A BRIEF EXPLORATION OF FLOOD DISASTERS IN NIGERIA WITH KEY EMPHASIS IN BORNO STATE: TYPES/CAUSES, IMPACTS, MITIGATIONS/CONTROLS

Flood is the overflow of water onto drylands. Rising tides in inland waters (e.g., streams, rivers, etc.) or increase waves in coastal waters (seas and oceans) may result in overflowing of the banks of these waterbodies thereby finding their way to nearby drylands. In recent time, Nigeria has witnessed several flooding events resulting in loss of lives, and properties, missing people, destruction of farmlands and even spread of diseases like cholera and diarrhea occasioned by contaminated waters and water vector-borne ones like malaria, and affecting Nigeria economy.

Over 29 states in Nigeria have been affected by flood events in the past few months including Jigawa, Niger, Nasarawa, Kogi, and more recently Zamfara and Borno States. The most hit location that garnered lot of attention both from governments at all levels in Nigeria and international organizations is that of Borno State located at Northeast in Nigeria. It was reported that several communities within and around Maiduguri, the capital of Borno State, were submerged by water occasioned by the overflowing of Alau dam because of heavy downpour of rainwaters. The Nigeria's Emergency Response Agency (MENA) informed that one of the spillways of Alau Dam collapsed as reported by Deutsche Welle (DW). An estimation of over 400,000 people were displaced by floods as reported by the National Emergency Management Agency. The authorities and the United Nations refugee agency in Nigeria said that it is the worst flood in 30 years in the city, also the authorities informed that over a million people were affected. NGO Save the Children stated that three million in Children in Borno State would be exposed to diseases, malnutrition, no schooling and other risks.

Further, the flood can also be linked to climate change, such as increased rainfall events, rising seas levels and, it also could be linked to other human activities (e.g., lack of proper drainage systems, building on floodplains, obstruction of waterflow around residential areas, etc.). Borno State is vulnerable to climate change effects, the flood risk is increased when drought affects soils they decertify, and when the soil receives heavy rains, it triggered the flood events as reported by NGO Save the Children. This is known as precipitation whiplash, abrupt shifts between wet and dry extremes, reported in the study "Increasing global precipitation whiplash due to anthropogenic greenhouse gas emissions" in nature communications.

One of the most affected government infrastructures that was affected was the University of Maiduguri Teaching Hospital, where patients' wards, and other units of the hospital were submerged by water. According to the Chief Medical Director (Professor Ahmed Ahidjo) of the teaching hospital, some patients were evacuated from the down floor of the hospital to the upper floor to prevent further compromise of the health situation of the patients. He also stated that the flood resulted in exposure of the hospital areas to chemicals and sewage carrying contaminated hospital items, and that this can pose a grave health risk to both the patients and the staff of the hospital.

TYPES/CAUSES OF FLOODS:

There are several types of floods, but here we explore three main types, namely: pluvial (flash) floods, fluvial (river) floods, and coastal floods.

a) The flash floods also known as surface water floods occur during a heavy rainfall. The flash floods usually last for a few hours before receding. Also, the nature of the soil within an environment can cause flash floods, for instance, clayey soil tends to hold more water than sandy soil, so in the event of heavy rainfall within a clayey environment, flash flooding may occur. Further, flash flood is not particular to rural environment, it also occurs in urban area most especially cities situated in lowland and within coastal areas like some parts of Abuja (low land) and Lagos (coastal) in Nigeria.

