones that currently occur within a particular aridity class will tend to occupy the agro-ecological niche of those systems currently in a relatively more humid zone such as the mangrove and forest ecosystems of Nigeria, and will themselves be substituted by systems currently in a more arid climate.
b) Climate-proofing rainfall-based systems: **T**hese systems are the ones most likely to come under pressure from climate change. In order to retain their productivity, these systems will need to draw inspiration from the established principles for successful dry land crop management including: retaining the soil moisture profile by reducing evaporation; using drought and heat-tolerant crops and varieties that fit the rainfall pattern (drought evasion) and conservation agriculture.
c) Making irrigated systems more efficient: Irrigated systems in many parts of the world including the Mediterranean Zone are already under considerable pressure to become more efficient considering their low water use efficiency. Irrigation will need to produce more with less water. The following are technical options for making irrigation systems more efficient:

    - Reducing distribution losses through the modernization of existing schemes;
    - Conversion of gravity or surface irrigation schemes to pressured irrigation systems such as drip or sprinkler systems;
    - Improving the efficiency of surface irrigation systems;
    - Shifting emphasis from more water-demanding systems based on relatively low-water demanding crops e.g. sugar beet vs. sugar cane;
    - Changing crop calendars to avoid extreme heat; and
    - Increasing the use of marginal waters. Both treated sewage and brackish as an important source of irrigation water, particularly for forage crops and agro-forestry.

d) Expanding the role of intermediate rain fed-irrigated systems: These systems have proven to be successful in many areas where expanding the conjunctive or alternating use of rainfall and irrigation water is possible through water harvesting, both micro- and macro-catchments; supplementary irrigation; and deficit irrigation.

8.2.1 Inter-basin water transfer

Water transfer from the basin of River Congo to the Chad basin via the headwaters of the Chari-Lagone system, a distance of about 1000km to address water needs in Nigeria is feasible and so should be vigorously pursued. The transfer though technically feasible is fraught with political, economic and environmental problems which should be appraised if sustainable development in the lake region is to be achieved. Two methods are envisaged for the successful transfer of water from the Congo basin into Lake Chad. The first is through pipelines. This entails pumping the water over long distance, using giant pipes to transport water from the headwaters of River Congo into the lake. The second is using the Chari-Lagone river system's flow of gravity to carry water into Lake Chad.

However, the environmental and socio-economic costs can only be best imagined. The use of Chari-Lagone gravity flow will lead to the inundation of several floodplains along the Chari-Lagone system if this option is adopted. The Waza-Lagone floodplain is an important grazing area for wildlife and livestock as well as for agriculturists in Northern Cameroun.

The water transfer will precipitate unprecedented social and economic disruption as hundreds of settlements presently on the lake floor will be flooded and migrants forced out. Many of the migrants have not known any other place as their home because some of them moved to the lake floor after the drought of 1970s. Resettlement and rehabilitation to cater for the exodus of thousands of migrants will be above the capacity of even the Federal Government to handle. The displacements cannot be compensated with irrigation and pastoral opportunities at the periphery of the new lake shoreline. Furthermore the lake shores are not bounded by dykes and levees and so over-flow into some areas cannot be ruled out.

8.2.2 Hydroelectric Power Generation

The National Water Resources Master plan indicates that Nigeria has a hydropower potential of about 12,220 MW out of which only 1,930 MW has been developed at Kainji, Jebba and Shiroro Dams. The master plan further indicated that there are 17 existing dams with combined potential hydropower capacity of 200MW that are yet to be exploited. Another four (4) dams that are under study and design have combined potential capacity of about 4,320 MW, including Mambila (3,050MW), Gurara II (360 MW), Dasin Hausa (150MW) and Zungeru (760 MW). Several other sites with total potentials of 6,460 MW are yet to be fully studied and developed.

