

BUDGETING FOR CLIMATE CHANGE IN WATER RESOURCES SECTOR



CENTRE FOR SOCIAL JUSTICE (CSJ)

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By

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ACRONYMS

COP	Conference of Parties
ERM	Environmental Resources Management
FEC	Federal Executive Council
FGN	Federal Government of Nigeria
FMWR	Federal Ministry of Water Resources
GDP	Gross Domestic Product
GHG	Green House Gases
INDCs	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
MDAs	Ministries Department and Agencies
NASPA-CCN	National Adaptation Strategy and Plan of Action on Climate Change for Nigeria
NIMET	Nigerian Meteorological Agency
R&D	Research and Development
RBDAs	River Basin Development Agencies
SDGs	Sustainable Development Goals
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
WRMP	Water Resources Master Plan
WSR	Water Sector Roadmap
WWAP	World Water Assessment Programme

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EXECUTIVE SUMMARY

Water is life and it serves as the fundamental link between the climate system, human society and the environment (UN Water, 2010). The state of this life-giving resource affects all social, economic and environmental systems. Sadly, water is vulnerable to the impacts of climate change which is already being felt globally. Decades of review of rainfall data by the Nigeria Meteorological Agency shows changing patterns of rainfall manifesting as late onset and early cessation of the rainy season in many locations of the country leading to shortened rainy seasons¹. The worsening situation of water resources in many countries of Sub-Saharan Africa including Nigeria, due to climate change comes with a variety of negative consequences such as increasing food insecurity, trans-boundary conflicts and rising health problems among other socioeconomic consequences². Thus, combating current climate change trends requires various innovative, integrated, multi-sectoral and multidisciplinary responses.

Goal Six of the Sustainable Development Goals (SDGs) has its focus on ensuring access to water and sanitation for all with year 2030 as its target year. This goal is inspired by the fact that the UN considers access to clean water and sanitation as a human right and that lack of it leads to devastating consequences including entrenching poverty and limiting educational opportunities. Human ecosystems are highly dependent on water which also determines and sustains healthy living. Water is also needed for agriculture, manufacturing, energy production, recreation and navigation.

Stressed by growing population, changing consumption patterns and climate variability, the provision of safe water for drinking and cooking, construction of net emission reduction hydropower dams and irrigation facilities will require a robust action plan designed and operated by dedicated professionals, an enlightened and engaged citizenry supported by impact based budgetary allocation. Having such well-planned water resource *management* will ensure the achievement of the three dimensions of sustainable development; promoting social inclusion, protecting the environment and promoting inclusive economic growth.

With increasing temperatures, extreme weather events are projected to increase thereby affecting availability and distribution of rainfall, river flows and groundwater. It will further deteriorate water quality. This will exacerbate an already bad situation with conservative estimates indicating that 31% of Nigerians do not have access to portable water (Federal Ministry of Water Resources, 2016). The most vulnerable – the poor, the elderly, women and children are likely to be adversely affected and their quality of life

¹ Nigerian Meteorological Agency (NIMET) (2015). 2014 Climate Review Bulletin, NIMET, Abuja, Nigeria

² Ngoran, S. D., Dogah, K. E., & Xue, X. (2015). Assessing the Impact of Climate Change on Water Resources: The Sub-Saharan Africa Perspective. *Journal of Economics and Sustainable Development*, 6(1), 2015

further diminished. Water resources are essential since they support most aspects of the economy from food production, security, health, domestic water supply and sanitation, energy, manufacturing to environmental sustainability. Climate change will continue to negatively affect this sector, except urgent steps are taken to build appropriate measures.

To build resilience to climate change and to enhance water security, different adaptation measures to deal with climate variability and promote integrated water resource management practices are required. Invariably, a wide range of approaches will need to be adopted including modern and traditional systems of conserving water resources. The propagation of water harvesting techniques for rural settings to the development of innovative technological solutions, implementation of bespoke sustainable strategies and ensuring adequate budgeting and financing are needed at the appropriate levels for adaptation as well as for mitigation and to enhance resilience.

This Study considers the impact of climate change on the water sector in Nigeria, reviews the various Plans and Strategies of the Federal Ministry of Water Resources and identifies the trend of budgeting in the last four years (2013-2016). In doing so, the Study also considers to what extent these Plans and Strategies addresses climate related issues in the water sector and the effects (positive and negative) of the appropriation to these identified climate impacts. It further considers the various programmes and projects to determine those with high and low climate co-benefits and the desirability to either continue with them based on their value addition to the sector. Finally, the Study identified some good programmes/projects, across the Ministry and its agencies, which if properly implemented will provide climate benefits in a cost effective manner.

Evidence based climate and socioeconomic projections and scenarios need to be developed and used to inform investment and budgetary allocation decisions. Addressing the present and future impacts of climate-related issues can be done through continuous collaboration with relevant research institutes and development partners. While all these activities are rather resource intensive, they can only be realistically conducted in the framework of structured institutional arrangement for coordination, appropriate financial mechanisms (allocation and private sector financing) and adequate human and technical resources. To attract investments, it will be essential to make continuous credible economic case for water resources management at the highest political level and among development partners and investors. Below are a number of recommendations to boost water resources management in the face of changing climatic conditions.

- A priority for the FMWR should be to ensure that RBDAs have enough resources to carry out their mandate, including competent personnel, budget and

equipment. At this stage, it is vital to start adopting a longer-term perspective and embed elements of climate change adaptation. In addition, there should be a plan/strategy for monitoring and evaluation.

