

Flood Menace in Nigeria: Impacts, Remedial and Management Strategies

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Abstract

Flood menace in Nigeria have become a normal and re-occurring phenomenon which sometimes has devastating impacts on human livelihoods and infrastructural development. Causes of this problem such as rapid population growth, poor governance, poor drainage facilities and decaying infrastructures, lack of proper environmental planning and management strategies, poor practice of dumping waste/refuse and climate change coupled with inadequate preparedness have been traced and among others, human activities in terms of developmental involvements adjudged to be very important factors in accelerating the rate of this disaster which often leaves in its wake spread of diseases, loss of thousands of lives from various parts of the country and properties worth billions of naira being destroyed. The impacts of floods are more pronounced in low-lying areas. In more recent years, 2011 and 2012 appears to be the worst incidence of flooding in Nigeria with a lot of reported cases indicating how flood menace ravaged affected states of the country when water from the Lagdo Dam in Cameroon was released. Although the Nigerian Meteorological Agency (NIMET) had alerted Nigeria that there would be an above normal rainfall in strategic parts of the country which might lead to flooding incidents in 12 states of the federation, yet nobody gave consent to that warning. This paper provides an overview of how Nigerian cities have been affected by flood menace incidences as it takes a look at the devastating impacts, remedial and management strategies at curbing flooding in Nigeria. A review of literature on flood menace was done. The articles were accessed from public libraries, as well as online through internet search engines and relevant information extracted. Onsite assessment of some areas affected by flood was done and pictures taken with the aid of a camera. Flooding in Nigeria is a serious issue requiring the attention of all stake holders aimed at preventing and remedying its adverse effects which threatens human existence.

Keywords: Flood, Menace, Nigeria, Infrastructure, Impacts, Remedial and management strategies.

1. Introduction

A common environmental problem in Nigeria is flood and it is said to occur when a body of water moves over and above an area of land which is not normally submerged. It could also be seen as the inundation of an area not normally covered with water, through a temporary rise in level of stream, river, lake or sea. Nelson (2001) viewed flood as a natural consequence of stream flow in a continually changing environment. Sada (1988) defines flooding as unusually high rates of discharging; often leading to inundation of land adjacent to streams, and it is usually caused by intense or prolonged rainfall.

The occurrence of flood represents a major risk to riversides populations and floodplains, in addition to causing substantial impacts on the environment, including aquatic fauna and flora, and bank erosion.

Flooding is becoming an increasingly severe and more frequent problem in Nigeria. Unfortunately, the impact is more felt by the urban poor in such a way that recovery is unlikely to be achieved without external aid (Blaikie, 1994). In other words, urban poor are most vulnerable to impact of flood because they set up homes in the floodplains. Flooding is one of the most devastating hazards that are likely to increase in many regions of the world partly due to global climate change and poor governance. According to ActionAid (2006) four types of urban flooding can be recognized:

- (a). Localized flooding which occurs many times in a year due to few and blocked drains;
- (b). Small streams in urban areas rising quickly after heavy rains, but often passing through small culverts under roads;
- (c). Major rivers flowing through urban areas;
- (d). Wet season flooding in lowland and coastal cities.

According to Gwary (2008) and Adeoti (2010), flooding occurs in Nigeria in three main forms which are: river flooding, urban flooding and coastal flooding. The heavy rainfall coupled with bad human activities in relation to the environment and lack of drainage infrastructure in most Nigerian cities has left hundreds of people distressed and homeless. It should be mentioned that flooding in cities can contaminate water supplies and intensify the spread of epidemic diseases, diarrhoea, typhoid, scabies, cholera, malaria, dysentery and other water-borne diseases.

Human activities such as rapid industrialization and urbanization, population growth, exploitation of natural

resources and location of infrastructures exacerbate the occurrence of floods. Causal factors of flood in Nigeria which includes indiscriminate dumping of refuse on drainage channels to channel adjustment and poor drainage conditions have been observed by Agbonkheshe, O. et al. (2013). The growing literature within the Nigerian landscape has attracted researchers like Ayoade and Aknitola (1981) to investigate into the problems of flood, its perception, frequency as well as its adjustment in some of Nigerian towns. From their findings, it was evident that concentrated attentions were given to individual perception and adjustment to flood hazards which were a function of the type of land use pattern on flood plains together with its frequency and magnitude. Although flood is a natural occurrence, it often leads to disasters as a result of human-created vulnerability, which is a consequence of human-environment interactions.

