

# Climate Change and Environmental Impacts of Flood in Nigeria

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## Abstract

Flood incidences pre-date Nigeria. It was one of the natural phenomena applied as retributive justice in the Holy Bible. Although, flood cases were fewer in the bible, but the most notable was that of Noah which occurred during forty days and night of continuous downpour of rains resulting into total destruction of all living things on the earth except the immediate family of Noah and the pairs of animals that were carried into the constructed Noah's Ark as directed by God. Today, Nigeria is wallowing in deep water distress especially flood from one place to the other. The causer factors and effects are controversial. Could it be the result of our sins as it was the case during the bible time or a total neglect of climate change or as a result of human radical interference with the environment? One major thing that is certain about the flood is that it has added pepper to a painful sore of Nigerians. The extent of this has not been estimated. These form the reflection of this discourse. However, it is revealed that most floods in Nigeria result from both human unhealthy interference with the environment as well as neglect of climate change. These have gone too far to affecting the environment. In other words, there is mass land and water conflict, forest shrinking and animal disappearance as well as rising wave of environmental refugees. Meanwhile, amnesty programme and institution of environmental laws are advocated.

**Keywords:** Climate Change, Environmental Impacts, Floods, Nigeria

## Introduction

Honestly, there is no other way to recover from the byssi environmental woes and calamities presently facing Nigeria other than to plug into the past following the words of Charles Spurgeon who lived between 1834 and 1892. I quote "Look for a thing where you dropped it .... But if it is hard to go back searching, for twenty miles onward is easier to go than one mile backwards." However if we must search backwards, be it production, governance or what have you, we must learn from historical antecedents of other countries.

The state of Arkansas in the United State of America is one of the smallest among the 52 states of that country, yet it produces 60% of the eggs the entire country consumes. Cuba, a small Island in the West Indies, produces the best sugar and high profile Cigars in the world. Also, stories had it that the Kennedys smoked or gave out no other brand while they wielded their political prowess. The Bay of Pigs invasion of the 60s tells another story.

Nigeria used to be the leading country of palm oil and palm kernel up to the time of the oil boom, second to Brazil in Cocoa and first in Groundnuts. Policies of production then were based on comparative advantage and conservation and preservation of natural resources. However, it is sad to know today that every state for some coerced years back was into production of cassava chips for China's pig industry. Garri that used to be 5kobo a cup or #20.00 per kongo is now #30.00 per tin, while kongo has gone to #200.00 or more. From coastal Lagos to desert-front (Devastated) Borno, the mad rush for cassava cultivation which was spearheaded by the federal government had vanished. Where is the cassava industry today? No cassava impoverished citizen and the environment is poorer for it with droughts, erosions and floods playing 'Russian Roles on the Nigeria landscape.

We have not seen the end because the basis of agriculture is land (soil) which is being ravaged and degraded by floods and drought without governments taking cognizance of what they should be doing beyond agreeing to palliatives to keep the populace happy on the surface. We are a race that never learn from history and remain comatose in thoughts and ideas as a corporate nation-state whereas elements keep crying on rooftops for a change in the country's agenda.

The point being stressed here is the fact that 'memories' are shallow and short. When last did you see a maize stalk carrying 2 to 3 hair of corns? When was the last time man allows plantain to turn golden yellow on the sucker with birds picking and pecking as they were want to do in those days? In living memory, I was privileged to have been alive to harvest and eat them. It is obvious, things are different today. Nigerians and nature have seriously changed. So also are the fruits of the farm. We are better informed that man is the architect of the bad turn in natural cycles and with disappearing insects that pollinate flowering plants for superior yield will also be disappearing of not just flowers but crops under climate change. Therefore, there is the need for us to look beyond our local communities to realize the signatures of the changing times rather than face realities, commentaries and opinions are so farfetched that one wonders where Nigeria is heading towards with climate change. The rural poor has no access to electricity yet someone is clamoring for e-Agriculture. Ideally, this would have been the best innovation right now in Nigeria, but history tells us it will not work. We have too many obvious holes to fill before embarking on that type of adventure. The Operation Feed the Nation of blessed memory should teach us to look twice before we contemplate on whether to jump or put a ladder across the

gorge to cross over. This has motivated this work with a view to advance mitigation measures to the effects of climate change in our nation especially the havoc of annual flooding.