- From the fact that motorized irrigation systems guzzle fossil fuel (a major source of human induced climate change) and require high operational and maintenance cost, efficient solar irrigation systems can be adopted. The variety of such solar solutions and options allows for affordability across various sizes and farm clusters. Fossil fuel generating plants for boreholes contribute to CO₂ emissions. For environmental sustainability, there is need to switch to other clean renewable options. The abundance of solar resources in Nigeria provides opportunity for off-grid renewable solutions for water sector development.
- The Ministry should focus on core policy advice and formulation, data collection, monitoring, evaluation and co-ordination of water resources development, allowing the RBDAs to conduct the fieldwork as they are closer to the people. The policy being referred to here should be one that will drive transition from fossil generator plants to renewable energy options in the long term.
- We recommend that actions should be taken to ensure that water resource management structures continue to function properly and efficiently. To this end, coordination between the FMWR, government agencies and the private sector at different levels must be improved. The current capacity gap that affects the Nigerian water sector also needs to be addressed by providing adequate training and support to staff (especially in RBDAs) and incentives to reduce high turnover rates.
- Research and development in the Ministry should be demand driven to solve climate change and other existential challenges. Funds should be budgeted not for general R&D but for targeted research outcomes relevant to climate change.
- Equivalent Ministries at the state level should collaborate with the FMWR on climate change mitigation and adaptation in the 36 states of the Federation.
- Collaboration between the FMWR, Ministry of environment and civil society organizations should be encouraged. This will aid effective monitoring of the projects that the Ministry is carrying out.

- Government should take urgent steps to improve public water supply. This will reduce the rate of indiscriminate sinking of boreholes and wells as well as its attendant negative effects on the environment.
- Dumping of solid waste in water ways should be checked by the appropriate authorities through effective regulation and enforcement action.
- Climate considerations should always be factored in both planning and implementation of water related projects and an appropriate funding mechanism for the water sector in the context of climate change is developed and institutionalized.

1.0 INTRODUCTION

Water is life and it serves as the fundamental link between the climate system, human society and the environment (UN Water, 2010). The state of this life-giving resource affects all social, economic and environmental systems. Sadly, water is vulnerable to the impacts of climate change which is already being felt globally. Decades of review of rainfall data by the Nigeria Meteorological Agency shows changing patterns of rainfall manifesting as late onset and early cessation of the rainy season in many locations of the country leading to shortened rainy seasons³. The worsening situation of water resources in many countries of Sub-Saharan Africa including Nigeria, due to climate change comes with a variety of negative consequences such as increasing food insecurity, trans-boundary conflicts and rising health problems among other socioeconomic consequences⁴. Thus, combating current climate change trends requires various innovative, integrated, multi-sectoral and multidisciplinary responses.

Goal Six of the Sustainable Development Goals (SDGs) has its focus on ensuring access to water and sanitation for all with year 2030 as its target year. This goal is inspired by the fact that the UN considers access to clean water and sanitation as a human right and that lack of it leads to devastating consequences including entrenching poverty and limiting educational opportunities. Human ecosystems are highly dependent on water which also determines and sustains healthy living. Water is also needed for agriculture, manufacturing, energy production, recreation and navigation. Box 1 shows the global water facts.

Box 1: Global Water Facts and Figures

- 2.6 billion Persons have gained access to clean water sources since 1990 but 663 million people are still without access.
- At least 1.8 billion Persons globally use a source of drinking water that is contaminated.
- Between 1990 and 2015, the proportion of the global population using portable water source has increased from 76 percent to 91 percent.
- But water scarcity affects more than 40 percent of the global population and is projected to rise. Over 1.7 billion people are currently living in river basins where water use exceeds recharge.
- 2.4 billion Persons lack access to basic sanitation services, such as toilets or latrines.
- More than 80 percent of wastewater resulting from human activities is discharged into rivers or sea without any cleaning of the water bodies.
- Each day, nearly 1,000 children die due to preventable water and sanitation-related diarrhea diseases.
- Hydropower is the most important and widely-used renewable source of energy and as of 2011, it represented 16 per cent of total electricity production worldwide.
- Approximately 70 per cent of all water abstracted from rivers, lakes and aquifers is used

³ Nigerian Meteorological Agency (NIMET) (2015). 2014 Climate Review Bulletin. NIMET, Abuja, Nigeria

⁴ Ngoran, S. D., Dogah, K. E., & Xue, X. (2015). Assessing the Impact of Climate Change on Water Resources: The Sub-Saharan Africa Perspective. *Journal of Economics and Sustainable Development*, 6(1), 2015

for irrigation.

- Floods and other water-related disasters account for 70 per cent of all natural disaster deaths.

Source: United Nations Water Development Report, 2016

1.1 WATER RESOURCES IN NIGERIA

Nigeria is endowed with large expanse of inland freshwater from the 800km coastline in the South to the Lake Chad Basin in the North. According to the UN Food and Agriculture Organisation⁵, the full extent of water resources in Nigeria cannot be accurately stated as a result of seasonal variation and year to year changes in rainfall. The hydrology of Nigeria is dominated by two major river systems – the Niger-Benue and the Chad systems. Estimates indicate that the surface area of the major rivers is about 10.8 million hectares representing about 11.6% of the total surface area of Nigeria⁶. On a daily basis, the many big rivers including Benue, Niger, Imo, Kaduna, Gongola, etc. and small lakes and streams that transverse the length and breadth of the country provide a means of livelihood and source of income generation for millions of households. Regarding power generation, the Director General of the Energy Commission of Nigeria Prof Eli Jidere Bala states that Nigerian rivers have the potential for generating about 15,000MW of electricity with 23% of it coming from environmental friendly small hydropower plants⁷.