Floods are the most recurring, widespread, disastrous and frequent natural hazards of the world. It is worthy to note that all floods are not alike, while some floods develop slowly and last for a period of days; flash floods can develop quickly, sometimes in just a few minutes and without any visible signs of rain. Urban flooding has resulted in major loss of human lives; destruction of economic and social infrastructure such as water supply, electricity, roads and railway lines (means of livelihood).

According to UN-Water (2011), worldwide, there has been rapid growth in number of people killed or seriously impacted by flood disasters. Indeed, the amount of economic damages affects a large proportion of people in low-lying coastal zones or other areas at risk of flooding and extreme weather condition. UN-Water (2011) also clarified that floods, including urban flood is seen to have caused about half of disasters worldwide and 84% disaster deaths in the world was attributed to flooding.

The common and recurrent phenomenon of flooding in Nigeria occurs on a regular perennial basis in some parts of the nation. However according to NEST (1991), the following geographical areas suffer from the hazard more than others in Nigeria:

- (a). Low-lying areas in the southern parts of the nation where annual rainfall is very heavy.
- (b). The Niger Delta zone
- (c). The floodplains of the larger rivers of the Niger, Benue, Taraba, Sokoto, Hadeja, Cross River, Imo, Anambra, Ogun, Kaduna etc.
- (d). Flat low-lying areas around and to the south of Lake Chad which may be flooded during, and for a few weeks after the rain.

Because of its disposition as flat, low-lying swampy area of alluvial deposition across which the tributaries of the Niger meander, the Niger Delta is by far the largest single area subject to annual flooding in Nigeria. It is a natural reservoir for the Niger-Benue catchment area and its inefficient outlet to the sea. Its rivers are bordered by levees, and when these rivers are in flood, the levees are overtopped and extensive areas are submerged. The zone is subject to two types of flood, the floods of the rainy seasons which are the result of rainfall within Nigeria and especially rainfall in the delta area itself which ranges from 2000mm to 4000mm per year and is concentrated in few months. The other type of flood is the river flood, almost all of which are caused by water coming from as far as the Fouta Djallon Highlands in Guinea. The water is primarily the run off from the previous year's rainfall on these highlands slowly making its way down to Nigeria. Almost all parts of the Niger Delta, with exception of the northern parts, suffer flooding at one time of the year or the other. Town, villages and agricultural lands in the Sagbama and Yenagoa areas in Balyesa state are often affected. Also, often affected are parts of the riverine areas of Edo, Delta, Cross River and Akwa Ibom states.

This study is a further contribution to flood studies, and it has the overall objective of analyzing the general effects of flood menace in Nigeria and subsequently recommending remedial and management strategies to curbing it.

2. Early Warning, EW as a proactive measure to curbing flood menace in Nigeria

Early warning is a proactive mechanism in which certain recognized bodies or agencies take to the study of climate and human interactions with the environment towards foretelling the occurrences of floods and thus issuing warnings to both individuals and government structures with a view of effectively being prepared and curbing the occurrence of floods, averting loss of lives and properties and checking the outbreak of epidemics.

In a 2011 monthly publication of Early Warning, EW Bulletin of the West Africa Network for Peace building (WANEP) Nigeria, a brief graphic analysis and description of flood menace conditions emerging from its Early Warning Reports was presented. These Reports are derived from the Network's online EW system which facilitates the generation of data from monitors and reporters across the 36 States of the country including the Federal Capital Territory. The Bulletin reflects data from the incidence and situation reports of the EW system. The WANEP-Nigeria EW system is adopted and supports the ECOWAS EW system-ECOWARN. The system is managed by the Early Warning Department of ECOWAS in partnership with WANEP through an MOU under the Protocol Relating to the Mechanism for Conflict Prevention, Management, Resolution, Peace-Keeping and Security in West Africa.