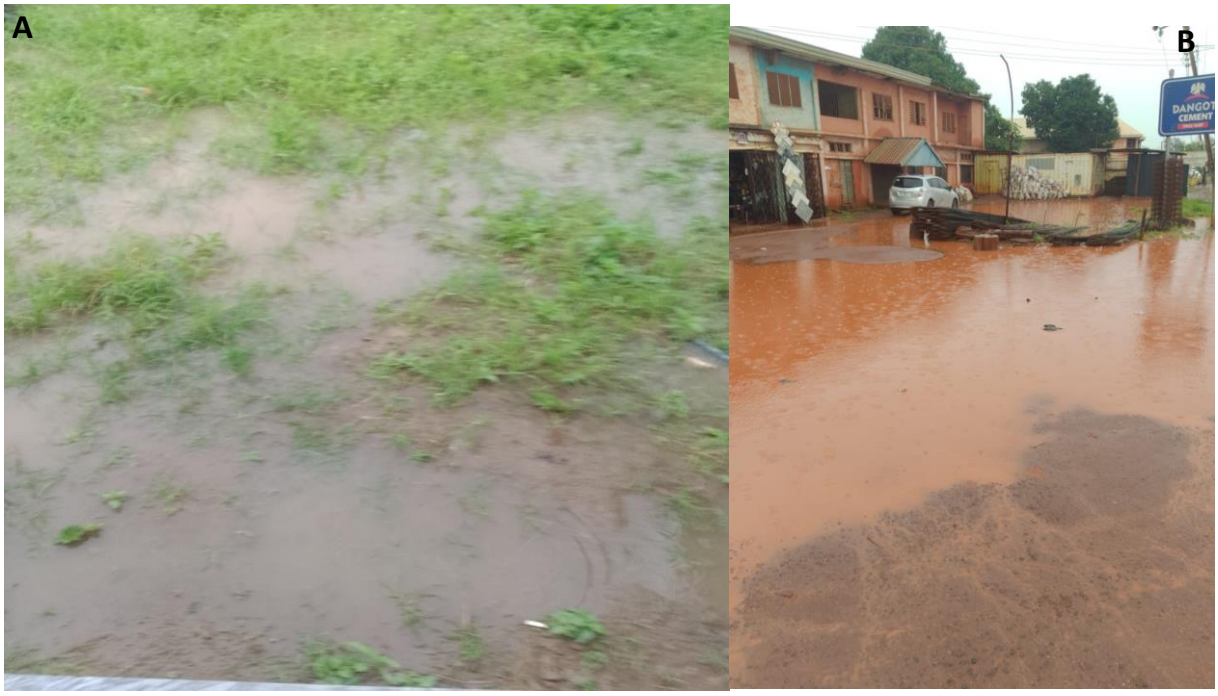

Plate 1: A clayey environment in Otada community **(A)** and a section of Makurdi-Enugu Express Way **(B)**, Otukpo LGA, Benue State, Nigeria hit by flash floods.

b) River (fluvial) floods occur when an extreme rainfall event creates a flood independent of an overflowing water body. River floods do not only occur in environments close to riverbanks, but it can also happen in environments far away from waterbodies because the river floods do not reseed so easily unlike the flash floods. Such floods last longer and much difficult to control, and the extent of damages in the event of river flood is quite huge, just as the case happening currently in Borno State of Nigeria which has resulted in loss of several lives, displacement of several hundreds of thousands of people and destruction of properties worth millions of naira.

