



Historical Review of Flood Occurrence in Nigeria and Some Possible Solutions

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ABSTRACT

In recent years, environmental disasters have increasingly threatened the globe, with flooding emerging as one of the most devastating natural hazards due to its rapid onset, unpredictability, and challenges in emergency response. Flooding poses significant risks to physical, social, economic, and environmental systems. In Nigeria, flooding has become an annual occurrence, profoundly affecting human lives and infrastructure. The country experiences three primary types of flooding: river flooding, urban flooding, and coastal flooding. This paper examines various flood incidents in Nigeria over the past four decades (1994–2024) to analyze their frequency and patterns. Findings indicate that floods have become a recurrent annual phenomenon, affecting multiple states across the federation. To mitigate the adverse effects of flooding, it is crucial to establish comprehensive early warning systems nationwide and implement improved methodologies for reservoir operations and the maintenance of hydraulic structures.

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INTRODUCTION

Globally, flash floods stand as the most damaging of all natural hazards due to its abrupt nature and difficulty in prediction which restrain emergency response (Nasir *et al.*, 2020). Flooding is a natural phenomenon that causes risk to both social, physical, economic, and environmental well-being of a society (Djamaluddin *et al.*, 2019). The number of fatalities and destitutions that come along with flood is sometimes unbearable for individuals, communities as well as government to manage. Floods occurs in different forms, although it has many triggering factors that initial its occurrence at a specific period of time. According to Rujji (2007), human beings are left with no choice other than to accept flood and manage it, however, to live with flood a certain level of understanding of flood and its concept must be known. It is a known fact that flooding and its impact can be minimized but it can't be eliminated completely. Flooding is a natural disaster that can occur either naturally or as a product of human-induced activities aimed at

modifying the natural environment which may alter the behaviour of runoff and streamflow. flooding is said to be partial or fully inundations of areas that are naturally dry with water which may be present for some hour lasting up to some days or even months in some instances. It is a common environmental problem which is set to occur when water flows through a surface that is normally dry that is not submerged at all. It can also be overtaken of area that is naturally not covered as a result of the brief and sudden increase in streams, rivers, lakes, or sea. Whenever flood occur, it poses a major risk to the riparian population, substantially impacting on the environment, including aquatic fauna and flora which also lead to the erosion of river banks (Talbot *et al.*, 2018).

The principal causes of flooding are rapid population growth, urbanization, poor governance, poor drainage facilities, decaying infrastructure, lack of proper environmental planning and management strategies, poor practice of dumping wastes and climate change

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coupled with inadequate preparedness, lack of adequate detention basin/reservoirs and also inadequate river banks (bashir *et al.*, 2013; Agbonkhese *et al.*, 2014; Aldardasawi and Eren 2021). Agbonkhese *et al.*, (2014) reported that flood hazard in Nigeria is becoming an annual reoccurring event that has a devastating impact to the overall wellbeing and sustainable advancement of the nation as a whole.

Nigeria is witnessing various forms of flood events annually as a result of the high level of exposure and vulnerability couple with lack of handling capacity of its populace and climate change induce characteristics that has led to fast occurrence of extreme events. Flood is reported globally to be the most devastating of all natural disasters claiming more lives and damages to property more than any natural phenomenon. However, in Nigeria it is not leading in terms of claiming lives but it has led to the displacement of people more than any natural disaster and has damage more property than any disaster (Ologunorisa and Abawua, 2005, Askew, 1997). Flood occurrence in different part of Nigeria has led to the relocation and resettlement of several towns and communities, paralyzed business activities, contaminate drinking water and increases exposure to risk of diseases outbreaks (Adeoye *et al.*, 2009; Akanle *et al.*, 2015; Imoniruwe *et al.*, 2023).

