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Research Article

CAUSES, IMPACTS, AND MITIGATION OF FLOODING IN NIGERIA: A CASE STUDY OF THE 2022 OGUNPA AND NATIONWIDE FLOODS

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Abstract

This study previewed causes, frequency, extent, magnitude, intensity and charted a course of mitigating flood in Nigeria. This Study revealed the causes of flooding to include: climate change, unending rainfall, excess water from Cameroon's Lagdo Dam, river overflow, expansion of floodplains and poor planning. In 2022 flooding affected 7 million Nigerians, 2 million internally displaced, 5,000 physically injured, 5,900 houses destroyed. The 2012 flood had the highest number of occurrences of 18 incidences, in 17 each in 2015 and 2017, in 2018 and 2019, 12 incidences. 2014 and 2016, had 1 incidence. These frequent floods were recorded in 31 out of the 36 and the FCT, severe in Benue, Kogi, Anambra, Niger, Adamawa, Oyo, Kano, Jigawa and Lagos States. The extent of flooding includes shortage of food supply, farmlands washed away; economy, health, social life and environment were also affected. Corpses floated in floods, the country was at high risks of waterborne diseases like diarrhoea, cholera and typhoid fever. However, the benefits of flooding include rendering terrorists incapable in some states; deposit rich, fertile alluvium, replenish irrigation channels, filter pollutants, nourish lands to support ecosystems and fertile areas for farming. This Study recommended that individuals should not build houses in floodplains; government should maintain dams; flood management policy and collaboration between agencies. Experts should develop awareness, enlightenment, educational and legal framework to checkmate flooding in Nigeria.

Keywords: Causes, Frequency, Extent, Magnitude, Intensity, Mitigation Measures of

Introduction

The Ogunpa flood on 31th August 1980 after about twelve hours unending heavy rainfall was a major happening that shook Ibadan the largest city in Nigeria to its foundation. This rainfall caused River Ogunpa that transverses the city to overflow its bank and also triggered Odo-Ona and other streams to overflow. 100 persons were killed, 5000 houses were destroyed, and over 50,000 persons were rendered homeless. Over 30 billion naira worth of properties was lost. This was worse than floods that occurred in 1963, 1978 and 2011. In Nigeria, there was another serious flooding in 2012, perhaps the worst in 40 years, it affected over thirty states and very sever in twenty States. The flooding then occurred for four months (July to October, 2012). Seven million Nigerians were affected and close to six thousand houses were destroyed. The flooding was purportedly caused by heavy rainfall across the country for many days this forced Cameroonian's government to open the Ladgo Dam used for electricity for irrigation to release the excess water. The Lagdo Dam is located in the northern part of Cameroon lying in the eastern part of Nigeria. Since then issues pertaining to erosion in Nigeria are becoming a serious challenge. The issue is now resurfacing in many states in Nigeria especially in the second half of year 2022, precisely between July and October, 2022. According to the Federal Government of Nigeria, over 2.5 million

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people have been affected so far. 1.3 million displaced, 2,407 injured, 603 persons dead while more than 200,000 homes were completely or partially damaged by torrential rainfall. 31out of the Nigerian's 36 states and the FCT were affected. In another source, this flood has culminated in the loss of 1.6 million Nigerian children and still counting. Schools and learning facilities were submerged in some communities. Properties such as bridges, houses, cars, roads, farmlands were also destroyed and animals were displaced by this moving water.

In this study, efforts would be made to clearly define some concepts without ambiguity as used in the study. The preview of causes of flooding in Nigeria would follow. Then the frequency, extent, magnitude, intensity and benefits of flooding in Nigeria would also be discussed. Finally, this research would chart a new course for preventing and mitigating flooding in Nigeria.

Definition of Terms as used in the Study

In this section of the Study, attempt was made to define flooding, erosion and floodplain. These three notions were very relevant to the Study. They were firstly defined in general terms and then they were defined as used in the study.