8.3 WATER CONSERVATION

Nigeria experiences wide swings in rainfall -heavy rainfall in the southern part of the country and water scarcity in the northern part. Therefore, activities for harvesting available water and its utilization have been developed in different areas of the country. These include:

- Temporary check dams: immediately after the rainy season, the run-off water is harvested by constructing temporary check dams across the rivers and streams. These are constructed using sand filled bags.
- Cisterns to collect rainwater

Traditional knowledge of water conservation and perspectives of women should be sought on one hand while public education and outreach plan is not neglected on the other hand in the analysis and evaluation of drought risk coping strategies and solutions. Making resources equally available and accessible to men and women to help them overcome the challenges of drought is of immense importance in achieving holistic drought mitigation.

Strategies for implementation to boost the water situation in Nigeria include:

- Provision of solid and liquid waste disposal schemes to avoid dispensing the waste into streams and rivers.
- Central sewage system should be provided by government to discourage the use of the conventional septic tanks which are prone to groundwater pollution.
- Provision of standard sewerage dumping sites to avoid emptying septic tanks into water bodies and waterways.
- Regulate and provide sites for cottage industries and mechanic shops far from the towns and making proper provision for waste disposal from their enterprises to avoid health hazards related to pollution.
- Checking poor mining practices that result in oil spillage and heavy metal pollution which are hazardous to health.
- Provision of toilets in public places and awareness campaign to encourage people to have toilets in their houses, hence eradicating diseases related to health.
- Avoidance of pollution caused by anthropogenic activities to open water bodies.
- Providing a proper scheme for the maintenance of water facilities.
- Use of public buildings like schools' rooftop for rain water harvesting.
- Provision of a smooth roof surface that neither leaches chemical into the water nor traps organic matter that could contaminate harvested water;
- A first-flush system to divert the first rain that falls during a storm, carrying off accumulated particulate matter;
- A coarse filter to keep out leaves and other detritus;
- A cistern large enough to preserve expected water needs.

Water conservation methods have been practiced by indigenous populations in the country. Among the Yoruba, the owner of a land is restricted from clearing the land up to 50 yards (about 45m) to the stream for conservation so that the stream would not dry up. However, the land owner is allowed to plant bamboo up to river bed known as OjuIpa.

The Kalabari, Okirika and Ikwerre tribes of the Niger Delta worship water spirits which have a specific pond or river designated as their holy place. In like manner where a shrine is a part of a water course it is usual to restrict others from using it.

The Oshun River sacred groove of Osogbo in Yoruba land is partly responsible for the conservation of the last remnants of the primary high forest in southern Nigeria.

The construction of earth dams and large concrete dams for hydroelectricity, fisheries and irrigation have been shown to be useful in recharging aquifers in the Hadejia Jama'are Komadugu Yobe Basin of Central Nigeria. It has also been shown elsewhere that these artificial water bodies do not only serve the surface water needs of the people during the dry season but also serve ground water recharge points.

8.4 PUBLIC EDUCATION AWARENESS AND OUTREACH

Since the promulgation of the water resources Act/Decree 101 of 1993, Ministry of Water Resources and its agencies, especially the National Water Resources Institute, Kaduna; a lot of effort has been put into public education, sensitization on water supply development, sanitation and hygiene. For instance, the institute trains students in water technology up to the OND and HND level. In addition they organize workshops for managerial staff of state ministry of Water Resources and Agencies from time to time.

In addition, the Federal Ministry of Water Resources organizes National Technical committee on water Resources meeting annually to deliberate on progress achieved and discuss possible solutions to problems encountered in water supply delivery. This yearly meeting is attended by professionals from state ministries of water resources and their agencies as well those from Federal Ministry of Water Resources and its Agencies.

The National Council on Water Resources is organized for the Minister of water resources, state commissioners of water resources and governors to consider and approve deliberations from the National Technical Committee meetings.

Assistant Works superintendants were established in each zone to train middle level man power on water technology; the ones at Maiduguri and Kaduna are still functioning to date.