People living in developing countries like Nigeria are predominantly vulnerable to flood disasters because significant part of the nation's population are located in high-risk flood areas, less coping capacity, and limited early warning or mitigation strategies (Olurunfemi and Adebimpe 2008; Oluwaseyi 2017; Odiana *et al.*, 2022). The recent shift in flood risk management is that flood cannot be stopped at all, however it adverse impact on the exposed communities can be minimized to the barest minimum if not completely (Schelfaut *et al.*, 2011). The widespread increase in flood hazards coupled with the damage associated have led to a holistic change in approach to flood risk management with more recent pre-flood preparedness techniques, flood evacuation and resettlements and flood

recovering plans especially in developed countries (Adelekan and Asiyambi, 2016).

Generally, water has been considered an important resource for domestic, industrial, and agricultural uses. Excess water or floods have become a serious problem in different parts of Nigeria. A significant part of the country is prone to flooding, and average annual economic losses due to floods in Nigeria run into millions if not billions of naira.

Flood Occurrence in Nigeria

Flood is one of the natural disasters which occur in Nigeria annually. The annual occurrence of flooding led to the washed away of farmlands, property damage and even result to loss of life. As a result of floods, huge funds are spent yearly on compensation and rehabilitation, yet the problem is left unrelenting causing severe damage to the inhabitants. It is one of the major environmental crises in this century which affects and displaces people and destroys properties, resulting in loss of lives, collapse of mud houses, destruction of livestock and farmlands leading to shortage of food and starvation, and extinction of species in the environment (Olorunfemi and Adebimpe, 2008; Mohammed and Kawu, 2014; Odiana *et al.*, 2022; Mfon *et al.*, 2022).

Flooding could also lead to health-related illnesses and water-borne diseases like cholera, bacterial and fungal infections, traumatic skin diseases, paralyze business activities, damage infrastructure, and displace people (Armah *et al.*, 2010; Bashir *et al.*, 2012; Ataire and Ezeomodo 2016; Abdulkarim *et al.*, 2022; Naeem *et al.*, 2023). Umo *et al.*, (2021) reported that flood disaster in Nigeria is generally controlled by climatic variation in season (rainy season), however, in Northern Nigeria it has to do with river discharge and dam failure while in Southern Nigeria it is mostly influenced by high frequency, density, intensity and poor land use planning.

Historical Overview of Flooding in Nigeria

The history of flooding in Nigeria dates to the early 1950s and it is on record that flooding is the highest occurring natural hazard in Nigeria which has been devastating impact on the lives



and properties of its populace, it has led to the loss of lives in several instance (Aderogba, 2012). It is now an annual event that occurs frequently across all parts of the nation either as coastal flood, river flood, flash flood or urban flood (Komolafe *et al.*, 2015; Alfa *et al.*, 2018; Shuaibu, 2020). Within the last two decades, several states of the federation have experienced unusual and devastating flood disasters that renders government's ability to prevent the adverse impact impossible. Among the most notable and devastating flood events that occurred in Nigeria is the 1963 flood event of Ibadan which claimed several lives and properties as a result of the overflow of Ogunpa River. The Ogunpa River also overflowed in 1978, 1980, and 2011 which resulted in the loss of life of about 100 people and an estimated property loss of over 30 billion (Komolafe *et al.*, 2015; Aderogba, 2012; Adegbola and Jolayemi, 2012).

Among the most devastating and worst-hit flood events in Nigeria for the last 40 years was the one that occurred from July to October 2012 and August to September 2022 affecting almost all the 36 States of the Federation including the Federal Capital Territory as a result of heavy rainfalls across the country coupled with the release of excess water from Lagdo Dam in northern Cameroon (Alfa *et al.*, 2018; Umar and Gray 2022; NEMA, 2022). The flood affected more than 7 million people, more than 2 million were internally displaced 5000 people were physically injured and over 5900 houses were destroyed (NEMA, 2013).

Between 2011 and 2012, Lagos State recorded 8 major floods which resulted in the death of more than 30 people and many infrastructural damages (Komolafe *et al.*, 2015). According to the report of EM-DAT: International Disaster Database on Nigeria disaster, floods have affected about 7,000, 867 lives and with over 363 deaths and billions of naira in farm produce and property damage in 2012 alone (Komolafe *et al.*, 2015). More recently in 2018, floods affected more than 1.9 million persons across 12 states in Nigeria (Including Jigawa and Yobe states) which caused the displacement of more than half a million of them from their households (WHO, 2018).