- *Flooding:* the covering or submerging of normally dry land with large water, in such a situation an area is covered with water especially from river. In this study, flooding would be regarded as excess water from overflow of rivers with destructive tendency and washed away properties, displaced animals, killed and maimed individuals the run water met on its way. It is becoming a perennial occurrence in Nigeria. Human lives were lost, properties spoiled, bridges damaged, plants uprooted and animals displayed. Several reasons had been adduced for the occurrence of flooding in Nigeria.
- *Erosion:* the action of surface processes that removes soil, rocks or dissolved material from one location on the earth's crust and transport it (in this case by water or river) to another location where it is deposited. In this Study, erosion would be conceived as violent and turbulent actions of the running water itself, responsible for the damage of lives and properties of human and displacement of animals. Flooding and consequently erosion had affected several States in Nigeria in the last forty years.
- *Floodplain or flood plain:* is a relatively flat land adjacent to a stream or river. In such land there is periodic flooding. This constitutes an important section of the environment. This floodplain accumulates a lot of sediments and provides habitants for wildlife. Notwithstanding of the susceptibility to floods, these floodplains serve as fertile land for farming and to reap advantage of transportation. These explained why settlers take the advantages offered by the proximity to water and locate there. In most cases in Nigeria, these floodplains were not planned leading to destruction of their natural functions. These settlers often had borne the brunt of adverse effects of flooding and the consequent erosion. In Kogi State, Nigeria, especially in the confluence town's floodplains, residents often suffered untold hardship occasioned by perennial flooding and the wild erosion.

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Causes of Flooding in Nigeria

Several causes of flooding were advanced by numerous scholars and government officials in Nigeria. In the literature, some of the experts opined that flooding is closely related to climate change. Climate change is often associated with rising in river, stream and sea levels. This also made rivers to over flow and consequently the flooding. Unending rainfall may also cause rivers and streams to also overflow. Other writers said forceful release of excess water from the Lagdo Dam by the Cameroonian Government with no counterpart dams in Nigeria to absolve the released water and thereby checkmating flooding and erosion. Noted expansion of floodplains in confluence town of Kogi State in Nigeria is another cause of flooding.

This is just as expressed by Adeyemi (2022), the release of water from the Lagdo Dam in Cameroon has resulted in devastating flood, causing pain and anguish to thousands of people rendered them homeless in Kogi State. The floods submerged residential houses, churches, mosques, shops were completely washed away. Household items, farm produces and domestic animals, among others, especially in Lokoja, the state capital, and communities in five other local government areas of the state, namely, Ajaokuta, Kotonkarfe, Idah, Ofu and Ibaji were worst hits.

In another setting, the Director General (DG) of National Emergency Management Agency (NEMA) on 19th September 2022 alerted Nigerians that the Cameroonian Government released the surplus water from the Lagdo Dam since 13th September, 2022. The DG added that the water then flew to Nigeria. This coupled with envisaged thick floods occasioned by beyond standard rainfall and integrated water from the Rivers Niger and Benue. The water so released had far reaching effects downstream as Kainji, Jebba and Shiroro Dams (in Nigeria) were expected to overspill between September and October, 2022 and these rivers overflew as envisaged (Oloniniran, 2022).

However, there are some noticeable uncertainties about the exact cause of flooding in the 2022 in Nigeria. This was as expressed by Suleiman Adamu, The Nigeria‘s Minister of Water Resources who refuted the claim that there was no treaty between Nigeria and Cameroon to build a counterpart dam to checkmate and absolve the excess water from the Lagdo Dam in Cameroon. The minister however expressed engineering concern. Adamu also stated that excess water from Lagdo Dam contributed insignificant percent and that 80 percent of the floods are occasioned by unending rainfalls. The minister further said that often water is often released without informing Nigeria, but this time, Nigeria was informed 24 hours after water had been released (Channels Television, 2022). Indeed prior to the release of water from Lagdo Dam there was perceptible expansion of flood plains in the confluence town. Again, Rivers Niger and Benue had over flown this actually prevented traffic across the bridge. This explained the scarcity of petroleum and gas in the area few months back as tankers could not crossover the bridge.

Another scholar, Aguiyi (2022) noted that the first culprit of flooding is always the big word

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_Climate Change', which is basically the changing weather patterns associated with global warming. However, there are many related, natural and manmade factors that contribute to flooding. One major cause of perennial flooding in Nigeria is _river and ocean surges' by tides, pushing water to overflow its boundaries downstream. The states around the major rivers like Benue, Kogi, Anambra, Adamawa and others are the most affected states. Again, Umar and Gray (2022) asserted that, in developing countries, flooding results from climate change, excessive precipitation, building on waterways, sea-level rise and soil moisture regime, dam operations, especially along borders, uncontrolled rapid population growth, inadequate preparedness and lack of political will. This is as corroborated by Echendu (2021) who noted that a link could be made between increasing flood incidences and climate change. Unlike some natural disasters, rainfall flooding can be controlled with proper planning and provision of necessary infrastructure. While, Nkwunonwo (2022) stated that prevalence of flooding within Nigeria could be attributed to climate change and poor urban planning.