Even with the vast water resource traversing the country in the form of rivers, streams and lakes, Nigeria's portable water infrastructure suffers from severe neglect. Rural areas have witnessed decline in services and in urban areas, people are compelled to purchase water from high cost private outlets. According to the Federal Ministry of Water Resources, 31% (more than 63 million people) live without access to safe water and the WHO estimates that around 68,000 (under-5) children die annually from diarrhea resulting from unsafe water and poor sanitation.

Already stressed by its many uses and growing population, climate change is projected to exacerbate these existing water resource challenges. Business-as-usual climate change scientific projection shows increased water demand amidst shrinking freshwater supplies. This is a trend that will challenge water managers to develop new approaches

⁵ FAO (2016), Nigeria Water Use. Available at: http://www.fao.org/nr/water/aquastat/countries_regions/Profile_segments/NGA-WU_eng.stm

⁶ Ita, E. O., Sado, E. K., Balogun, J. K., Pandogari, A. and Ibitoye, B. (1985), Inventory Survey of Nigeria's Inland Waters and their Fisheries Resource, Part 1: A Preliminary Checklist of Inland Water Bodies in Nigeria with Special Reference to Ponds, Lakes, Reservoirs and Major Rivers. New Bussa, Nigeria, Kaniji Lake Research Institute Technical Report, 14: 59pp Available online: http://aquaticcommons.org/797/1/No_14.CV.pdf [Accessed: August 19, 2016]

⁷ The Nation Newspaper (2013), Nigeria has 15,000MW hydropower potential, available online: <http://thenationonlineng.net/nigeria-has-15000mw-hydropower-potential/> [Accessed: August 19, 2016]

to cater for growing communities, agriculture (crop and livestock production), energy production, sensitive ecosystems and manufacturers. In some other areas, water shortages will be less of a problem than increases in runoff, flooding or sea level rise. These effects have the potential to destroy properties, reduce the quality of water and damage the infrastructure that are used to transport and deliver water.

With the launch of the Water Sector Road Map (2016 – 2030) '*Immediate and Long Term Strategies for the Water Sector*', Nigeria will require effective implementation to be able to upgrade her water infrastructure fast enough to support her exponentially growing population.

1.2 WATER RESOURCES MANAGEMENT AND CLIMATE CHANGE

Water is the primary medium through which climate change influences earth's ecosystem and thus the livelihood and well-being of societies⁸. From observational records and climate projection, the Intergovernmental Panel on Climate Change [IPCC] (2007) concludes that freshwater resources are vulnerable and have the potential to be adversely impacted by climate change, with far reaching consequences for human societies and ecosystems.

Some of the climatic variation observed in Nigeria include changing precipitation patterns in the form of shortened rainy season but with increased intensity leading to catastrophic flooding events, increasing atmospheric water vapour content and changes in soil moisture and runoff, ocean surges caused by rising sea levels, coastal inundations, dry spells, rising temperatures over the last 20 years (NIMET, 2015). The 2012 flooding events that resulted in 363 fatalities, 5,851 injured and displaced over 3.8 million people with total value of damages and losses estimated at over ₦2.6 trillion⁹ stands as Nigeria's most extensive and expensive disaster in recorded history.

While floods may further ravage the humid areas of the South, decrease in precipitation is expected in the savannah grassland of the North. This is projected to increase occasion of heat waves, drought frequency and decrease in surface water resources, thus increasing the overall dependence on underground water sources. The rapid shrinking of Lake Chad from about 25,000 km² in 1960 to less than 2,500 km² in 2007 is mainly attributed to changes in the climatic conditions in the region. This is projected to lead to decreased food security and increased vulnerability of small farm holding

⁸ Bates, B.C., Kundzewicz, Z.W., Wu S. and Palutikof, J.P. Eds., (2008), *Climate Change and Water*, Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210 pp. Available online at <https://www.ipcc.ch/pdf/technical-papers/climate-change-water-en.pdf> [Accessed: August 18, 2016].

⁹ See: *Nigeria Post-Disaster Needs Assessment: 2012 Floods*. A report by the Federal Government of Nigeria with technical support from the World Bank, EU, UN and Other partners, June 2013.

households, especially in the arid and semi-arid tropics of Northern Nigeria ultimately affecting food supply, stability and access.

Responding to the challenges of climate change on water resources requires the development of purpose built adaptation measures¹⁰. Sadly, existing water management practice and infrastructure in Nigeria cannot satisfactorily cope even with current climate variability, such that with large floods and drought, damages of extreme proportion may occur without appropriate and sufficient response. Effective monitoring and information dissemination of trends of the phenomenon will facilitate risk reduction strategies and safeguard lives and properties.

While climate change is one of the major driving forces of change for water resource management, demographic distribution, economic, environmental, social and technological forces drive the management of water resources (World Water Assessment Programme, 2009). Thus with Nigeria's exponentially growing population and changing consumption patterns, there is an increased demand for appropriate water solutions and a robust implementation strategy to ensure sustainable development.

1.3 NIGERIAN CLIMATE CHANGE POLICY FRAMEWORK

Significant impacts of climate change are already being felt in Nigeria, and these impacts are projected to increase in the future. A 2009 DFID funded study conducted by Environmental Resources Management (ERM) using an integrated analytical assessment model to show projected economic impacts of climate change in Nigeria revealed that without the implementation of adaptation, climate change could result in a loss of between 2% and 11% of Nigeria's GDP by 2020, rising to between 6% and 30% by mid-century¹¹.

Following the development of the National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN) which evolved through a stakeholder engagement and providing a basis for an integrated and comprehensive plan for adaptation in November 2011, the Federal Executive Council (FEC) in 2012 adopted the Nigeria Climate Change Policy Response and Strategy. The goal of the strategy is to promote low-carbon, high growth economic development and build a climate resilient society. NASPA-CCN identified the key impacts of climate change on freshwater resources, coastal water resources and fisheries to include increased temperature, rainfall, extreme weather events, sea level rise and cross sectoral challenges and impacts. This is shown in Box 2.