### Concept of Climate Change Population and Environmental Management

According to United Nations Population Division (2011), the world is adding the largest number to its population now than in any time in history. World population reached seven Billion in 2011 within 12 years from 1999 when the sixth Billion mark was achieved. This was in great contrast to the second Billion achieved in 1930 occurring – 130 years after First Billion ever was reached in 1800. The current rate of growth is thus about 18 million annually which is saying that by 2003, world population would increase to Eight Billion.

With the high rate of global population explosion which is happening in the developing world, poverty is emerging as a serious global issue especially in the most rapidly growing countries like Nigeria. The World Bank (2011) has classified world development Indicators in which Nigeria with an index of 81% leads the peak while Democratic Republic of Congo is second with 80% of its population living at less than US \$2 per day. Surprisingly, India an emerging economy State has 76% of her population or 900 million people in that category (World Bank, 2012).

Nigeria has only 80% of her population living less than \$2 per day (World Bank, 2012). Nigeria needs to be careful with respect to her population growth which is projected to rise astronomically from 160 million in 2011 to 433 million by 2050 (that is if we limit birth to 2 per family). It will go in world ranking from 7<sup>th</sup> position to 3<sup>rd</sup> only next to China and India within 40 years- even going ahead of the U.S.A which is currently in 3<sup>rd</sup> position or shown in table 1 and 2 (PRB,2011). The implication of Nigeria’s projected population – come 2050 – should ‘scare’ any mind. The Nigerian landscape cannot become larger than its present size of 924,000km<sup>2</sup> unless we annex neighboring countries like Cameroon that has ceded the Bakassi peninsula and other countries to the west and north. This is a political impossibility. Lake Chad environ to the northeast is almost but lost to desertification by product of drought. The country must brace up for more intense inter/intra state local boundary bloodsheds and losses of lives and intra structure if nothing is done (as typical of us) and wait until 2050 when it will undoubtedly be too late for intervention in the face of threats of flood which become more severe under climate change.

If the U.S.A with all her technology is still struggling to survive severe and extreme weather events with 300 million people now that will only increase by a mere 100 (plus) million in 40 years. Let us imagine the implications of what will become of Nigeria in that space of time with a phenomenal increase of over 270 million under a state of insecurity in many sectors including life property, food etc. Corruption (that is crying to the high heavens for suppressions), mono economy (dependence on oil) is aberrations, which will not help under climate change for two reasons:

- i. The total arable land will shrink to less than 70% of its carrying capacity in the face of inundated coastal south and advancing desert in the north. Thus reducing land resources.
- ii. Increasing population will combine with possibly shrunk oil mono – economy to make for a bleak for yet unborn generation in Nigeria since the country has survived the project break up in 2015 (IPCC, 2009).

**Table 1: Population of some countries in 2011**

Country	Population (Million)
China	1,346
India	1,241
United state	312
Indonesia	238
Brazil	197
Pakistan	177
Nigeria	162
Bangladesh	151
Russia	143
Japan	128

Source: (World Bank, 2012).

**Table 2: Projected population of some countries in 2050**

Country	Population(Million)
India	1,692
China	1,313
Nigeria	433
United State	423
Pakistan	314
Indonesia	309
Bangladesh	226
Brazil	223
Ethiopia	174
Philippians	150

**Source:** (World Bank, 2012).

### **Climate Change and Nigeria Environment**

Nigeria is located between the environmentally dynamic Atlantic Ocean to the south, and the large expansive Sahara Desert to the north. Nigeria has become very vulnerable to the adverse consequences of weather and climatic events, particularly during the past three decades. Africa in general, and West Africa and Nigeria in particular have been a major focus of attention. The impact of climate (variation and change) on environmental dynamics and their implications on the socio-economic and socio-cultural attributes on the continent have been escalating while attempts to curb or control them have been disjoint and disappointing.