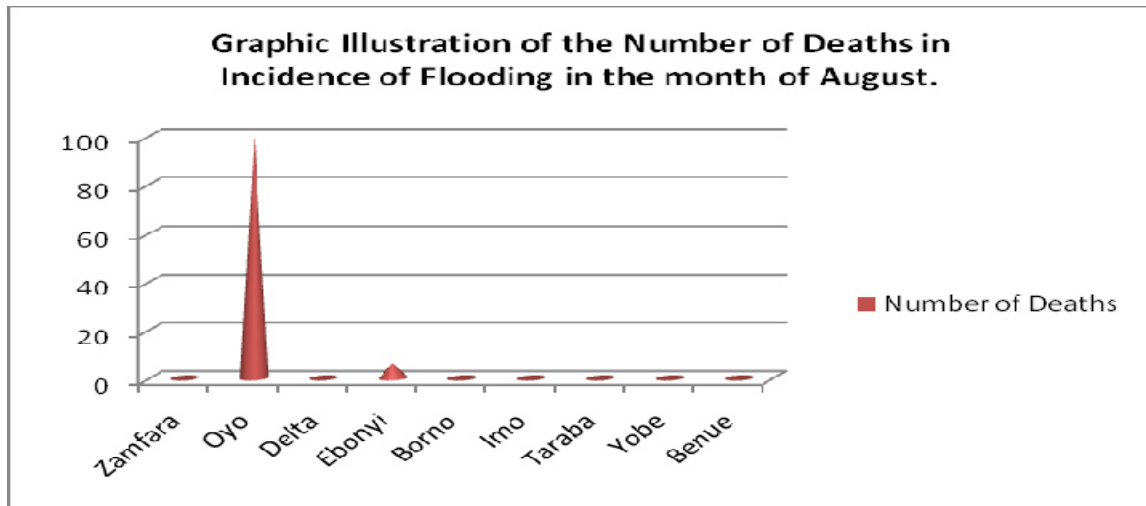


Figure 1

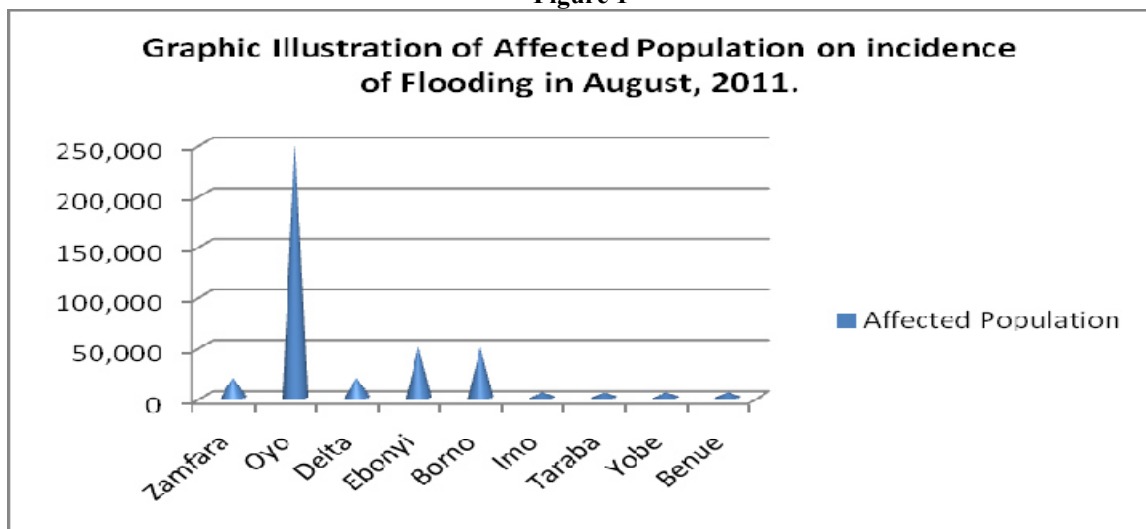


Figure 2

Thirteen states of Benue, Borno, Delta, Ebonyi, Lagos, Imo, Jigawa, Kano, Katsina, Oyo, Sokoto, Taraba and Yobe reported incidents of flooding in the month of August, 2011, of these thirteen states, Nine (Zamfara, Oyo, Delta, Ebonyi, Borno, Imo, Taraba, Yobe and Benue) were the worst hit having higher number of casualties as reported in the National Early Warning System (NEWS) shown in Tables 1 and 2 above. The flood claimed about one hundred and forty lives with thousands displaced and properties worth millions of Naira destroyed, sadly children and the elderly accounted for a larger percentage of the dead from the flood (pictures 1 and 2).



Picture 1. A flooded community in Ibadan



Picture 2. Victims of the flood in Ibadan

In the wake of the floods in these states, the Nigeria's Emergency Management Agency (NEMA) accused State governments of overlooking early warning messages of flooding across the country in the month under review. Most of the affected states recorded over 60% increase in the volume of rainfall in the period. This disaster caught most of the State governments unawares and they could therefore not do much to prevent, mitigate or prepare for the humanitarian crisis that ensued from the disaster. Lagos and Oyo who recorded the highest number of victims from flood in the months of July and August respectively exhibited the inability of both federal and state governments to be proactive in responding to issues of possible humanitarian crisis despite having early warning signs on the possibility of flood in the states. The cumulative risk index for urban planning and drainage management is high in most of the affected states while the index for response of state actors is low. The issue of poor urban planning and blockage of drainage and water ways came to the fore as the proximate condition for the fatality of the flood in especially Oyo state which accounted for about 905 of the total deaths from flood in the month. Sadly successive governments in the state have not done much to tackle the issue of proper urban planning and development. The importance of sensitizing government at all levels on the reality of climate change and on possible risk reduction strategies is crucial in preventing a similar crisis in the nearest future. The need for an effective community based early warning system for disaster prevention and mitigation for Nigeria cannot be over emphasized. The existing one like the National early warning system