Finally, the drivers of flooding in Nigeria could be humanly induced and exacerbated by humannature interactions. Poor or non-existent drainage systems are a major cause of flooding. Increasing urbanisation also means more areas are built with concrete and cannot absorb water, thereby increasing runoff. Poor waste management is another recognised factor. Other factors are unregulated urban expansion. Agricultural lands are increasingly being converted to residential areas to accommodate housing needs. There was an increasing lax in implementation of planning laws. One consequence of this is that there have been construction projects on natural floodplains and storm water paths. This has exacerbated flooding. Lastly, town and country planning officials could be corrupt and accept bribes and overlook issues.

Frequency of occurrence of flooding in Nigeria

In this segment, the frequency of occurrence of flooding would be aptly discussed. For instance, in 2012, Nigeria experienced its worst flooding in over 40 years, because of heavy rainfall across the country, for many days and the Lagdo Dam in northern Cameroon east of Nigeria used for electricity generation and irrigation releasing its excess water. The incidence affected 32 states, 24 severely. The floods occurred from July to October that year, affecting more than 7 million people. More than 2 million were counted as Internally Displaced Persons (IDPs). More than 5,000 people were physically injured. Over 5,900 houses were destroyed (National Emergency Management Agency, 2013).

Other scholars, Umar and Gray (2022) noted that the North-West zone had the highest frequency of flooding, with 31 instances, followed by the North-Central and North-East zones of Nigeria with 20 and 19 instances respectively. The South-East zone had the fewest floods, similar to the South-South and South-West zones. The dominance of flooding in the northern regions in most years is clear. According to the scholar, the years 2012 had the highest number of flood occurrences in the country in the time period studied, with 18 incidences, closely

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followed by years 2015 and 2017 with 17 incidences each and next are 2018 and 2019 with 12 incidences each. The years with fewest flood incidences are 2014 and 2016 each with 1 incidence in the South-West and North-West regions respectively.

In another write-up, Aguyi (2022) x-rayed flooding in recent years between 2020 and 2022. The writer wrote, ―Incidents of flooding in recent years have been devastating and continue to pose a serious challenge to food production, food security and livelihoods. In 2020, floods affected 320 local government areas in 35 states including the FCT, displaced over 129,000 persons, killed 68 persons and destroyed many properties and farmlands‖.

Extent of Flooding in Nigeria

In this section of this Study, the extent of damage done to lives and properties by flooding in Nigeria would be discussed. The Minister of Works and Housing in Nigeria, Babatunde Fashola, while reacting to extent of damage did to lives and properties in Nigeria said that it may not be easy to say categorically the extent and cost of damage done to Nigeria's roads until when the flood finally receded. The minister added that ―with extreme weather conditions, travel logistics were hampered, some of the roads were difficult to traverse. It has caused some backlog in logistic movements; we saw some disruptions in the supply of fuel Fashola said (Agbakwuru 2022). However Olonіniran (2022) quoted the negative impacts of flooding to include the shortage of food supply in the affected areas and to other parts that depend on farming products from those areas. During flooding, farmlands were washed away while food banks, whether at the residents' homes or warehouses, were also destroyed or washed away by the floods. Echendu (2021) opined that flooding negatively affected the economy, health, social life and environment.

Flooding constituted a threat to Nigeria in achieving the global sustainable development goals. In Nigeria, flooding had a major impact on the country's development goals in relation to the social, economic and environmental targets.

Nkwunonwo (2022) noted that between 1985 and 2014, flooding in Nigeria affected more than 11 million lives with a total of 1,100 deaths and property damaged exceeding US$17 billion. These frequent floods were recorded in Niger, Adamawa, Oyo, Kano and Jigawa States possibly due to the influence of rivers Niger, Benue, Ogun and Hadeja, Lagos State seemed to have experienced most of the floods in the country. Echendu (2021) added, in 2012, Nigeria experienced its worst flooding recorded in recent history. Total losses were put at US$16.9 billion. From the foregoing, it is obvious that in Nigeria, flooding had negatively affected the economy, health, social life and environment. Flooding constitutes a threat to Nigeria achieving the global sustainable development goals for achieving environmental and human development by 2030.

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Magnitude of flooding in Nigeria

In this aspect of this Study the magnitude of flooding as it affects states and cities in Nigeria would be discussed. The International Monetary Fund (IMF), Mai Farid, of the African Department, while highlighting the possible economic impact of floods in Benue, Kogi and Anambra States of Nigeria said noting that Nigeria and other countries in the sub Saharan Africa are the most food insecure region and also the region most vulnerable to climate change and yet the least prepared to pay. There is need for governments to invest in early warning system technology and infrastructure that is climate resilient. Also speaking in the same context, John Spray of the Asia and Pacific Department of the IMF stressed the need to provide social assistance to moderate the impact of floods and food insecurity on the people (Komolafe, 2022).