Concerns have been expressed on consequences of recurrent rainstorms that cause colossal damage in Nigeria, both in the resent past and in the present time. The calamities that follow have created considerable awareness and have demonstrated the sensitivity of human welfare and the socio-economic planning to environmental imperatives. With floods, soil erosion is fast eating away the country side as consequences of climatic variations and climate change. There is no further doubt as to whether or not climate change is the remote cause(s) of unstable governments. People now feel caught by issues of climate variability, climate change and their impacts, as regards the problems of sustainable development and sustainability of the environment and natural resources. Even local hunters have expressed fear of depend natives-habitat animals suggesting that FAMINE is imminent (Adefolalu, 2013).

Scientific evidence has shown that variability and changes which have been known to occur in weather and climate will continue in future and that these changes will continue to have implications for resources planting and management. In particular, such evidences suggest that there is urgent need to be concerned with the science of climate change, its characteristics and consequences or impact on the future of the environment. All these call for adaptation measures to reduce the adverse consequences of the impact of climate change, especially in coastal areas prone to effects of sea level rise (SLR). Rises to population are to be minimized while recognizing the need to protect and maintain important coastal marine ecosystem vulnerable to higher sea surface temperature (SST) and the effects of storms surges and tidal waves.

### **Implications for the Coastal Areas of Nigeria**

The Nigeria coastal environment can be described as an 834 kilometer- long stretch of coastline that begins from the boundary of Nigeria – Benin Republic through the western flanks of Lagos, Ogun, and Ondo states, through the Niger Delta sub – region of Edo, Delta, Balyelsa, Rivers and Akwa-Ibom states, to the Eastern flanks of Cross River state (Teme,2005). Some other inter land states of Abia and Imo (in the eastern flanks) as well as Ondo (in the western flanks are also added to the “sensu-lato” definition of the present day Niger Delta sub-region of Nigeria.

The Niger Delta zone is approximately estimated to be about 75.5% of the Nigerian coastline (629.67-630km) the western frank is about 8.21% of the coastline (68.50km). Quite critical to the climate with rainfall are key to mean state stability.

The coastal or lever Delta zone consists mainly of sandbars and ridges and the water bodies here are saline in nature. The area is subjected to diurnal ebb and flow tides thus quite distinct from annual floods of the freshwater zone. The sub-soil here consists of sand, silts and highly plastic clays in some inlet areas. The vegetation of this zone is basically mangrove trees with a preponderance of nippa palms (a recent development in this zone). Some freshwater trees such as palm trees are also found within the few elevated bead ridges within this zone. Town within this zone are Bonny, Akassa, Brass, Bekinkiri, Koluama1, (unripe out by wave erosion in early fifties), Koluama, Oyerokoto (Teme, 2005).

The Transition or mangrove (Middle Delta) zone coincides with the mangrove brackish water zones with its numerous inter-tidal flats and mangrove vegetation. Sub-soils here are characterized by a typical fibrous,

pervious clayey mud (locally known as chico) that exhibits large values of compressibility and consolidation. Usually beneath these fibrous layers core silty sands which most often grade into partly-graded sands and gravels. Lateritic clays also occur in certain 'old' residual deposit on which are located densely populated town such as Bakana, Buguma and Abonnema in River State. The Vegetation within the Transition zone comprises basically mangrove trees especially within the saline swamps and along the banks of the numerous rivers, rivulets and creeks. Further inwards and away from the rivers and creeks are some palm trees and giant's trees that populate the patches of residual 'high' lands where human settlements are often found. Such settlements as Angulama, Bukuma, etc are situated in these areas. This Zone experiences diurnal ebb-and-flow of the tides with maximum values obtained during once-a-year spring tides. Notable settlements and towns within this zone comprise port- Harcourt, Opdo, Sapele, Buguma, Abonnema, Bakana and Warri. (Adefolalu, 2013).