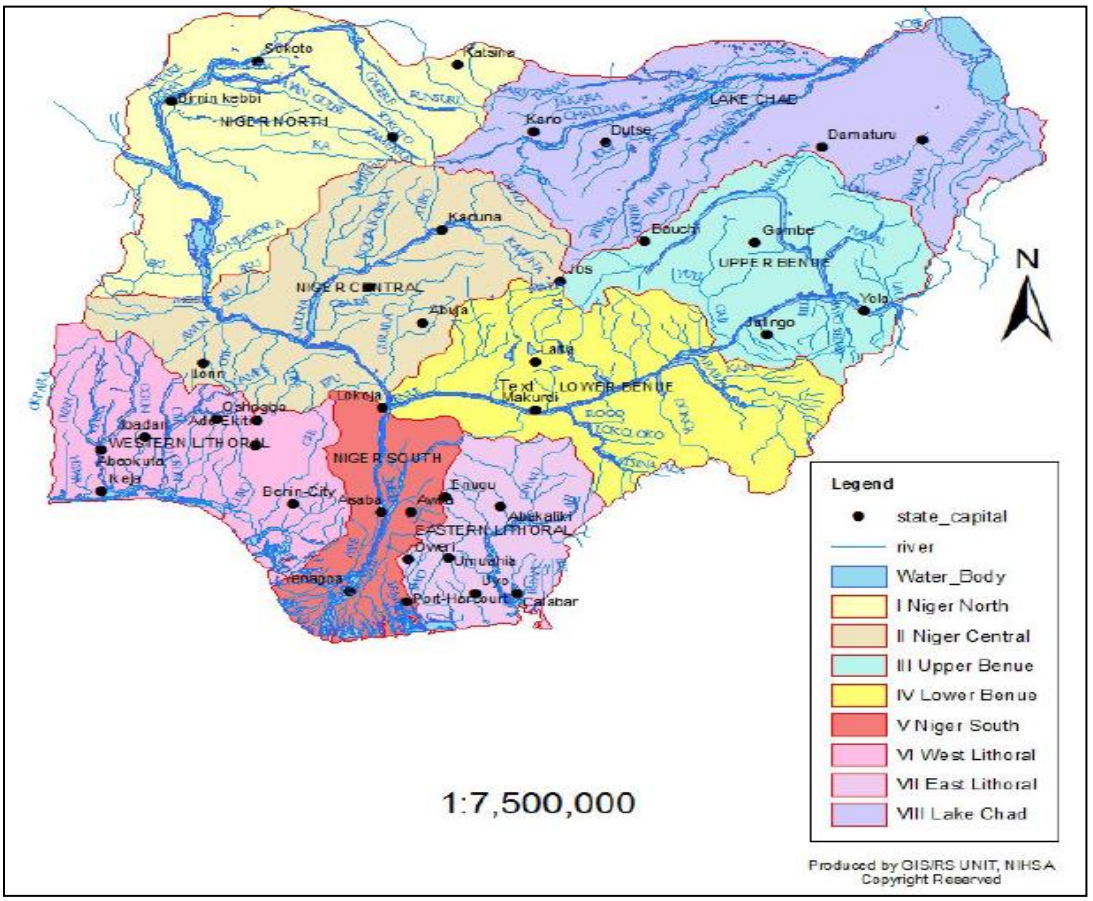
The Federal Ministry of Water resources in collaboration with development partners such as UNICEF conduct through the state Ministry of water resources and their Rural Water Supply and Sanitation Agencies [RWSS], sensitization seminars/workshops for LGA's and communities on Water, Sanitation and Hygiene [WASH] education from time to time. With such education the rural communities will be able to operate and maintain water facilities provided to them properly.