¹⁰ See: UN Water (2010), Climate Change Adaptation: The Pivotal Role of Water, Policy Brief, 18pp. Available online: http://www.unwater.org/downloads/unw_ccpol_web.pdf [Accessed: August 18, 2016]

¹¹ DFID/ERM, (2009). Impact of Climate Change on Nigeria's Economy (Abuja: DFID, 2009).

Box 2: Key Impacts of Climate Change on Freshwater Resources, Coastal Water Resources and Fisheries

TEMPERATURE

Increased temperature results in:

1. Higher surface water temperatures that may lead to habitat loss for some temperature sensitive organisms and increased abundance of undesirable species (e.g. algal blooms and pest species).
2. Higher evaporation and transpiration in plants that could cause reduced availability of surface and groundwater and changes in water quality (particularly salinity).
3. Warmer coastal waters which are linked to increased frequency and severity of storms and higher rainfall events.
4. Impacts on fisheries, including drying up of breeding habitat in wetlands and changes in species composition and abundance.

RAINFALL

Increased incidence of high intensity (extreme) rainfall events could lead to flooding and associated impacts such as:

1. Erosion causing loss of habitat and productive lands.
2. Siltation leading to reduced capacity of lakes/reservoirs, rivers filled with silt (entering cycles of flooding followed by drying), delta accretion, and smothering of mangroves.
3. Contamination of surface and groundwater, including fish habitat.

Drought induced by reduced rainfall can lead to desiccation and death of rivers, lakes and wetlands.

EXTREME WEATHER EVENTS

1. Greater frequency and severity of coastal storm/sea surge could impact mangroves, which constitute critical breeding habitat for many fish species.
2. Drought could reduce or eliminate dry-season habitat critical to sustaining fish populations through the dry season to the next wet season.

SEA LEVEL RISE

Sea-level rise may lead to:

1. Salinization of existing surface and ground water resources in coastal areas, and flooding in areas where rivers can no longer drain to the sea.
2. Loss of low lying coastal ecosystems and shorelines and a general shift of existing coastal ecosystems inland; exposure of new inland areas to coastal erosion processes.
3. An increase in the area of saline and freshwater flooding (wetlands), resulting in an increase in fish habitat, but also changes in species diversity and abundance.

CROSS-SECTORAL

Poor management of climate change impacts in watersheds and in coastal areas will affect other sectors. For example, flooding has direct impacts on communities and infrastructure and leads to impacts in such sectors as agriculture, water supply, power generation, transportation, and biodiversity.

Source: NASPA-CCN

The fundamental objective for the protection of the environment is as stated in section 20 of the Constitution of the Federal Republic of Nigeria 1999 which provides that the “*State shall protect and improve the environment and safeguard the water, air and land, forest and wild life of Nigeria*”. The adoption of the national climate policy is based on

Nigeria's commitment to provide a policy framework to combat climate change at the domestic level as well as its obligations under the United Nations Framework Convention on Climate Change (UNFCCC) as part of the global efforts to stabilize green gas house emission.

The National Water Resource Policy states the objectives of the interventions related to climate change. This is as shown in Box 3.

Box 3: National Water Resource Policy and Climate Change

Key Policy Statement 10 – Flood, Drought and Climate Change

The management of water resources shall be responsive to climate change resilience measures by adopting environmentally friendly practices and innovative solutions towards maintaining the balance between the environment, water resources and ecosystems.

Policy Objectives:

To manage the nation's water resources with a view to ensuring disaster reduction - floods and drought management - environmental conservation and incorporating future climate swings into development planning.

Strategies:

- i. To enhance continuous climate change information gathering and sensitization of planners, stakeholders and the public towards information dissemination at various levels.
- ii. Incorporate climate screening and proofing into all water resources infrastructural development.
- iii. Develop more small-scale earth dams for expanded storage of raw water as adaptation strategy for water conservation, flood management and integrated water management.
- iv. Invest in programmes to upgrade canals and storage infrastructures to improve water conveyance, river training and to reduce water losses.
- v. Improve structural and non-structural flood and drought management.
- vi. Promote integrated catchment management approach for water resources conservation, planning, including rainwater harvesting towards strategic adaptation at community levels.
- vii. Carry out research towards sustainable water use and deployment of renewable options as alternative energy source in the water sector towards creation of green jobs and green energy use.
- viii. Improve drainage facilities in the southern parts of the country and water retention mechanisms in the north to check flooding, erosion and droughts.
- ix. Ensure incorporation of appropriate mechanisms for settlement and compensation programmes into project implementation.
- x. To improve national, regional and bilateral co-operation to strengthen water resources management for environmental sustainability.

Source: Federal Ministry of Water Resources, National Water Policy, 2016

Following the 21st Conference of Parties (COP 21) to the UNFCCC in December 2015, the Paris Agreement was adopted. The Agreement represents (for the first time) a globally endorsed document by all Parties to further commit to addressing climate change. One of the major outcomes of the Agreement was the adoption of the Intended Nationally Determined Contribution (INDC) where all Parties indicated their commitment to reduce emission through national mitigation actions. The Federal Government of Nigeria (FGN) submitted its INDC just before the COP 21 and committed to a 20-45% emission reduction by 2030 while delivering direct development benefits and sustainable growth of the economy¹². While the INDC does not provide a strategic action plan for the water sector, it proposed under agriculture the implementation of strategies for improved resource management including increased use of irrigation systems that use low amounts of water; increase rainwater and sustainable ground water harvesting for use in agriculture.