There is the Freshwater or Upper Delta zone that comprises the remaining northern position of the Niger Delta sub-region. This covers the predominantly fresh water rivers, creeks and ephemeral depressions. Generally, soil profiles within this zone comprises of a top lateritic clay layer usually underlain by silty clays and silty sands which are further underlain by poorly- graded sands and gravels. Notable towns in this zone include Agbere, Odoni, Ndoni, Isampou, Patani, Asamabari, Yenagoa and Amasonia. The vegetation within the freshwater zone comprises of palm trees, broad-leafed trees with very thick undergrowth characterized by creepers and climbing varieties. Tall grasses are not uncommon within the zone. The once famous cane-furniture are made from such tough termite-resistant. Climatologically, rainfall occurs in over nine months of the year, especially during the annual flood periods of May through October and ranges in value between 200mm and 600mm monthly in towns such as Aloada and Omoku in Rivers state. (Adefolalu, 2013).

#### Precipitation Dynamics and Floods in Niger Delta

Being in the southern rainforest/mangrove belt Niger Delta has means state precipitation regime of equistatic patterns with the west and east flanks receiving more rainfall during each of the rainy months of April through October and annual mean values (1941-80). Flood events are therefore perennial to the region. Also, the specific water consumption exceeds -1500mm in all states and is therefore prone to sheet flow and river overflow in the low-lying coastal margins. See table – to as they present summaries of these attributes for all the states that qualify for sheet flow and river flow.

**Table3: Vulnerability Classification of Ondo State. (Geopolitical zone. SW)**

Parameter	Lowest Value	Higher Value	Remark
Rainfall Intensity (mm/hr)	35	40	Low to moderate rainfall intensity flood to be much weaker than sheet flow or annual flood.
Mean Annual Rainfall (mm)	1100	1900	Moderate to high annual Rainfall-Annual Flood due to rivers and of excessive rainfall.
Degree of wetness or dryness ( ratio)	0.5	1.6	Drought spells will be intense in northern half while flooding will be perennial in riverine areas (Ratio) south of ore.
Specific Water Consumption (w/f)	-1600	+100	Drying trends in northern half to become worse while perennial water-logging will be worsened by impact of climate change in riverine areas.

Source: Adefolalu, 2013.

**Table4: Vulnerability Classification of Edo State (Geopolitical zone.SS).**

Parameter	Lowest Value	Highest Value	Remark
Rainfall Intensity (mm/hr)	25	45	Water logging in below sea level south especially Benin area and southwards.
Mean Annual Rainfall (mm)	1200	2500	Moderate to very high rainfall to cause annual flood in southern half of the state. Erosion to be high in Auchi/Ishan/Akoko. Edo upload LGAs to the north.
Degree of Wetness or Dryness ( ratio)	0.7 (NE)	1.3 (south central)	Drying trend in the north east similar to SW Geopolitical zone. But southern one-third is prone to flood.
Specific Water Consumption (W/F)	-1500	-100	Flood sheet flow and Annual Flood in the south. The North will need water supplementation especially in drought years.

Source: Adefolalu, 2013.

A very critical aspect of rainfall is the diurnal patterns. Rain occurrence is the expected in Calabar from early hour to late evening (02-21 GMT). It must also be observed that while maximum occurrence of rain is

concentrated between July and October in Port-Harcourt, its spread from June through November in both Warri and Calabar. These have impact on day-to-day activities of local communities. Flooding will dominate the low-lying plains for months east and west of Port-Harcourt which suggest that sustainable channelization of perennial rivers should have higher priority in the Niger Delta.

### **Implications on the Environment and Livelihoods**

The PLAN B.4.0 for ‘Mobilizing’ to save civilization from the ever increasing impact of climate change base in the current off beat approach of the developed countries which has been considered rather too slow to salvage the world.

However, the introducing aspect of the plan was advocated and this form the basis of generalization as it applies to Nigeria.

### **Land and Water Conflicts**

As land and water become scarce not necessarily quantity but quality with resulting from environmental decay arising from floods and drought, competition for these vital resources intensities within societies, particularly between the wealthy and the poor who are disposed. This shrinkable of life supporting resources per person that comes with population growth is threatening to drop the living standards of millions of people below the survival level, leading to potentially unmanageable social tensions.

Non-accessibility to land is a prime source of social tension. Expanding world population has cut grain land per person in half since 1950 to less than an hectare. This does not only threatens livelihood but threatens survival in largely subsistence societies. Tension within the communities begins to build as landholdings shrinks below the survival that needed for survival. Nowhere is this so crucial than in the Niger Delta of Nigeria due to natural causes including global-warming-related high Sea Surface Temperature (SST) and Sea Level Rise (SLR) resulting in tidal wave-induced coastal flood related inundation marine ecosystem degradation and biodiversity losses, etc.