Education and awareness creation is very important drought mitigation measure especially, since other sector response actions must of necessity, incorporate elements of education and awareness creation. Mitigation measures relating to education and awareness creation include the following:

- Adopt participatory planning that is gender responsive.
- Organize drought information meetings for the public and the media.
- Organize workshops, town hall meetings, talk shows and drama on special drought-related topics.
- Ensure that appropriate technical capacity to support decision making in water and related sectors, is available in national institutions.
- Higher Institutions of learning should be encouraged to include in their research and development activities the development of early warning systems and appropriate indicators to support policy makers in their planning and adaptation strategies.
- Establish drought information centers at all levels of Government.
- Develop training and sensitization materials in several languages.
- Disseminate drought information using gender considerations for effective response actions.

8.5 LEGISLATION AND LAND USE PLANNING

Nigeria is blessed with abundant surface and ground water resources; the Nigerian Water Act (No.101) of 1993 categorized the water resources of Nigeria into the following schedules/systems. All water, whether surface or ground water, from time to time, contained within or flowing or percolating through such sources and tributaries and catchment areas in Nigeria has been grouped into Hydrological Areas (Figure 14). The eight contiguous hydrological catchments designated as Hydrological Areas (HAs) I–VIII which serve as units for scientific assessments and management of water resources of the country. They are also the building blocks of all hydrological evaluations. The water resources potentials of the HAs are presented in Table 9.



Source: NHSA, 2014

Figure 14. Nigeria showing the Hydrological Areas (HAs) and the Drainage Network

Table 9. Water Resources Potentials of the Hydrological Areas of Nigeria

Total Water Resource Potential		**HA -1**	**HA -2**	**HA -3**	**HA-4**	**HA-5**	**HA-6**	**HA-7**	**HA-8**	**Total**
Including inflow from outside Nigeria (BCM/yr)		37.4	40.9	60.2	47.9	50.7	43.7	84.4	10.3	375.1
Only internal generation in Nigeria	(BCM/ yr)	10.7	40.3	37.9	32.8	50.7	43.6	60.3	10.3	286.6
Surface Water Resources Potential										
Including inflow from outside Nigeria		35.1	32.3	56.4	46.0	40.1	35.7	79.9	7.2	332.7

Only internal generation in Nigeria		8.4	31.7	34.1	30.9	40.1	35.6	56.2	7.2	244.2
Groundwater Resources Potential										
Groundwater Recharge	(BCM/ yr)	5.0	20.5	19.3	18.6	31.9	23.4	32.8	4.3	155.8
Runoff Condition (only internal generation in Nigeria)										
Precipitation (p)	(mm/ yr)	767	1,170	1,055	1,341	2,132	1,540	2,106	609	1,148
Total Runoff (RO)	(mm/ yr)	62	205	218	415	744	359	978	40	268
Groundwater Recharge (GRE)	(mm/ yr)	37	132	123	250	592	236	570	24	171
Loss of Recharge	(mm/ yr)	18	56	24	25	197	80	72	17	47
Runoff Rate (RO/P)		8.1	17.5	20.7	30.9	34.9	23.3	46.4	6.6	23.4
Recharge Rate (GRE/P)	(%)	4.8	11.3	11.7	18.7	27.7	15.3	27.1	3.9	14.9
Loss Rate (LOS/P)	(%)	2.3	4.8	2.3	1.9	9.2	5.2	3.4	2.9	4.1
Total Water Res. Rate [(RO+LOS)/P]	(%)	10.4	22.3	22.9	32.8	44.1	28.5	49.8	9.5	27.4

Source: JICA, (2014)

1) The river Niger from the border between the Federal Republic of Nigeria and the Niger Republic to the outlet of the Kainji reservoir including:
   a. The Sokoto – Rima River from the border with Niger Republic.
   b. All tributaries of the river Niger crossing the border to the Benin Republic.
   c. The Sokoto Sedimentary Hydro-geological area.
2) The River Niger from the Outlet of the Kainji reservoir to the point of confluence of the River Niger and of the Benue River including
   a. The Kaduna River with its Tributaries.
   b. The Gurara River
   c. All tributaries of the River Niger crossing the Border to the Benin Republic.
   d. The Upper Niger sedimentary hydro-geological area.
3) The Benue River from the border between Federal Republic of Nigeria and the Republic of Cameroons to the point of confluence of the River Benue and Niger, including:
   a. The Gongola/Hawul river system.
   b. The Pai-yul River.
   c. The Wase River.
   d. The Shemankar River.
   e. The Dep River
   f. The Mada River

g. All the tributaries of the Benue River crossing the international border to the republic of Cameroons and the Benue sedimentary Hydro-geological area.