2.0 TREND OF BUDGET ALLOCATION TO FEDERAL MINISTRY OF WATER RESOURCES FROM 2013-2016

Budgetary allocation to the Federal Ministry of Water Resources for the years 2013-2016 is as shown in Table 1 below.

Table 1: Budget Allocation for the Federal Ministry of Water Resources for 2013 - 2016

Year	Total Allocation	Recurrent Budget Allocation	Percentage of Recurrent Expenditure	Capital Budget Allocation	Percentage of Capital Expenditure
2016	53,300,177,864	7,219,056,441	13.54	46,081,121,423	86.45
2015	23,446,953,562	7,668,953,562	32.71	15,778,000,000	67.29
2014	52,278,003,225	7,707,230,646	14.74	44,570,772,579	85.26
2013	88,227,914,995	7,920,948,630	8.98	80,306,966,365	91.02

Source: Budget Office of the Federation (2013 – 2016)

Table 1 indicates that allocations to the FMWR has been undulating over the four year period, with the 2013 total allocation standing at ₦88.22 billion being the highest whilst the lowest allocation of ₦23.45 billion in 2015. Recurrent expenditure has been almost unchanged; staying in the neighbourhood of over ₦7.2 billion to N7.9 billion for the period under consideration. On the other hand, capital expenditure dropped from N80.3 billion in 2013 to N15.77 billion in 2015 before rising to N46.081 billion in 2016.

On the average, the Ministry's percentage allocation to capital expenditure for the period under consideration was 82.51 percent while that of recurrent expenditure was

¹² Approved Nigeria's INDC

17.50 percent. In 2013, recurrent expenditure got 8.98 percent while capital expenditure got 91.02 percent. In 2014, the percentage distribution between recurrent and Capital allocations was 14.74 and 85.26 respectively while in 2015, 32.71 percent was allocated to recurrent expenditure and a higher 67.26 was allocated to the capital expenditure. In 2016, 13.54 percent is allocated to recurrent expenditure and 86.45 percent to capital expenditure. It implies that the government allocated more money for capital projects than recurrent expenditures, which in developmental terms is good budgeting. Figure 2 below summarizes the above narrative.

Figure 2: Allocations to the FMWR, 2013-2016

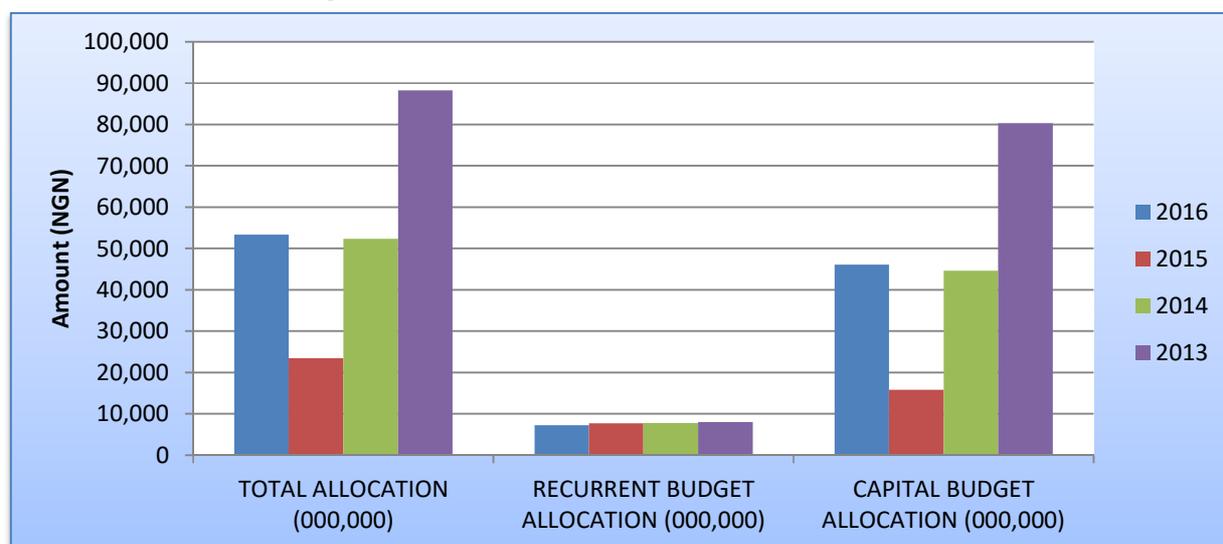


Figure 2: FMWR's Budget as Calculated from Budget Office of the Federation website

2.1 ALLOCATION TO THE WATER SECTOR AND THE FUNDING GAP

Table 2 below shows the capital allocation to water resources sector during three out of the four year budget review in comparison with the expected average annual investment to meet the SDGs (formerly MDGs). This is calculated against the background of the Water Aid Country Strategy projections.

Table 2: Capital Allocation to the Water Sector 2013 – 2015 and Funding Variance

Year	Capital Allocation to Water Resources	Water Aid Country Strategy (Projections) 2010 – 2015 ¹³	Variance Between MDG Water Targets and Allocation to Water Resources
2013	80,306,966,365	256,864,800,000.00	176,557,833,635.00

¹³ To meet the MDG Water targets, Nigeria must invest an average annual funding of approximately £1,048 million in the sector.

2014	44,570,772,579	256,864,800,000.00	212,294,027,421.00
2015	15,778,000,000	256,864,800,000.00	241,086,800,000.00

Source: Computed from BOF and Water Aid Country Strategy Projections

These large funding gaps show how relegated the water sector stands in the scheme of FGN's priority. Table 2 showed an average variance of N209.48 billion over the three years. Over these periods, the average budget of the Ministry in relation to total annual appropriation stood at about 0.8%. Even with such low budget allocation, uncompleted projects within the Ministry show severe neglect. According to the FMWR, the total amount required to complete the 116 on-going and abandoned projects across the country stands at over N504 billion¹⁴. With a capital budget of less than N16 billion in 2015 (assuming no new project is taken up), it will take another 32 years to complete these on-going and abandoned projects. But the infrastructure being completed then would be insufficient to cater for the country's population at that time¹⁵.