The situation in the south and in particular the Niger Delta is precarious. Sea Level Rise (SLR) has already inundated appreciable coastal margins while pollution by gas flaring and oil spills have depleted the once rich alluvial of biological diversity.

In the Niger Delta, the problem of canals (or water resources) degradation reached a climax during the late 80s when the biodiversity of the region (fish, fauna and flora) was threatened with dumping of toxic waste at koko in Delta State. Water were polluted which necessitated the setting up of the Federal Environmental Protection Agency (FEPA) by the Federal Government. Preceding this, the youth in the area took up arms against the local community leaders whom they felt were gaining from the “fall-outs” or droppings from oil companies. Later they had face -offs with the oil companies and it has in the recent times metamorphosis into abductions (Kidnapping and Hostage-taking) for ransom as well as bombing of pipe lines.

### **The Rising Wave of Environmental Refuges**

In the Delta, population of internal refuges has increased due to low output from both fresh water and salt water catches of people’s main livelihood – fishing. Compounding this is the spoilage of the fragmentary agricultural lands which have been badly degraded due to oil spills and incessant fires emanating from oil from of pipe damages and gas flaring. In short, the people had become refugees in their local communities.

To compound matters’ the issue of climate change came into focus in the late 90s when Nigeria became signatory to AGENDA 21 of the UNFCCS. However, nothing much happened until after the Kyoto protocol came into force in 2004. The author was privilege to have been commissioned by the sustainability science committee in the Federal Ministry of Science and Technology (FSTM). Since then, rapid change have occurred in the MDAs to warrant the establishment of NOSDRA, NESREA, and the Climate Change Desk in the Federal Ministry of Environment, with agitations and insurgencies gaining grounds, the Federal Government further set up the NNDC and followed with the establishment of a fall Pledged Federal Ministry of Niger Delta Affairs in 2006. Then came the Socio-economic rapture of civil uprisings and militant activities action was then initiated peace to return to the oil-rich region leading to the amnesty Initiative during president Ya, rah dua regime, it is now engulfing the entire Niger Delta thereby paralyzing all economic activities resulting in huge losses to the National Revenue base-oil exploration and exploitation.

### **Impacts and Risks of Climate Change Imperatives**

In the coastal/Marine Ecosystem zone, there is the need to be prepared for devastation that impact of climate episodes events will cause. Apart from exposing offshore oil drilling platforms and personnel to imminent risks of damage and facilities, all coastal habitat of man, animals and plants will be inundated by storms surges or blown away by strong wind. These are impacts of climate change which are considered to be the worst threat to the Economy of Nigeria (Adefolalu, 2012).

Coastal wetlands and mangroves will be among the most severely affected ecosystem since these forms largely in the inter-tidal zone. The response of a salt marsh to rising sea level however depends on the relative rates of subsidence versus vertical accretion or of sedimentation. It may be emphasized that because of the extremely low elevation and slopes of Nigeria's coastal zone. Nigeria is presently subjected to recurrent flooding both from coastal storms and the annual rainy season floods especially in March through October. With an estimated population of about 32million people (or 25% of the Nigeria population) concentrated in the coastal zone already experiencing periodic cold often serious flooding, tidal waves induced inundation.

The natural environment always maintains a state of dynamic equilibrium between its constituent components viz: air, water, land, plants and animals (including man). The character of the environment anywhere on earth is thus dependent upon this balance (a fragile one considering recent natural events many of which are induced by man's interventions). Places with an abundance of life forms (vegetation/animals), moist and hot air resulting in heavy precipitation (prone to leaching of topsoil and perennial rivers/streams that often overflow the flood plains) are distinctively termed marine (mangrove) ecosystem while places with loose landforms, dry and hot air with little or no water life forms are categorized as arid or desert environments which take their definition from the type of equilibrium that is associated with them.(Adefolalu,2013).