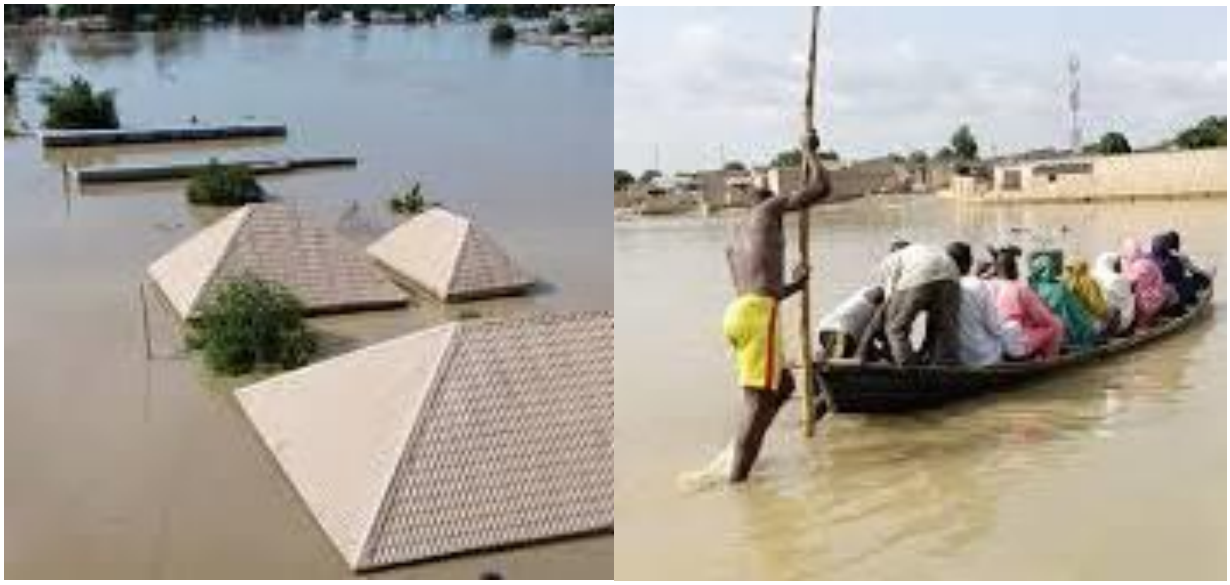

Plate 2: Communities in Borno State affected by River floods

c) Coastal floods are caused by accumulation of water on land along the coast by seawater, oceanwater or other salt waterbodies. It results from intense windstorm events following heavy waves and tides in the seawater. It can also be caused by natural disasters such as tsunamis. Such flood events are not usually common in Nigeria except in areas surrounding oceanwaters such as Delta, Bayelsa and Lagos States of Nigeria.

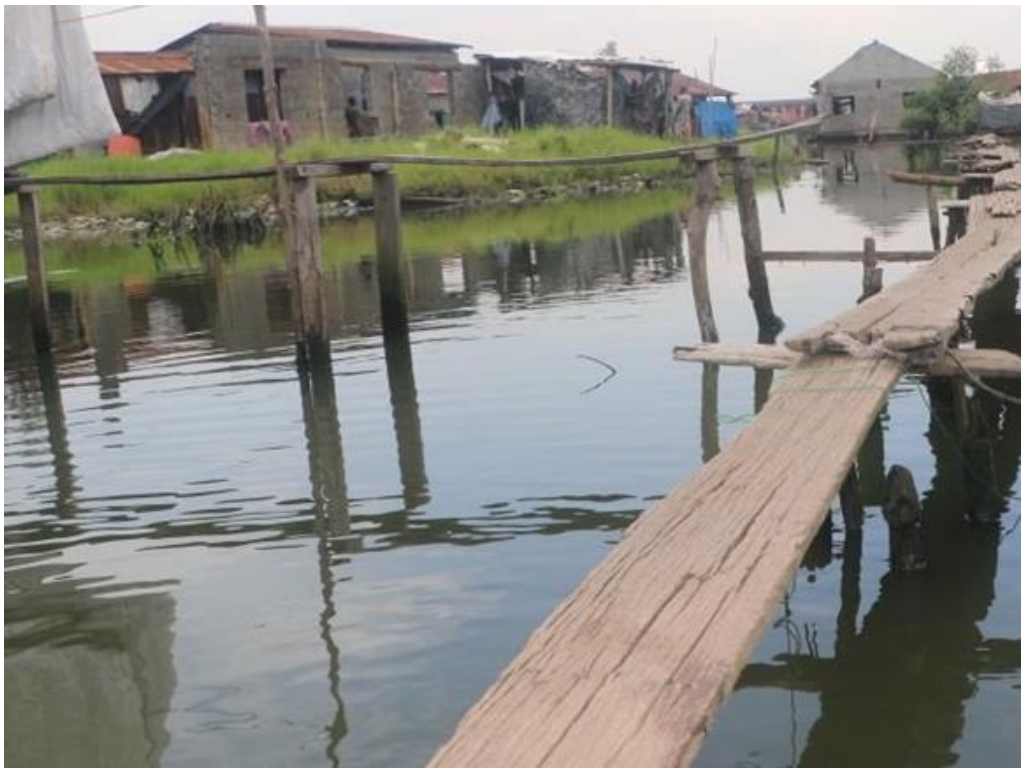

Plate 3: Flooded coastal community in Lagos State, Nigeria (**source:** gettyimages, Photo credit: Majority Worlds)

IMPACTS OF FLOODS

Flood events have several negative impacts on the environments and living organisms, some of the impacts of floods have been mentioned in the preceding sections, here are some specific impacts of floods: i) Loss of human life and properties; ii) damage to energy infrastructures; iii) increase erosional processes; iv) risks of landslide, v) destruction of agricultural produce such as crops and livestock; vi) food security crisis; vii) spread of diseases; and viii) impacts on other infrastructure.

For emphasis, the following impacts are discussed in detail: damage to energy infrastructures, food security crisis, spread of diseases, and impacts on other infrastructures.

a) Damage to energy infrastructures: The electricity production infrastructure is affected by floods, for example, those events impact the electricity generation mainly using natural gas, and onshore oil and gas production according to the International Energy Agency (IEA). Another example is the impact of the floods in 2012. The negative effect on the sector was estimated in total to be 8,342.6 million naira (EUR 4.7 million), being among the worst effects registered.