Fortunately, the 2016 Appropriation Act proposed a capital expenditure of over ₦46 billion which is a commendable increase. However, it will take 11 years to complete existing projects under the same budgetary allocation. Water being a cross cutting sector, is not receiving the needed prioritization with less than 0.9% of the 2016 total national budget. Completing these projects is imperative not only to ensure water supply but also to enhance adapting to climate change impacts in the near future. Thus, it will be important to complete these projects before 2025 and this will require a minimum capital allocation to the Ministry of ₦57 billion annually¹⁶.

¹⁴ Presentation by the Minister of Water Resources Engr. Suleiman h. Adama, (*Fnse*) at the public launch of the "Immediate and Long Term Strategies for the Water Sector" 2016 – 2030 on 18th August, 2016 at the National Press Centre, Radio House, Abuja.

¹⁵ United Nations Department of Economic and Social Affairs, Population Division (2012). World Urbanization Prospects: The 2011 Revision, CD-ROM Edition.

¹⁶ According to the Federal Ministry of Water Resources, the total amount required to complete the 116 on-going and abandoned projects across the country stands at over 504 billion [1]. With a capital budget of 16 billion in 2015 (assuming no new projects are taken up), it will take another 32 years to complete these on-going and abandoned projects. It is important to mention here that it will be almost the mid-century – 2048, when United Nations projects that Nigeria's population is estimated to surpass 370 million[2]. Fortunately, the 2016 Appropriation Act proposes a capital project amount of over N46 billion which is a commendable increase. But this will take 11 years to complete these on-going or abandoned projects with the level of capital budgetary allocation. Completing these projects is imperative to adapting to climate change impacts in the near future. It is opined that these projects be completed before 2025, and by that, it will require a minimum capital allocation of ₦57 billion annually to the Ministry assuming that no new projects are taken on and inflation is held constant. Water being a climate sensitive cutting across sectors, one can say that it is not receiving the needed prioritization it requires with less than 0.9% of the 2016 total national budget.

3.0 WATER RESOURCES PLAN AND NEED FOR ROBUST CLIMATE CHANGE FINANCING

Against the background of poor funding and implementation of water projects in Nigeria and the imminent threat posed by climate change to the sector, the need for an effective framework that will fund the sector in the context of climate change has become very compelling. The FMWR is mandated inter alia to formulate the National Water Resources policy towards ensuring adequate water supply for agricultural, industrial, recreational, domestic and other uses; management of hydro-meteorological and hydrological data; implement the Water Resources Master Plan (WRMP) and promote research in water resources management. Pursuant to that mandate, it recently launched the Water Sector Roadmap tagged “Immediate and Long Term strategies for the Water Sector” 2016 – 2030 with a target of 100% access to safe drinking water by the year 2030 from the current 69% access. This strategy is based on the United Nations Sustainable Development Goal 6 – ‘ensure access to (safe) water and sanitation for all’.

While the Water Sector Roadmap is a laudable framework, financing for such an ambitious plan requires a robust and detailed outline. This is especially so considering the shortages in government revenue, government’s renewed strategy to develop the agricultural sector and the need to avoid fanciful projects with minimal impact.

With water access already pressured by rapidly growing population, diversification into agriculture will bring about more pressure as agricultural practices require huge amounts of water¹⁷. Climate change on its part stands as an exacerbating factor for increased water demand, reduced water quality and quantity. As earlier indicated, the water sector is highly vulnerable to climate change which leads to reduced rainfalls leading to increased occasional drought, increased intensity of rainfalls leading to floods, increased evapotranspiration from increasing temperatures, more heat waves occasions leading to increased demand for drinking and bathing water etc. Consequently, the national budgetary allocation must factor in climate change considerations to the water sector and be sensitive to potential consequences. The budget must make adequate provisions for not only water supply development but also for building the resilience of the sector to very likely climate impacts.

3.1 ALLOCATIONS POSITIVELY IMPACTING ON CLIMATE CHANGE

In reviewing the 2016 budget for water resources sector, the construction of dams received higher allocation when compared with the 2015 allocation. But it is lower than the allocations for 2013 and 2014. Since construction of dams and reservoirs can be

¹⁷ Nigeria’s water withdrawal ratio for agricultural purposes is estimated by Food and Agricultural Organisation (FAO) to be 69%; FAO Aquastat database.

considered as an adaptation and mitigation measure providing constant water supply both for agriculture and hydroelectricity which will contribute to smart agriculture and clean energy (hydropower), there is need to sustain such positive budgetary allocation. Table 3 has the budgeted sums for the construction of dams in the fiscal years under review.

Table 3: Allocation for the Construction and Rehabilitation of Dams

Year	Capital Budget Allocation	Amount for Dams	% of Capital Allocation to Dam Construction
2013	25,936,910,815	13,092,373,400	50.48
2014	30,673,743,742	18,662,791,479	60.84
2015	15,778,000,000	2,716,421,699	17.22
2016	46,081,121,423	10,314,877,023	22.38

Source: Budget Office of the Federation: Approved Budgets 2013-2016

Table 3 shows that ₦13.09 billion, ₦18.66 billion, ₦2.72 billion and ₦10.32 billion was set aside for construction and rehabilitation of dams in the 2013, 2014, 2015 and 2016 budgets respectively. More allocation was provided for dam construction in 2014 budget even when the capital allocation of the sector was smaller than the 2016 allocation. 22.38% was provided for dam construction in the 2016 budget which was below the 60.84% provided in 2014 budget. It is imperative that on-going projects be prioritized in resource allocation. It is important for these dams to be completed and old dams rehabilitated. This will aid smart agriculture and also help to address low rainfall that comes as a result of climate change. It will also help in channeling excess sea water during high rainfall due to rise in sea level.