of WANEP – Nigeria should intensify efforts in getting early response to identified humanitarian risk. Government at all levels need to shift from being reactive to being proactive in responding to disaster. There is also the need for government at all levels and its agencies to fund and map out contingency plans and emergency preparedness plans to prevent break the spate of humanitarian crisis in Nigeria.

In 2012, the discharge of water from Lagdo Dam in Cameroon along with torrential rains was the major cause of the untold incessant flood across Nigeria with the climate change phenomenon. The recurring flood disaster

along the coastal communities in Nigeria has left no fewer than 25 million Nigerians being displaced and devastated in recent times. Those living along the coastal communities of Rivers, Niger, Benue, Sokoto, Katsina, Lagos, Ondo, Bayelsa, Delta, Akwa Ibom, Anambra, and Cross River states are gravely affected by the incessant flood menace. Although the Nigerian Meteorological Agency (NIMET) had alerted Nigeria that there would be an above normal rainfall in strategic parts of the country in 2012 which might lead to flooding incidents in 12 states of the federation, yet nobody gave consent to that instruction. The National Emergency Management Agency, NEMA after collating figures from rescue workers and others involved in disaster management, said the incident claimed 363 lives and displaced 2,157,419 people. According to a report from the agency's Emergency Situation Room released in Abuja, the floods affected 7,705, 398 people between July 1 and October 31, while 18, 282 people were treated for injuries sustained during the incident.

It also said 256 local government councils out of the nation's 774 councils were adversely affected by the flood. The report, which is the latest provisional casualty figure by NEMA, also identified Adamawa and Kogi as the two states with the highest casualty figures.

Nigeria's rainy season is usually characterized by flash floods, which are sometimes devastating because of the poor drainage systems in most parts of the country.

The 2012 flooding was however massive because some coastal areas of the country experienced higher rainfall while the release of water from the Lagdo Dam in Cameroun and the overflow of some dams and river banks in Nigeria aggravated the situations in some other states.

The massive flooding submerged hundreds of communities and washed off thousands of hectares of farmlands in states bordering Cameroun and along Rivers Niger and Benue, and the estuaries in the Niger Delta.