The coastal loss of mangrove is typified by the loss of 153 and 165 hectares in Port-Harcourt and Buguma respectively between 1986 and 2007 (Adefolalu, 2013). The estimated concluded losses are associated with

- Forest shrinking and so are forest products that support livelihoods. For instance cane-chairs which used to be the most economic 'past-time' activities of local communities of the Niger Delta in the 60s-80s are near rarity in this millennium.
- Species disappearing, fisheries collapsing resulting in economic downturn and mal-nourishment. These have been concerned to be the remote causes of agitation and social instabilities in the Niger Delta.

### **Human Livelihood in the Flood Prone Area (Niger Delta)**

The vulnerability of fisheries to flooding depends on the nature of the climate change, the nature of fishery and its species and habitats. Changes in climatic conditions such as air, temperature and precipitation affect fisheries by altering habitat availability and quality. Specifically, fisheries habitats may be affected by change in water temperature, the timing and duration of extreme temperature conditions, the magnitude and pattern of annual stream flows, surface- water elevations, and the shore lines of lakes, reservoirs, and near- shore marine environments.

Polluted land water at its most basic level, mean lower crop yields from farming, which negatively affects the economy and food supply. Lower yields caused increase demand for farmlands coupled with the already deteriorating condition; threaten the quality and quality of life. Specifically, soil in degraded environment of oil producing areas of Akwa-Ibom State has lower values of available phosphorus organic carbon and cation exchange capacity. Obviously, impoverishment of such soils result in poorer crop yields, hence lower economic returns for rural communities across the length and breadth of the Niger Delta.

For many years, the river line areas of Ondo State have been neglected due to poor transportation and communication. The problems of Ilaje/Ese-Odo Local Government Area are a major challenge. The problem can be traced to the early crude oil exploration and exploitation which has now led to total destruction of animals and human habitats, fauna and flora and the entire aquatic life through oil spillage and pollution in over 50 village communities stretching from Ode-Iji to Awoye- the location of the oil rig/pumping station linking about 7 on-shore oil wells to the Warri Refinery.

During a bird's eye assessment of the entire Ilaje/Ese-Odo Local Government that was carried out in the recent time, four aspects of the problem facing the area as identified are: total neglect in terms of infra-structural facilities, action of water and man in the hinterland, the problem of oil pollution in the areas and tidal action of Atlantic Ocean as feed-back effect.

Most village communities in the area have no pipe-borne water, electricity and good access routes except local canals. They are therefore cut-off from oil links from the entire state. It is unfortunate that their lack of infrastructural facilities which denies the people the right or sense of belonging to the state.

In addition, the majority of local people from Igbokoda down to Awoye are fishermen using small canoes for daily activities. The first inference from this is that most of the inland erosion problems before reading the restricted to the village water-heads where 'canals' are dredged manually to allow canoes easy access to houses on stilts. While the mangrove vegetation at the water's edge control the action of the water all the way down to Legbo, the situation of erosion eating the embankment becomes worse downstream especially in the lagoon areas. Consequently, the lukewarmness of the people to the 'hue and cry' about on share oil for years cannot be unconnected with this total neglect.

From a close study of the flooding of the Atlantic Tidal (feedback) Action, the area in heavily polluted by oil which has led to the demise of the tree/mangrove forest area. It is easy to realize that the mud flooding of coastal villages by the Atlantic Ocean of Awoye (and further to the south-east) is caused by the return of all

water land sediments and dead plants which had earlier been washed into the sea from the oil polluted areas to the north west of the affected areas. More areas will be submerged in the distant future if remedial action is not taken now. Head next to the last oil well (on-shore) is proof of the continued tidal action of the Atlantic Ocean which will continue to inundate the coastal margins of the oil producing Niger Delta areas if not “arrested”.

### **Recommendations**

To all well-meaning Nigerians, the magnanimity of president Ya, rah dua will remain a lasting legacy for generation to come. The government therefore should execute the agreement reached with militants with a view to laying down arms. However, amnesty package is one thing to deliver faithfully is another. It is not that Government will revenge in agreement and accords but the working environment needs a thorough and painstaking appraisal if the programme is to be sustained. Underlying factors that may militate against the success of the programme are natural floods as issues that are considered fundamental to a lasting peace in Niger Delta.

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