4) The River Niger from the confluence there of and of the Benue River Including the Delta of the River Niger and all water tributaries or influent there to or diffluent there from including:
   a. The Anambra River.
   b. The Imo River.
   c. The Akwa – Ibom River.
   d. The Aboine River.
5) All water courses directly or indirectly influent in the Lagoon and other Litoral Lagoons and water course from the border with Republic of Benin to the mouth of the Forcados River including:
   a. The Oshun River
   b. The Ogun River.
   c. The Shasha River.
   d. The Owena River.
   e. The Ogun/Oshun sedimentary hydro-geological area.
6) All water courses rising or situated in the Federal Republic of Nigeria which are directly or indirectly influent to the Lake Chad including.
   a. River Komadugu Yobe.
   b. River Yedzeram
   c. River Ngadda
   d. River Ebeji (El-beid)
   e. The Chad sedimentary hydro-geological area.
   f. The Cross River from the boundary between the Federal Republic of Nigeria and the Republic of Cameroons and all water influent or tributaries thereto or diffluent there from including the cross River sedimentary hydro-geological area.

Therefore Nigeria has abundant water resources which can be developed for the purpose of domestic water supply, hydroelectricity, navigation, industrial use, fishery and recreation. In 1995 the surface water potential of the country was estimated at 267.3billion M^3 while the ground water potential was estimated at 51.9billion M^3.

Nigeria adopted the English common Law System and given its multi-cultural and multi-ethnic composition and adherence of many citizens to their ethno specific indigenous customs, it practices Legal pluralism; Customary Law and Islamic Law [technically categorize as Customary Law] particular relating to chieftaincy matters and community governance, land tenure and personal laws. The Nigerian Supreme court defines customary law as the organic and the living law of the indigenous people of Nigeria, regulating their lives and transactions.

Customary land titles confer rights to all products of the land including water resources. The ownership of the land carried the rights to resources in the ground, on the land and over the land.

Water related disputes tend to be resolved by traditional dispute – resolution processes and procedures such as through the use of customary leaders and tribunals, mediation and arbitrations in modern times, customary courts carryout official adjudication of disputes involving customary laws.

A study of conflict management between farmers, pastoralists, hunters and fishermen in the Fadamas [Flood plains] of Northern Nigeria, found that the traditional method of settling the conflict is the most effective of all the methods. However, the Water Resources Act (decree) 101 of 1993 vests in the Federal Government the right to use and control of all surface and ground water and all water in any water-course affecting more than one state, for the purpose of promoting the planning, development and use of the country's water resources, coordinating the distribution use and management of water resources and ensuring the application of appropriate standards.

In 1997 the Federal Government created the National Inland Water-Ways Authority to improve and develop inland water ways for navigation, provide an alternative mode of transportation for the evacuation of economic goods and persons, and execute the objectives of the national transport policies as they concern inland waterways.

The general functions of the Authority are to provide regulations for inland navigation, ensure the development of infrastructural facilities for national inland water ways network connecting the creeks and the rivers with economic centers, using the river ports as nodal points for exchange and ensure the development of indigenous technical and managerial skill to meet the challenges of modern inland water ways.