3. Causes of flood

The usual universal cause of floods is heavy or excessively prolonged rainfall or even both. Flood can manifest along marine coasts from wind-driven storm surges and rain-swollen streams associated with tropical typhoons and hurricanes. Besides, flooding can also occur on the shorelines of large inland lakes.

Climate change is also a major cause of flooding and it is an issue that is related to economic, social, cultural and physical environment of any nation. It is a vital environmental factor that shape and re-shape various activities of human beings in a society. The United Nations Framework Convention on Climate Change, UNFCCC defines climate change as a change of climate which is attributable directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Human activities such as industrialization, technology development, urbanization, deforestation, burning fossil and agricultural activities, etc and natural factors such as solar radiation quality and quantity, astronomical position of the earth are notable causes of climate change. Climate change is making weather less predictable, especially in developing countries like Nigeria where facilities to predict and manage weather conditions are not adequate. The unpredictability of rainfall in recent times has caused untold hardship during the raining season. Climate change works in an indirect way to aggravate flooding by altering the pattern of flooding in the flood prone areas. It however go beyond doubt that climate change and its impacts such as increase in sea level have direct impacts on urban and coastal floods, and it has continuously disrupt the social fabric of cities and exacerbates poverty particularly in most developing countries, including Nigeria. People are indeed becoming increasingly vulnerable as the urban population increases and the poor ones are pushed into the fragile areas which are prone to flooding.

As already mentioned above, another major cause of flooding is human interaction with his environment in the form of industrialization, technology development, urbanization, deforestation, burning fossil and agricultural activities. Activities of man are undoubtedly assuming greater importance as cause of flooding. As urbanization intensifies, natural surfaces are replaced, which do not allow water to percolate readily into the ground. The effect is that a large proportion of the rainfall which should normally infiltrate into the soil or be intercepted by the vegetation and thus be delayed for some time before running off, is immediately available for surface run-off into streams and rivers, making them flood.

Bad planning also brings about floods and as humans try to harness available water resources which have resulted in the construction of dams and other water control structures, the failures of these structures have resulted in floods. Good examples include the collapse of the Bagauda Dam near Kano in 1988 which resulted in disastrous environmental consequences; the mass failures of drainage systems across Nigeria; the encroachment of buildings on the flood plains of streams and rivers flowing through towns and cities and the deposition of waste materials in their courses.

Natural flooding through streams which is caused primarily by excessive down pour is the most regular or common form of flooding in Nigeria. This invariably causes water in the stream or river to flow beyond its boundary to nearby settlements.

However, several causes are responsible for flood to occur but the most important are the climatologically causes.

In an area that is already saturated with water, smaller amount of rainfall may also produce flooding. Furthermore, in Nigeria, other causes of which climatologically factors are only parts or indirectly responsible include:

- (a). Flooding of low lying coasts by excessively high tides associated with storm-surge effect;
- (b). Rivers and tributaries carrying water floors very much in excess of their transporting capacities due to concentration of run off;
- (c). Heavy rainfall synchronizing with spills of rivers;
- (d). Main rivers backing up the water in their tributaries;
- (e). Inadequate and inefficient drainage of low lying and flat areas to the overflow;
- (f). Ponding back of stream flow by rising tides, particularly during spring tide conditions;
- (g). Peak floods occurring at the same time in a main river and its tributaries.

Flooding is, however, not totally a natural phenomenon but an environmental hazard. Flood becomes a hazard when it impinges unfavourably on human activities as it frequently does because of the affinity which man tends to have for flood plains and coastal locations.

4. Impacts of Flood

Reported and documented flood disasters in Nigeria afford good insights into the extent of flood menace and flood related problems in Nigeria.