Another effect related to climate change, the heat waves, which rises energy demand for air conditioning, increases the pressure on the electricity grid, according to a study about the economic impact of the climate change in Nigeria by the Ministry of Economy, Finance and Industry of France. The economic impact of electricity shortages estimated by the World Bank is USD 29 billion per year or more than 5 % of GDP.

b) Food security crisis: Malnutrition already present crisis in the Northeast region of Nigeria. This is occasioned by the activities of bandits and other terrorists non state actors (e.g., Boko haram), and food insecurity could be increased because of the more than 550,000 hectares of agricultural land flooded in the country, mainly in the Northeast, as estimated by The UN's World Food Program (WFP). Moreover, the impact of floods, soil degradation and drought, over the yields in agriculture, sector that contribute to GDP around 25.18 % and 70.8 million of hectares are used for farming, implies the increases of food prices due to factors such as food importation, affecting mainly the most vulnerable people, according to a study about the economic impact of the climate change in Nigeria by the Ministry of Economy, Finance and Industry of France.

c) Spread of diseases: Some diseases are being spread rapidly during and after flood events. For instance, mosquitoes that carries malaria parasites breed more in stagnant waters, and most time even when flood waters have receded, patches of stagnant puddles that serve as breeding sites for mosquitoes and other insects which are vectors of several diseases still remain for some time. Further, diseases such as schistosomiasis and other gastrointestinal diseases that are transmitted by aquatic Mollusca (e.g., *Biomphalaria* and *Bulinus*) are prevalent in flood prone areas, most especially in coastal communities.

d) Impacts on other Infrastructure: As stated above, the inability of farmers to access their farms will encourage them to migrate from the floods and insecurity prone areas of the region and relocate elsewhere that is reasonably safe and less impacted by the events of floods for their farming activities, most especially the urban areas of the region and other regions of Nigeria, which implies more pressure on the infrastructure and services in those regions. Food inflation in Nigeria estimated by the Ministry of Economy, Finance and Industry of France, will be around 20% in 2025 and 17% in 2026 in the long term, therefore, urgent actions must be conducted by the appropriate government agencies and departments, as well as the entire populace to avoid that scenario.

FLOODS MITIGATIONS/CONTROLS

Having understood what flood is, some of the key types of floods/causes, and their impacts, it is pertinent we outline some of the ways in which we can mitigate/control flooding. Depending on locality and the nature of the flooding, several structural and non-structural mitigation measures may help to reduce/prevent flooding events. However, note that flood mitigation measures may only reduce flooding impacts, heavy rainfall and hightides cannot be prevented.

Structural flood mitigations

By structural flood mitigation, physical structures can be constructed or modified to reduce the impact of flooding on individual properties or whole catchments. Some of the structural flood mitigations are as follows:

i) Infrastructure, including dams, levees, bridges and culverts can be built to reduce the effect of floods:

For instance, some of the infrastructure mentioned above may reduce flooding to a reasonable extent by few meters which provides minimal benefit to very few sections of a given community but not to an entire community, most especially those houses or properties located along or at the middle of a floodplain or well know erosion prone areas.

ii) Maintaining the existing infrastructure mentioned above in case of wear and tear:

There should be consistent maintenance plans of already existing infrastructures that aid in reducing flooding event, just like the case of Alau dam in Borno State, Nigeria which could have been fixed before the flooding event that ravaged several communities in State. Developing and reviewing a regular maintenance schedule for flood prone areas can provide significant benefit during seasonal rains. Please note that regular clearing of drainages does not always help reduce the impact of large flood events just like the case of river flood, but it can help prevent flash flooding totally.

iii) installation of flood proofing measures:

Installation of flood proofs like perimeter fences between 7-8m could help to reduce the impact of floods in our homes. Further, raising of windows, stop boards and limiting sewage contamination could help to reduce the impact of flood as well as reduce diseases spread in the event of flash flood.

Non-structural flood mitigations

i) Ensure you survey your land before erecting your buildings or other landed properties. If it is a flood prone area you can relocate elsewhere to build your home(s).

ii) Make sure the location in which you intend to build is fully approved by the land survey department of the country, state or local governments.

iii) As mentioned in structural mitigation measure above, it is pertinent you clear off debris from existing water passage infrastructures such as drainage system.

iv) Avoid cutting down trees which help in reducing stormwater in the event of flooding events.

v) Avoid other climate change aggravated activities such as bush burning and other excessive carbon emissions activities.

vi) Be abreast with flooding early warning signals as provided by the country or state meteorological department and other government departments and agencies saddled with the responsibility of doing so.

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