The Ministries, Departments, Authorities and Agencies (MDAs) have the laws governing their establishment; where there is conflict, the Ministry of Water Resources, other relevant ministry and Ministry of Justice will confer to find solutions. In the case of customary laws, they are recognized as a major source of law and would be enforced as such, if not found to be in conflict to equity, natural justice and good conscience or incompatible with any statute. Therefore if there is conflict between statutory law and customary law, the former takes precedence. In the context of water rights, this means that statutory rights would generally supersede customary water rights where there is conflict.

9.0 RECOMMENDATIONS AND IMPLEMENTATION ACTIONS

This chapter provides broad recommendations and priority implementation actions that should be taken by specific stakeholders.

9.1 RECOMMENDATIONS

1. Review and implement the National Policy on Drought and Desertification.
2. Constitute the Drought Task Force at State and Federal Levels.
3. Undertake a baseline study to quantify the extent and severity of land degradation and desertification in all States and mitigate the effects of drought in Nigeria.
4. Strengthen the capacity of the Department of Drought and Desertification Amelioration (DDA) in the Federal Ministry of Environment to co-ordinate activities for combating drought and desertification.
5. Strengthen the synergy between the Department of Drought and Desertification Amelioration (DDA), Department of Forestry, the National Agency for the Great Green Wall (NAGGW) and other relevant agencies.
6. Enhance environmental sustainability and promote Land Degradation Neutrality (LDN).
7. Strengthen the capacity of the Centre for Arid Zone Studies (CAZS) University of Maiduguri and Climate Change linkage center of the Federal University of Technology Minna, to undertake research and effectively sensitize the public and policy makers on the socio-economic impacts of desertification and drought.
8. Review the National Land-use Decree to ensure that it contributes to the goals of the National Drought Plan.
9. Equip drought control offices in all the states of the federation.
10. Promote gender differentiated sustainable land management best practices.
11. Integrate and enhance scientific and indigenous drought monitoring and early warning systems.
12. Translate the National Drought Plan into the Nigerian languages.

Table 10. Priority Implementation Actions

Themes	Problems	Activities	Responsibility

Crop production	• Inherent low fertility.
	• Low soil moisture holding capacity of soil.
	• Poor crop production.
	• Poor crop production technique
		• Remove gender- based barriers and hardships that limit access production capital
		• Adopt improved agricultural systems:
		  ○ Increase access to drought resistant crops
		  ○ Adopt better soil management practices.
		• Raising farmer awareness to implement water conservation measures.
		• Encouraging farmers to use treated wastewater for irrigation, which will reduce the pressure on groundwater.
		• Provision of credit facilities and provision of inputs to farmers at reasonable cost to increase their capacity for production and minimize losses.
		• Identify suitable insurance policies for risk-prone farmers.
		• Improvement in agricultural extension services to farmers, especially on issues relating to drought mitigation.
		• Provide early warning/meteorological forecasts and related information.
		• Integrate indigenous and scientific early warning systems.
			FMARD
			FMEnv
			STATE GOVERNMENTS
			LOCAL GOVERNMENTS
			NBMA
			BOA
			NIRSAL
			NGOs/CBOs
			Resource users
			Research Institutes/Centers

Livestock	• Overstocking which leads to over grazing. • Declining fodder yield leading to shortage of feed and inappropriate. • Non-Integration of local stakeholders with pastoralists.	• Integrate traditional pastoralist into the economic system through settlement in developed grazing of land tenure rights. • Promote fodder banks establishment. • Review land use decree to ensure equal access to land. • Strengthened livestock extension services to deliver comprehensive health care. • Create warning/sensitization points at strategic	FMARD FMEnv STATE GOVERNMENTS LOCAL GOVERNMENTS NIRSAL/C BN BOA