Over the years, one of the cities greatly ravaged by flood menace in Nigeria is Ibadan in Oyo state. Ibadan does not possess the type of excessive rainfall regime which favours frequent flooding, yet the city is one of the most frequently flooded non-coastal cities in Nigeria. The first recorded flood in Ibadan occurred in 1933, when Cege River drowned the houses of those living on its bank. A two days heavy down pour between July 9th and 10th 1951 caused considerable damage to properties along the banks of the major rivers that pass through the city. Trees, vehicles and houses were swept away in June 1955 by the flood that followed the two day heavy rainfall. The city was again ravaged by the flood waters of swollen rivers and streams resulting in many lives being lost in 1960. Over 1000 people were rendered homeless, and properties estimated at over one hundred thousand naira were damaged. In late August, 1963 a more devastating flood occurred again in Ibadan causing damages to property worth over two hundred thousand naira. The most catastrophic and most publicized flood to hit Ibadan occurred on August 31st, 1980. After a twelve-hour down power from the night of August 30th through the morning of August 31st, the city was flooded and over 300 lives had been lost. 50,000 people were rendered homeless and properties worth over three hundred million naira were destroyed. Though there have been floods in recent times in the city, they couldn't be compared to the case of 1980.

Again in more recent times of 2011, various national newspapers reported cases of floods to hit Ibadan as *The Nation, August 29th, 2011* reports how Five hour downpour triggers panic in Ibadan; Boy dead, dad, sister hospitalized in school fence collapse. Ibadan floods: six residents still missing as death toll hits 32. How we saved a 102-yr-old woman and 15 kids Ibadan floods death toll up as more bodies surface. Man loses eight children. Another loses four kids, father. *The Nation, August 31st, 2011* reports of how University of Ibadan, UI loses 10 billion naira property to flood.

Other cities of Nigeria were also ravaged by floods in 2011 as they were also reported by various national dailies. *The Nation, July 11th, 2011* reports of how flood kills eight in Katsina and 100 families rendered homeless; Floods of fury in cities. Lagos calls for calm, Lagos ask pupils to stay away from school. *The Nation, July 12th, 2011* reports 10 dead in Lagos floods; Lagos/Abeokuta road cracks. *The Nation, August 30th, 2011*: Bakery, 10 buildings collapse. How Doctor, three kids died- Senator consoles with families of victims. *The Punch July 12th 2011*: Four waitresses, baby dies on wet night. Floods: Lagos residents go fishing. *The Nation, September 3rd, 2011*: Where do I start life from? Asks Ganiyat Hussein, a revenue collector who lost all to flood. *Daily Times, August 26th, 2011*: Flood: Sokoto council evacuates 6,000 residents. *The Punch, October 12th, 2011*: 12-year-old girl drowns in Lagos floods, typhoid cases rise. Lagos relocates 681. *The Punch, July 3rd, 2011*: Floods sack residents of highbrow Ikoyi, Victoria Island. And *The Punch, July 18th, 2011* reported of how Lagos residents panic as fresh downpour causes floods.

Other documented flood disasters in Nigeria presents rich history of the menace of flooding in Nigeria. For instance, in the flood event of 1976 at Ilorin, 24 houses were submerged. The flood water also washed away vegetable and sugar cane farmlands, while many roads in the city were rendered impassable for some time. The Evening Times of June 14, 1985 had as its headline "Large floods hold up classes" The story described how most of the classrooms of primary and post primary institutions in Lagos were turned into pools of water after a down pour, holding up classes for one week.

No matter where one lives in Lagos, it is the same story of flooded streets or homes almost each time it rains heavily, especially from June to September. From Victoria Island to Ikoyi, Maroko to Agege, Isolo to Oworonsoki the story has been the same over the years. When it rained for three days continuously in Lagos in June, 1988, the stream near the Lagos University Teaching Hospital Ishaga in Surulere overflowed its banks and

rendered Ishaga road at that point impassable. Such was the case of some of the major roads in the city including Awolowo road Ikeja, Ijora causeway, Apapa, Apapa-Oshodi Expressway at Itire junction and at the intersection leading to the Murtala Mohammed International Airport. Also, in Surulere, Lagos residents of Chief Natufe Streets woke up on Saturday, July 9, 1988 to find themselves virtually in water. The previous night's rain which started from dusk and continued right through the following morning had caused untold havoc. Some people were trapped in their homes because of the floodwater, which was waist high. Some sewage tanks overflowed and mixed with underground water tanks thereby polluting people's drinking water for many days. The canal which runs from Lagos Teaching Hospital right through certain parts of Surulere into Orile Iganmu, which was supposed to be a channel for the evacuation of water, had been blocked by solid waste and sediments and was not dredged before the peak of the rainy season.