In Nigeria, flooding occurs in three main forms, which are river flooding, urban flooding, and coastal flooding. 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 (Gwary 2008; Adeoti *et al.*, 2010; Adesti *et al.*, 2010; Agbonkhese *et al.*, 2014). Several studies have been conducted by different researchers across the federation. Egbinola *et al.*, (2017) investigated the incidence of flooding in Ibadan City. The study found that even with the daunting challenge of financial constraint, management, and lack of continuity in governance and policies, small-scale flood management remedies such as proper waste management, dredging, clearing of channels and bridge through way have proven effective in the management of flood risks. OCHA (2022) reported that the number of people affected by widespread flooding across Nigeria has risen to over 3.2 million with over 600 fatalities and over 1.4 million people displaced. The flooding is said to have increased the risk of waterborne diseases such as cholera. 4.1 million people faced the risk of food insecurity and 1.74 million children under five were projected to suffer from acute multi-nutrition.

Nigeria is experiencing the worst flooding the country has seen in a decade. More than 3.2 million people have been affected. At least 612 people have lost their lives and over 2700. have been injured. As of 3rd November 2022, according to the National Emergency Management Agency (NEMA, 2022), flooding has forced 1.4 million people to leave their homes, adding to the already high level of displacement in the country. Over 300,000 homes have been destroyed or damaged creating a shelter crisis for hundreds of thousands of people.

Nigeria has witnessed many flood disasters resulting from heavy downpour to dam failure leading to loss of lives, properties, farmlands and farm produce (Ezugwu, 2013). Between August to September 2010, scores of people were killed and thousands displaced by the flood that overran villages in about 6 states of the federation namely Sokoto, Katsina, Kano, Jigawa, Zamfara,



and Kebbi as a result of unusually heavy rainfall that swollen rivers and streams.

Umar and Gray (2022) reviewed flood occurrence in Nigeria over the period of 10 years (2011-2022) based on flood mapping and modeling approaches and highlighted the global possibilities of flood management and mitigation. The study identifies that in Nigeria, flooding is a common phenomenon. However, data on the impact of flooding is lacking at both local, state, and national levels. Flood reports are incomplete, making it difficult to compare impacts across locations and to quantify their magnitude (Lucas, 2021). The annual flood outlook reports by NIHSA signify floods in 2012, 2018, and 2022 as the most catastrophic flood events in Nigeria. National Emergency Management Agency (NEMA) indicated that the flood that ravaged Nigeria in 2022 is the worst ever the country has seen in the last decades. The flood affected more than 3.2 million people and led to the loss of life of at least 612 people, with over 2700 people injured (NEMA, 2022). The flood has impacted on 34 of the 36

states of the federation destroying over 300,000 and damaging 569000 hectares of farmland (OCHA, 2022). Only recently on the 10th of September, 2024 that flood revenue over 40% of Maiduguri Metropolis as a result of a breach in Alu Dam thereby leading to colossal damage to both physical, socio-economic, and environment (UNICEF, 2024). OCHA, (2024) reported that flooding has led to the death of over 37 people, 58 people injured and over 400000 people registered across the 30 internally displaced persons (IDP) camps in the State.

Table 1 presents a summary of flood events in Nigeria. From the table, it can be deduced that flooding is an annual event in Nigeria. Its occurrence can be as a result of heavy rainfall, reservoir releases, or dam failure. Flooding in Nigeria has led to the loss of life of many innocent Nigerians. The damage caused by flooding runs into billions of naira and year in year out billions of naira are spent on rehabilitation and recovery of the affected communities.