	• Encroachment of grazing lands and stock routes • Insufficient number of grazing areas. • Lack of qualitative pasture and drinking water. • Pest and diseases • Ineffective livestock extension services.	locations. • Sensitize and encourage ranching system. • Control of invasive alien species of grasses. • Provision of low interest credit facilities to support off-farm economic activities. • Identify and provide suitable insurance policies for risk-prone herders. • Provision early warning/meteorological forecasts and related information.	NGOs/CBOs Resource users Research Institutes/Centers
Water resources	• Pollution of surface and ground water. • Depletion and disappearance of water-bodies. • Problems arising from seasonal flooding and erosion. • Inadequate hydrological data inappropriate construction of dams and dykes. • Conflict among water users. • Scarcity of water • Inefficient and uncoordinated exploitation of water. • Siltation of water channels	• Institutionalize multi-sectoral and integrated water resource management approaches that promote rational utilization and conservation based on community needs and priorities and the protection of the ecosystem. • Water demand management should be a driving force in water resources management during droughts • Controlling groundwater abstraction from upper and lower aquifers to be within the sustainable yield limits. • Capturing rainwater by harvesting and building micro- and macro-dams for storing water. • Explore water efficiency and management of water demand, particularly in Sahel and Sudan savanna areas. • Raising farmer awareness to implement water conservation measures • Educating the public on better water use practices. • Build capacity and strengthen local expertise on the concepts of Integrated Water Resources Management (IWRM). • Hold workshops on managing and operating the dams to improve the equitable sharing of their benefits and reducing risks to downstream dwellers.	FMWR FMARD FMEnv STATE GOVERNMENTS NIWRMC NIRSAL NGOs/CBOs Resource users Research institutes/centers

		• Carry out pilot projects to remove silt and typha plants along the river courses to improve flow and reduce flooding. • Capacity-building for water users to reduce conflicts. • Linkage with financial institutions to access micro-credit. • Synergize with River Basin Development Authorities to implement the water charter. • Inter basin water transfer: • Strengthen the advocacy for the Inter-basin water transfer from the basin of River Congo to the Chad basin.	
Policy, Institution & Legal Framework	• Poor enforcement of existing legislations. • Overlapping of sectoral policies • Obsolete policies and laws • Weak institutional capacity. • Lack of proper consultation in policy formulation. • Sectoral approach to policy formulation and implementation. • Lack of proper funding of drought mitigation and response activities.	• Review existing policies and regulations to identify gaps. • Streamline and update obsolete policies and regulations. • Sensitize policy makers about drought laws and the need for enforcement. • Engage advocacy visits to relevant enforcement institutions. • Monitor the implementation of policies and enforcement of the laws and regulations. • Integrate drought response actions into budget systems. • Entrenchgender monitoring systems in the budget.	FMEnv NASS STATE GOVERNMENTS LOCAL GOVERNMENTS NGOs/CBOs MEDIA Research Institutes/Centres
Gender Mainstreaming	• Women and men experience different vulnerabilities, risk levels and impacts. • Women are not involved in policy formulation and implementation. • Gender inequality and roles	• Encourage participation of vulnerable groups in communities, during planning and implementation of policies. • Contribute in build existing knowledge and capacities of men, women, boys and girls. • Engage a deliberate gender lens at every level to identify and analyse gender gaps.	FMWA; FMEnv; STATE GOVERNMENTS LOCAL GOVERNMENTS

	contribute to increased women's vulnerability to drought.	• Recognize the important role of women, men and youth as change agents in agricultural adaptation, not only as vulnerable groups. • The distribution of benefits accrued from different adaptation interventions needs to be equitable • Address structural gender challenges, unequal gender relations and power dynamics, including the lack of ownership of land and other production assets, unequal division of labour and inequitable decision-making, that inhibit adaptation technologies and practices by women.	Gender Experts; Women Groups; NGOs/CBOs; Resource users; Research institutes/centers
Health	• Drought conditions are associated with dehydration. When water loss from the body is greater than intake, this will lead to dehydration and hence other health hazard such as thirst, headache, dizziness, kidney and liver problems may follow. • Malnutrition is very likely to occur due to reduced food production, from spread of infectious disease and food- and water-borne illness, and from increased air pollution. • The impact of drought on water resources, including reduced water availability in some areas and flooding causing contamination of water in other areas, will	• Drought Early warning system should give adequate consideration to health of the people particularly of the most vulnerable frontline States of Nigeria. • Strengthen disease prevention and treatment for those diseases expected to increase as a result of drought. • Reinforce programmes to build and maintain wastewater and solid waste management facilities. • States should ensure that bio-fortified food and nutritionally enhanced food materials are made available at affordable rates, to provide needed nutrients to the people, to cushion the effects of drought during critical periods. • Promote and facilitate the adoption of practices and technologies that reduce exposure and health impacts from extreme heat. • Establish early warning and health surveillance programmes.	FMoH FMEnv STATE GOVERNMENTS LOCAL GOVERNMENTS; NGOs/CBOs; Resource users; Research Institutes/centers