Flooding hit parts of Nigeria in the months of September and October, 2022. 2.5 million persons were affected and over 603 persons killed by the flooding caused by torrential rainfall of late National Emergency Management Agency (NEMA). Houses and farmlands were submerged in

Lagos, Yobe, Borno, Taraba, Adamawa, Edo, Delta, Kogi, Niger, Plateau, Benue, Ebonyi,

Anambra, Bauchi, Gombe, Kano, Jigawa, Zamfara, Kebbi, Sokoto, Imo, Abia States and the Federal Capital Territory.

Khalid and Maishman (2022) noted that disaster has affected 27 of Nigeria's 36 states. Part of the problem is that people return to their homes on floodplains each year after the water levels subside. Many do not have the means to relocate. Nigeria's economy has been battered in the past year, with inflation at an all-time high and many communities struggling to cope.

Intensity of Flooding across Nigeria

Nnodim, Adejoro, Azubuike, Igoni, Ochei and Ayeni (2022) observed that the Nigerian Medical Association raised alarm over floods across Nigeria, warning the country was at a high risk of waterborne diseases. The President of the NMA, Dr Uche Ojinmah, lamented that corpses were floating in floods, adding that the government should swing into action to prevent an epidemic. The scholars added that the United Nations International Children‘s Emergency Fund had a few days ago, said the floods, which had affected 34 out of the 36 states in the country, had displaced 1.3 million people. The UN body said over 600 people had lost their lives, adding that over 200,000 houses had either been partially or fully damaged.

The NMA president said there were high risks of waterborne diseases in the country as a result of the floods. Ojinmah said, ―The wells and streams are already contaminated so there is a risk of waterborne diseases, especially in the affected states. ―Corpses are floating in the floods, especially in Bayelsa. The government needs to provide good camping, toilets, water and healthcare for them because they will need to be attended to medically

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for their health needs. Also, the President of the Nigerian Association of Resident Doctors, Dr Emeka Orji, told The PUNCH that there were immediate and future implications and threats of the floods in the country. —I must confess that we've not conducted any study to find out the effects of flooding in the country. Unfortunately, floods can lead to waterborne diseases like diarrhoea, cholera, and typhoid fever. —The state and federal governments must proffer preventive measures to prevent this disaster from reoccurring.

The Secretary of the Gombe State Chapter of the NMA, Dr Daniel Apollos, in an interview with one of our correspondents in Gombe said there were health concerns, especially cholera. Meanwhile, the governor of Akwa Ibom State, Udom Emmanuel, commiserated with his Bayelsa counterpart, Douye Diri, over the flood situation in his state.

In Lagos State, the state government, on Wednesday, said the flood incident at Oko Oba, in the Agege area of the state was caused by property owners in the community. The state Commissioner for the Environment and Water Resources, Tunji Bello, said, —flooding is a natural disaster but it could have been well utilised, for example for irrigation of agricultural farms, but that entails a plan in place. In 1977 or thereabout the Nigerian government embarked on a dam but it was abandoned by 1982 and this was why up till today the effect of the opening of the Lagdo Dam in Cameroon was so massive. —If that dam had been constructed, it would have contained that water that came when the water from their dam was released. They released the water due to climate change and high rainfall which increased the water level but our country had no means of containing it. In 2012, over 300 lives were lost but this year it is over 600 because we have entered another phase of climate change and we now have more rainfall. —So, I will blame the failure of the government to make use of the River Niger, Benue and the river in Taraba to effective use and here, flooding has now become a curse when we consider the damage done and the lives lost. This is why President Muhammadu Buhari ordered the Minister of Water Resources to come up with a plan; unfortunately, I think the 90 days is too long.‖

Nigeria's meteorological agency has warned that flooding could continue until the end of November, 2022 in some states in the south of the Nigeria, including Anambra, Delta, Rivers, Cross River and Bayelsa. Khalid and Maishman (2022) Experts also said poor planning and infrastructure have exacerbated the damage. Since the flooding began in early summer, large swathes of farmland have been destroyed. There are concerns about increased spread of disease, food and fuel supplies have also been disrupted.