In Sudan Savanna, a rainstorm described as one of the heaviest in an 80 years instrumental record, persisted over Kano for a few days, generating floods in various parts of the state. This caused the Bagauda Dam near Kano with a storage capacity of 22 million cubic litres of water to reach an unprecedented volume of 142 million cubic litres before it collapsed on August 17, 1988. The havoc done by the collapse of the dam and the rainfall floods resulted in the loss of 146 lives and destruction of property worth millions of naira. Many roads in Kano were flooded, leaving motorists stranded. The same year, in the Misau council area of Bauchi State 4 persons were killed and over 750 houses and properties including crops worth hundred of thousands of naira were destroyed by floods, following a heavy down pour.

Also heavy rains in various parts of Borno State resulted in the loss of 52 lives, and the destruction of over 170 houses and other properties. In Kebbi State, the River Niger flooded Bagudu, Bunza and Arugungu Local Government Areas. Consequently, several villages and settlements were submerged. Hundreds of farmlands were also flooded and crops destroyed. Apart from rendering hundreds of families homeless, it was estimated that the flood destroyed property worth about one hundred million naira.

In Cross River and Akwa Ibom states, Cross River over flowed its bank in September, 1989 as a result of continuous rainfall. This brought about the flooding of about 130, 000 hectares of agricultural land in some parts of the states. This flood was estimated to have left about 150,000 farming families homeless and destroyed food crops and economic trees worth millions of naira.

Flooding is not only becoming more frequent in Nigeria especially in the cities, it is also becoming more severe and devastating over the decades. However, the increase frequency and severity could not be traced from increased rainfall. Rainfall amount on the contrary, has overall, been on the decrease. Rather they are in response to an increasing rate of urbanization in the absence of well articulated and comprehensive physical planning and planning control, which invariably have left many of our coastal cities in flood dilemma.

5. Remedial and Management strategies of flood control

Flood menaces in Nigeria have been on the increase in recent times. Proactive and preventive options involving structural and non-structural measures need to be adopted and implemented at curbing the menace of floods.

The structural measures such as check dams, levees, flood walls and adequate drainage systems will help control periodic inundation in the areas that are liable to flooding in the following ways:

- (a). The construction of structures for irrigation and the use of excess run-off water for inter-basin transfer as an alternative to absorb excess water from the Cameroons.
- (b). Check dams will reduce peak flows
- (c). Levees and flood walls confines flow within predetermined channels
- (d). Adequate drainage systems will reduce peak flow stages of flood and divert excessive flow.
- (e). In communities where the rate of flow of storm water is high, embankments should be constructed to breakdown storm water so as not to result into floods. These embankments could be permanent or temporary, such as sandbags placed when a flood is imminent.

However, the adoption of structural measures alone could lead to sub-optimal development of the flood plain and may even invite greater losses when storms occur which exceed the design limits of the structures, as the collapse of the Bagauda dam in Kano clearly showed.

Moreover, structural measures are expensive; hence there is also need to regulate floodplain development with the adoption of non structural measures.

Consequently, the following non structural measures could be adopted to curb the menace of flood in Nigeria.

(i). Floodplain management is seen to be the best approach. In finding solution to flooding using this approach, the first step is to construct a flood-frequency curve based on historical records and an examination of vegetation to determine how often on average a flood of a certain size occurs in a particular area. Although this approach does not tell exactly when floods will occur, but it gives an insight of how often they might occur based on past history.

From the data obtained, a plan can be developed and applied to:

- (a). prohibit certain types of buildings or activities in flood high risk zones.