	have a negative impact on the already poor sanitation situation in Nigeria		
Forestry and Wildlife	• Drought occurrences often affect the animals, • Animal migration beyond the reserves is often due to lack of water points during the drought period. • During drought conditions wild animals migrate to areas where their survival is assured by nature. • Poaching is common during the drought as the big games often roam beyond their normal habitat in search of pasture and water points. • Increase in frequency and intensity of Wild fires	• Consider Protected areas and inform relevant institutions when forecasting drought condition. • In order to mitigate drought episodes in the reserves it is essential to provide water points in ponds for the animals. • With effective DEWS, adequate arrangement and provision could be made for the animal to prevent them from migration due to drought condition. • Establishment of a scheme for dry farm development and management for forest and wild life; and • Comprehensive review of the national forestry policy. • Improve management of protected areas. • Enact laws that will prohibit logging impact practice. • Establishment of more protected areas across the country. • Adequate control of bush fires through enforcement of bush burning edict.	FMARD FMEnv STATE GOVERNMENTS; LOCAL GOVERNMENTS; Gender Experts; Women Groups; NGOs/CBOs; Resource users; Research Institutes/Centers

9.2 FUTURE UPDATES AND REVISIONS

The drought preparedness plan should be reviewed regularly and as the need arises. The population of Nigeria remains threatened by varying degrees of drought risks and vulnerabilities and so government at different levels and partners may want to initiate or intensify policies accordingly. In order to achieve a long term and lasting reduction in disaster proneness the rate of the marginalization process of water users and the communities in the country particularly along the urban/rural divides will have to be slowed down.

Pre-disaster planning will have to be integrated in the general planning process as it its security mechanism because all regions of the country are clamoring for one issue or the other. Prevention and preparedness are very much in the hands of the governments at all levels. There is an indispensable need for an almost neglected grass root component of pre-disaster planning that integrates plans at local, district state and national levels and the logic for building such plans from below.

Future updates of the Drought Plan should be predicated on the realization that the detection of new challenges and methods of mitigating these problems are continuously being developed and new issues arise which may justify the need for a review. This is very true in Nigeria where the previous National Drought Plan (2007) was insensitive to gender issues which prompted the present review that targets mainstreaming of gender into the plan. With increased levels of research and the frequency and intensity of disasters, it is likely that there will be improved means of detection, monitoring and dissemination of information on droughts which may necessitate a review.

Drought Preparedness plans in Nigeria has a very short history dating back to the National Action Plan (2000) which was conducted under Professor A.O Foluronso (Former Linkage Coordinator, FMEnv. and Centre for Arid Zone Studies University of Maiduguri), followed by the National Drought Plan and National Drought Preparedness Plan 2007(conducted under the consultancy of Professors Daniel M. Gwary (former Resident Scientist for CAZS, Unimaid) and the current review which is being prepared under the consultancy of Professor U.M. Maryah (current Director of CAZS). This reveals that the Centre for Arid Zone Studies University of Maiduguri has played a dominant role in drought preparedness in the country. It is pertinent therefore for future updates to take into cognizance the vast pool of expertise that is domiciled in the Centre for future reviews.