In his own words, Aguiyi (2022) suggested that there is need to forestall further threats to food security, the economy, health, security, and the environment, the government must adopt the following recommendations as a way to reduce the impact of perennial flooding in Nigeria. First, NEMA must begin to act proactively by utilizing Geographical Information Systems (GIS) and metrological data to improve their early warning systems and reduce people's exposure to flood risk. The communication must be timely and effective and adequate provisions

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must be made in case of an emergency evacuation. Secondly, the Nigerian government must begin to consider the construction of a buffer dam to accommodate excess water from the Lagdo dam in Cameroon. This is very critical given that aside from dam absorbing excess water, a buffer dam will provide irrigation for thousands of hectares of land, stimulate fishing, and most likely support the generation of electricity. Thirdly, the government must invest in the dredging of the major rivers to accommodate high volume of water, promote inland waterways as well as capture fishing. Finally, the government must build, reactivate, and maintain the urban drainage systems, and prevent people from erecting structures on waterways.

Umar and Gray (2022), many of the studies reviewed identified key or main causes of flooding as anthropogenic factors. Building beside rivers leaves settlements vulnerable to flooding, yet town planning could limit further expansion of settlements on vulnerable land. Blockage of waterways, by dumping of refuse, for example, diverts the flow of water. Inadequate drainage and broken water pipes are also problematic. Resourcing suitable maintenance programmes could help to prevent these causes of flooding. Trees growing on moderate slopes help to prevent erosion, landslides, water runoff, and flooding, through take-up of water and land stabilisation by tree root systems. Forestry management could mitigate the loss of trees. Impacts of flooding from waterborne diseases must be met with well-resourced health programmes. Therefore, given the political will and prioritising of resources, flood occurrence and impacts could both be reduced.

Benefits of Flooding in Nigeria

Despite the negative effects of flooding, its‘ benefits are numerous. For example, the 2022 flood checkmated the notorious activities of terrorists and bandits in some States in Nigeria. Israel (2022) noted that before the 2022 flood, Jigawa, Kaduna and Niger States were hothouses for terrorism. With the flood, activities of these terrorists in their environment have been hindered. The kidnappers were unfamiliar with their terrain overnight. The terrorists could not ride bikes and vehicles to launch attacks anymore and even if they try, escaping would become difficult if confronted by government, local vigilante or rival group. They are now forced to lay low and temporarily sheath their sword. An added advantage to that is the fact that the military, especially the navy and airforce. now has the opportunity to launch attacks into their hideouts and clear them up or capture them. They are not used to the torrential reality they are being faced with and that means they are losing steam, they are now easy targets. Also, there is a flood in Anambra, one of the worst affected states by insecurity in the southeast. We barely hear of kidnap or killing at the moment because their hideouts in the forest were washed by the flood. Those perpetrators now relocated to the town and are living with the people. They should be tracked down and arrested by security intelligence so that peace can reign again.

Apart from insecurity issue, flood could deposit rich, fertile alluvium in agricultural areas. Flood water could also replenish irrigation channels and this water could be stored and used by nature and people. They also filter

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pollutants out of rivers and nourishing lands to support ecosystems and fertile areas for farming. Flooding creates islands and channels and other habitats that are home to fish, birds and other wildlife.

Mitigating Flooding in Nigeria

As Cameroon could open the Lagdo Dam in the nearest future, what would Nigeria do to curtail the next flooding? Whether Nigeria could build dams or embankments along the banks of the rivers, the country must chart a development plan to mitigate the adverse effects of flooding in Nigeria.

- Individuals should not build houses close to floodplains or in areas liable to flooding. On these floodplains, farming or gardening could be practiced, this is to avoid loss of lives and properties. Within cities and towns, canals, drainages and waterways should be free of dirties such as plastics and bushes such that water could flow freely.
- Experts such as geographers, hydrologists, geologists, environmentalists, planners and parliamentarians should come up with integrated awareness, enlightenment, educational and legal framework capable of checkmating flooding and erosion in Nigeria.
- Government should do the following to address the perennial flooding challenges in Nigeria.
  - Maintain existing dams; build counterpart dams to take care of water released from dams in the neighbouring countries of Cameroun, Niger and Chad. Rivers Niger and Benue and their confluence at Lokoja should be closely monitored. On these major rivers government should provide functional Erosion/water level Alert systems, the spoilt systems could be replaced while new ones should be provided when and where necessary.
  - There should be flood management policy in Nigeria and integration of flood risk management with spatial planning is the way to go.
  - There should be collaboration between the Nigerian Meteorological Agency and National Emergency Management Agency in using the Geographical Information System (GIS) and early warning systems to work on flood data. Integrated planning and infrastructure combined ICT tools; these would assist in communicating agents responsible for flooding and erosion.

Addressing Nigeria‘s perennial flooding is important for the country to make progress. The human-induced causes of flooding should be addressed urgently. Not doing this will delay its journey to sustainable development.

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