4.0 ALLOCATIONS IN THE WATER SECTOR WITH CLIMATE CO-BENEFITS

This section reviews the FMWR budget over a four year period from 2013 – 2016 for projects and programmes with positive outcomes for climate change issues. These include the following.

Table 4: Climate Change Related Budgetary Allocation from 2013 - 2016

Year	Project Description	Allocation (N)
2013	Development of Climate Change Information Model for the Eight Hydrological Areas with Focus on Hydrological Areas 6 (Western Littoral) in 2013	15,000,000
	Research/Studies on Appropriate Adaptation for Climate Change Clean Energy Use in the Water Sector (Hydrological Area I - Sokoto-Rima Basin)	7,500,000
	Participation at National and International Conferences, Seminars and Workshops on Climate Change	7,500,000
2014	Development of Climate Change Information Model for the Eight Hydrological Areas -Focus on Western Littoral (Southwest)	15,500,000

	Comprising Of Lagos, Ogun, Oshun, Ondo and Ekiti States	
	Research/Studies on Appropriate Adaptation for Climate Change Clean Energy Use in the Water Sector (Hydrological Area I & 6)	9,500,000
	Participation at National and International Conferences, Seminars and Workshops on Climate Change	5,000,000
2015	Development of Climate Change Information Model for the Eight Hydrological Areas - Focus on Western Littoral (Southwest) Comprising of Lagos, Ogun, Oshun, Ondo and Ekiti States	1,632,803
	Flood Plain Investigation Programme: Flood Risk and Mitigation Investigation/Studies in Major Flood Prone Areas of the Country (by National Hydrological Services Agency)	5,176,033
2016	Research and Development	324,000,000
	Community Based Advocacy on Climate Change Effect on Water Sector Nation Wide	60,000,000
	Development of Climate Change Water Sector Information System	20,000,000

Source: Annual Budgets, Budget office of the Federation, 2013 – 2016.

Table 4 above shows that there have been allocations for climate change research and study in the four years reviewed. In the budget of the 12 River Basin Development Agencies (RBDAs) and other agencies under the Ministry, there have been yearly allocations for research and development. But these R&D allocations have not shown any direct linkage to climate change. There have also been allocations for erosion and flood control. This is a step in the right direction in combating the challenges of climate change. In the area of human development, it is essential that capacity development for knowledge and skills for personnel of the Ministry and its relevant agencies is integrated into planning and provided for in the budget.

According to the Fourth Assessment Report, climate change projection will reduce the volume of freshwater resources by as much as 10 – 30% in many tropical regions and by the third quarter of the century, people in their millions will experience flooding annually especially in developing countries including Nigeria. Large parts of Northern Nigeria are susceptible to desert encroachment and are already experiencing severe freshwater shortages. Budget allocation for the Ministry should consider the threat this poses for the agricultural sector considering that a significant amount of food comes from this region.

While there are few established planning methods for adaptation to climate change in the water sector because it is an uncharted area, application of adaptation technology must consider the communities for which it is developed. The budget allocations for the three years contain known adaptation projects and programmes some of which include:

- Erosion and flood control;
- Construction of earth dams
- Development of climate change models
- Trainings (local and international); Research and development

4.1 NEGATIVE IMPACT OF BUDGET ALLOCATIONS ON CLIMATE CHANGE

Table 4 above contains budget allocation for climate change interventions. However, there is a downside to it which has been the year on year repetitiveness of certain projects in the budgets. In the year 2013 - 2015, there were allocations with same description and item title captured as 'new' in each year. The concerns here are in three folds. One, this repetitive trend suggests a lack of innovative strategies which is necessary for successful climate interventions. Secondly, the entries repetition may be as a result of lack of implementation, that is none release of funds to execute the programme. Thirdly, it could be a case of unclear and frivolous budgeting. These concerns stem from the fact that the struggle against climate change must be driven by the legal/moral imperatives and the political will to take decisive actions. In addition, some of the allocations in Table 4 can be classified under climate knowledge when the world has moved from climate knowledge to climate action using best practices in climate financing.

Furthermore, there seems to be a huge focus on the construction of earth dams and motorized boreholes. While these projects are laudable in reducing water pressure in the short term, they are vulnerable to climate variability in the long term. With reducing amount of rainfall (as a result of climate change), leading to reduced surface water and groundwater recharge, these facilities may become redundant and useless in the future.

It is understood that construction of dams fits into the government plan to diversify the economy as reflected in the Ministry of Agriculture's increased 2016 budget allocation. The concern with this is for Nigeria not to over focus on one sector like it did with the oil sector. Intensive agriculture is a major source of greenhouse gases (GHG) emission responsible for present day anthropogenic climate change. Agriculture contributes to the emission of GHG through the intensive use of nitrogen-based fertilizer, the use of animal dung and uncontrolled felling of trees to clear land for agricultural use. Also, agriculture is very vulnerable to the impacts of climate change; from the changing precipitation patterns to the intensive rainfall leading to farmland flooding.

The review of the Water Sector budget revealed some borehole projects being powered by fossil fuel generators. While such projects enable communities to access portable water for improved livelihood, the operation of these generators contribute to overall emission release and should be discontinued as they negatively impact the environment. The 2016 water sector budget alone has 40 motorised borehole projects needing fossil fuel powered generators.