Table 1: Flood events in Nigeria

Flood Event / Cause	Damage	Year	Source
Shiroro Dam Releases as a result of heavy downpour	Eight children die and 25 villages in 15 local government areas were submerged as a result of increased water releases from Shiroro Dam. Thousands of houses and buildings, including schools and hospitals, were destroyed. The principal cause of this flood is heavy rainfall and releases from Shiroro hydroelectric dam	1999	Ezugwu (2013) and Eze (2018)
Flooding in Abia State as a result of rainstorm	Several houses were affected and over 500 people displayed	2001	Etunovbe (2011)
Flooding in Jigawa and Kano State as a result of release of excess water from Tiga and Challawa Dam	Over 20,000 people were rendered homeless and about 180 people died in Jigawa state, with 800 people injured and 35,000 people displaced, while Kano recorded not fewer than 28 deaths and 48500 displaced.	2001	Daily Trust (2001)
Shiroro Hydro Electric Dam, Heavy downpour	The flooding resulted from the heavy downpour and release of excess water from Shiroro hydroelectric dam. Over 26 villages in Niger state were flooded by water from River Kaduna and River Niger. Flood displayed over 10,000 persons in Keche LGA. Another 13,500 persons in Lakpan	2003	allafrica.com

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Flood Event / Cause	Damage	Year	Source
	and Shiroro were rendered homeless, and houses, properties, farmlands, farm produce and animals were washed away.		
Obudu Dam Spillway Damage, heavy downpour	Heavy downfall that lasted for 16 hours. Releases of excess water from Lagdo dam. Over 200 houses, several farming lands, settlements and businesses were affected.	2003	(Uyigue, 2006)
Kangimi Dam Collapse in Igabi Local Government Area Kaduna State	Properties worth over 500 million were destroyed from produce destroyed, thousands of people were rendered homeless, and several streets and houses estates were submerged in Kaduna State.	2003	(Uyigue, 2006)
Eleyele Dam Collapse, heavy downpour	Flood was caused as a result of a heavy downfall that lasted for more than six hours which led to the collapse of the Eleyele Dam	2003	Ezugwu (2013)
Barrage Dam in Gusau Zamfara State releases due to heavy downpour	Leftover 40 people dead and over 500 houses were washed away and another 1000 people displaced	2006	OCHA (2006)
Kagara Dam Spillway Failure	The entire village submerged tens of thousands of people were displaced, roads, shops, trees, and building were submerged over 130000 people displaced and 49 people reported death.	2010	Etuonobve (2011)
Ikorudu flooding due to heavy downpour and the spilling of river Ogun	Many were left homeless resulting in loss of several properties, water spread over the flood-prone areas of river Ogun	2010	Etuonobve (2011)
Lagdo Dam excess water releases	90 communities in Lokoja, Ibaji, and Kogi were completely submerged, and over 500000 people were reported to be displaced	2010	Etuonobve (2011)
Sokoto State Dam Failure on Rima River as a result of heavy downpour	About fifty villages were submerged, more than 2000 houses were destroyed and over 100,000 people were displaced across 11 local government areas of Sokoto state as a result of heavy rain that led to Dam failure on Rima River. Thousands of hectares of farmlands and farm produce were washed away.	2010	(Vanguard, 2010)
Kastina State	Hundreds of houses were destroyed with over 1700 persons displayed in Dutsenma local government area alone.	2010	Daily Trust (2010)
Zamfara State	Over 2000 acres of farmland were washed away in Gummi local government area.	2010	(Daily trust, 2010)