- (b). elevate or flood proof buildings that are allowed on the legally defined floodplains.
- (c). construct a floodway that allows floods to flow through the community with most minimal or no damage.
- (ii). The National Inland Waterways Authority (NIWA) of Nigeria should urgently take steps to desilt waterways and tributaries which are sited and taken over by shrubs to allow for channels and easy flow of water to curb the ravaging flood in the coastal communities.
- (iii). As is obtained in developed countries of the world particularly in America and Europe, there is always a standing taskforce that is set up to deal with the problem of snow once winter is approaching. In the same way, the Nigerian government needs to be proactive by setting up standing taskforce that will tackle the issue of flood once the rainy season is approaching.
- (iv). Town planning laws should be properly enforced and strictly adhered to as this will go a long way to curbing the menace of floods. The Nigerian government should always plan ahead of the population so as to avert the occurrences of unplanned houses and cities. This is necessary because deviation from the original master plan by prospective town developers do facilitate the occurrence of floods as investigations has shown that a lot of houses built today in Nigeria are erected on natural drainage channels/courses which are often first sand filled by land developers before erecting their structures. The resultant effect of this practice is that these natural drainage channels/courses haven been blocked will afford storm water no channels/courses to pass through and thus the inundation of the areas that are liable to flooding.
- (v). All roads should be constructed with adequate drainage facilities provided.
- (vi). Drainage systems should be regularly inspected and monitored to take note of any failure with a view of effecting repairs. Also sedimentation and littering of the drainage systems should be guilded against while vegetations like trees whose rooting system tends to or are likely to distort, break or undermine the drainage system should be removed.
- (vii). The immediate downstream culverts which helps to ensure effective runoff discharge and hence effective self-cleaning of the drainage systems should be desilted and properly aligned.
- (viii). Nigerians should realize that "*Action and reaction are equal and opposite*". To this end, they should properly dispose off their refuse/waste and not into drainage channels as improperly disposed refuse/waste which comprises discarded plastic, foot-wears, clothes etc. equally block the drains especially at their narrow ends or points. This equally results to overspill or overflow of the storm water in the drains leading to flooding that can burst into people's homes and farms destroying household property and crops.
- (ix). Streams, rivers, etc should be channelled by deepening, widening or straightening to allow more rapid runoff.
- (x). There should be adequate sensitization of people who are often affected by flood menace towards adopting environmental best practices.
- (xi). Concerted efforts must be geared towards adequate city planning, policy formulation, enhanced public enlightenment programmes, integration of environmental planning and education to curriculum of schools at all levels, capacity building towards adaptation and mitigation of climate change.
- (xii). Government at all levels should ensure proper and effective use of ecological fund; and encourage the integration of environmental disaster insurance to take care of the fall out of flood menace.
- (xiii). National disaster and emergency policies should be strengthened to facilitate effective disaster preparedness and response. This approach will not only save lives and livelihoods, but it will equally reduce vulnerability to flood menace.
- (xiv). Adequate and long-term environmental and natural resource management practices can help to reduce the risk and vulnerability of people in disaster prone areas.
- (xv). Collaborations between local communities, NGOs, voluntary groups, local and international donor organizations towards managing floods should be established.
- (xvi). Within the realm of professional practice (good land use planning and management) professionals should undergo training and re-training programmes in related fields (human capacity development) and uphold the ethics of their profession, particularly avoiding corrupt planning practices that can jeopardize lives and properties of the people.
- (xvii). Dangerous political interventions in land use planning and management should grossly be avoided in order to protect the occurrence of avoidable flood menace and blaming of innocent professionals

6. Conclusion

Flood menace have ravaged several towns in Nigeria for several decades leaving in its wake loss of thousands of lives and tens of billions of naira worth of properties damaged which calls for holistic urgent action on our part as individuals and that of the government.

The importance of sensitizing government at all levels on the reality of climate change and on possible risk reduction strategies is crucial in preventing flood menace in Nigeria. The need for an effective community based early warning system for flood prevention and control for Nigeria cannot be over emphasized. Government at all

levels need to shift from being reactive to being proactive in responding to flood menace. There is also the need for government at all levels and its agencies to fund and map out contingency plans and emergency preparedness plans to prevent flood outbreaks crisis in Nigeria.

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Dedication

In loving memory of Gregory and Victoria: forever in our hearts.

Acknowledgement

The authors would like to acknowledge the supports from their families

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