5. AFFORDABLE LOW HANGING FRUITS FOR MITIGATION AND ADAPTATION STRATEGY IN THE WATER SECTOR

With the current call to diversify the Nigerian economy through agriculture, the redevelopment of the water sector cannot be over emphasized. Unfortunately, the water sector in Nigeria has suffered years of neglect and there are many reasons for this. Some of these reasons include poor budgetary performance, non-appreciation of climate change impact on water, general inefficiency and vested interest of those responsible for implementation. Fortunately, there is still opportunity to reverse this trend through streamlining of projects and identification of cost effective interventions. The low hanging fruits which can be implemented from available resources include:

- From the review of the Ministry's budget, it was revealed that there are over 150 on-going small hydropower and irrigation dam projects across the country. The government should consider completing these projects which will cost less in relation to new big power and irrigation projects. However, this should be done only after due diligence has been conducted on such projects to assess their viability.
- While there is no one-irrigation system that is best for all situations, the government can promote the use of low cost drip systems as against the standard commercial drip systems. This system saves water and increase yield where rainfall is low and irrigation is used throughout the growing season. The availability of these low cost drip irrigation packages unlocks their potential for literally millions of poor farmers. It is potentially beneficial even where water supply is considered insufficient. This can be developed using local technology and materials.
- Though there are drawbacks; rainwater harvesting although an old technique can be important for providing a sustainable source of irrigation water for use in arid, semi-arid regions of the northern part of the country to supplement rain-fed agriculture. Rainwater harvesting is an efficient adaptation approach which methods include rooftop harvesting¹⁸; short term micro-catchments¹⁹; macro-catchments²⁰ and floodwater harvesting – where water is collected from major seasonal rivers, channeled and stored in soil, ponds or reservoir.
- Sustainable collaboration with the Ministry of Agriculture and Rural Development so as to use extension services to disseminate water resources - climate smart

¹⁸ Rainwater is caught and stored directly from rooftops.

¹⁹ The land is contoured to catch run-off close to the cropping area.

²⁰ Run-off is collected from large catchment outside the cropping area.

information relevant to farmers including conservation through sustainable water management systems.

- For erosion projects being carried out by the Ministry of Water Resources, climate resistant trees planting will be a vital solution to erosion problems.
- With the public launch of the '*Immediate and Long Term Strategy for the Water Sector*' 2016 – 2030, there is need to assess the full potential of water resources in Nigeria with a bid to evaluate the possible construction of more dams and reservoirs to maintain constant water supply for smart agriculture and hydroelectricity.
- Agencies and authorities under Ministry of Water Resources should be given more funds for capital project execution as against the main Ministry carrying out those projects. The Ministry should be more focused on policy formulation and supervision and monitoring of implementation.
- The Ministry should ensure that all projects embarked upon are environmental friendly and climate sensitive. Thus, generation, deployment and use of renewable energy should be mainstreamed in all major projects of the Ministry.

6.0 BUDGET AND POLICY RECOMMENDATIONS

Evidence based climate and socioeconomic projections and scenarios need to be developed and used to inform investment and budgetary allocation decisions. Addressing the present and future impacts of climate-related issues can be done through continuous collaboration with relevant research institutes and development partners. While all these activities are rather resource intensive, they can only be realistically conducted in the framework of structured institutional arrangement for coordination, appropriate financial mechanisms (allocation and private sector financing) and adequate human and technical resources. To attract investments, it will be essential to make continuous credible economic case for water resources management at the highest political level and among development partners and investors. Below are a number of recommendations to boost water resources management in the face of changing climatic conditions.

- A priority for the FMWR should be to ensure that RBDAs have enough resources to carry out their mandate, including competent personnel, budget and equipment. At this stage, it is vital to start adopting a longer-term perspective and embed elements of climate change adaptation. In addition, there should be a plan/strategy for monitoring and evaluation.

- From the fact that motorized irrigation systems guzzle fossil fuel (a major source of human induced climate change) and require high operational and maintenance cost, efficient solar irrigation systems can be adopted. The variety of such solar solutions and options allows for affordability across various sizes and farm clusters. Fossil fuel generating plants for boreholes contribute to CO₂ emissions. For environmental sustainability, there is need to switch to other clean renewable options. The abundance of solar resources in Nigeria provides opportunity for off-grid renewable solutions for water sector development.
- The Ministry should focus on core policy advice and formulation, data collection, monitoring, evaluation and co-ordination of water resources development, allowing the RBDAs to conduct the fieldwork as they are closer to the people. The policy being referred to here should be one that will drive transition from fossil generator plants to renewable energy options in the long term.
- We recommend that actions should be taken to ensure that water resource management structures continue to function properly and efficiently. To this end, coordination between the FMWR, government agencies and the private sector at different levels must be improved. The current capacity gap that affects the Nigerian water sector also needs to be addressed by providing adequate training and support to staff (especially in RBDAs) and incentives to reduce high turnover rates.
- Research and development in the Ministry should be demand driven to solve climate change and other existential challenges. Funds should be budgeted not for general R&D but for targeted research outcomes relevant to climate change.
- Equivalent Ministries at the state level should collaborate with the FMWR on climate change mitigation and adaptation in the 36 states of the Federation.
- Collaboration between the FMWR, Ministry of environment and civil society organizations should be encouraged. This will aid effective monitoring of the projects that the Ministry is carrying out.
- Government should take urgent steps to improve public water supply. This will reduce the rate of indiscriminate sinking of boreholes and wells as well as its attendant negative effects on the environment.

- Dumping of solid waste in water ways should be checked by the appropriate authorities through effective regulation and enforcement action.
- Climate considerations should always be factored in both planning and implementation of water related projects and an appropriate funding mechanism for the water sector in the context of climate change be developed and institutionalized.

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