Flood Event / Cause	Damage	Year	Source
Flooding in Jigawa and Kano State as a result of release of excess water from Tiga and Challawa Dam	Between August to September 2010, not fewer than 2 million people were displaced after the spillway of two dams Chalawa and Tiga Dam located in Kano state were open to release excess water. The flood left hundreds of hectares of farmland waterlogged, farm produce completely destroyed, damage estimated at over 4.5 billion naira.	2010	(OCHA, 2010)
Kano City Flood, heavy downpour	About six people lost their lives while several others were injured as a result of territorial rainfall that led to the collapse of about 27 houses in the fragile local government area of Congo state. About 300 people were rendered homeless.	2011	(Premium Times, 2011)
Adamawa flood, releases of excess water from Lagdo Dam	The flood was caused by the release of excess water from the Lagdo Dam in Cameroon. Thousands of people were rendered homeless, and farmlands and farm produce were destroyed.	2012	Ezugwu (2013)
Warawa Dam failure in Kano State,	Numerous communities in Kano State were submerged. Thousands of people were rendered homeless, several hectares of farmlands were washed away and farm produce worth millions of naira destroyed.	2012	Ezugwu (2013)
Jabba and Kainji Dam Sluice gate opening	This resulted in the death of more than 15 people, hundreds injured and the displacement of tens of thousands affected Niger river Basin and Kaduna River. It resulted in the loss of Lives, properties, farmlands and farm produce.	2012	Daily Trust (2012)
Kano State Flooding	As a result of heavy downpour between August and September 2012 and left not fewer than 19 people dead and more than 15000 people injured	2012	Olayinka (2013)
Kano City Flood	Heavy rain caused flooding in Kano, Nigeria, displacing over 500 people and killing one person after he fell in the Katsaiki River at Darmanawa in the Kumbotso Local Government Area of the State.	2013	(Floodlist, 2013)
Jigawa State	Flooding has affected hundreds of families in Jigawa State Nigeria over the last week. At least 21 people died in a road accident after a bridge collapse	2021	(Floodlist, 2021)



Flood Event / Cause	Damage	Year	Source
Alu Dam failure	40% of the Maiduguri metropolis was submerged by flood water about 37 people were reported dead, 58 people were injured and over 400000 people displaced	2024	UNICEF (2024); UCHA (2024)

DISCUSSION

Flood is annual occurring phenomena in Nigeria with more frequency and impact in the Northern Region (Nura and Gray 2022). Although these can be attributed to a number of factors such as the vast land mass of Northern Nigeria and the availability of more reservoirs within the region. It can be seen that from Table 1 almost all the flood events reported are in northern Nigeria with the exception of two events of dam collapse at Eleyele dam and Obudu dam spillway damage. Flooding in Nigeria is said to have led to the death of many people and property damage running into billions of naira annually as can be seen from Table 1 above. No flood event that those not come with catastrophes to the populace in Nigeria among all the reported cases. The major cause of flooding in Nigeria from the above-studied flood incidences were identified to be reservoir operations, heavy rainfall, normal rainfall with longer duration, siltation/infestation of drainage channels, and inadequate drainage facilities.

RECOMMENDATIONS/POSSIBLE SOLUTIONS

As flood continues to spread all over the country, below are some possible solutions:

1. The installation of flood early warning signs and systems within all the flood prone areas in the country.
2. Proper operation and maintenance of hydraulic structures, through control release of water from reservoirs upstream to minimize overflow/ flooding in downstream communities.
3. Improved methodologies for the management, operations and maintenance of reservoir and also the construction of channels that will minimize the effect of reservoir releases to downstream of the basin.
4. Strategic awareness programs should be introduced by government disaster

management teams in communities within the river course on the hazard and vulnerability/exposure of the communities to flood risk with plans for possible evacuation and resettlement to safer locations.

5. Agencies responsible for the control and management of reservoirs should gauge the catchment and collect streamflow data continuously for future research.
6. Government law enforcement agencies should ensure proper siltation of the basin, cutting of grasses, provision of adequate drains, proper maintenance of drains, avoid building on waterways and create environmental awareness on flooding and its impact on the society as well as investment in infrastructures that will reduce water accumulations most especially during rainy season.
7. Develop comprehensive disaster response plans involving emergency agencies and community members so as to avert the adverse effect of flood and providing alternative dwelling for those living on the flood plains

CONCLUSION

Flooding is an unavoidable disaster that can be managed with appropriate preventive measures such as flood mitigation and preparedness. So also, the consequences and damage caused by flood disasters can be minimized with adequate response and recovery plans. Although it has been established that flooding is caused by excessive rainfall, urbanization, poor environmental planning and management, and reservoir operations and management. However, flooding can be abated or minimize by taking into cognizance of flood causative factor at preliminary stages in the

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design of urban areas and development along flood prone areas.

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