Flooding in Nigeria: A review

Ahmed ABUBAKAR

School of Preliminary Studies, Sule Lamido University, Kafin Hausa, Nigeria

E-mail: Abubakar8550483@gmail.com

Abstract

Flooding is arguably the weather-related hazard whose occurrence is most widespread around the globe. It can occur virtually anywhere. The aim of this paper is to review the impact of climate change and how the changes and variability exacerbate flooding and human displacement in Nigeria. The objective of the study was to understand the extent and impact of flooding in Nigeria. Flood studies in Nigeria are usually regional or local, covering a specific location, state(s) or local government area. Therefore, this study conducted a systematic review of literature on flooding and climate change across the country. It considered only articles that were published in English, spanning the period 2000 to 2020. The retrieved documents were screened and coded into categories and themes based on the similarities in the documents. Articles reporting the causes, impact or management of floods were grouped independently to form several themes and coded for further analysis. The findings indicate that floods occur as a result of torrential rainfall and poor surface drainage systems, ocean and tidal waves causing flooding along the coastal areas, bursting of dams, deforestation, population pressure, and uncoordinated land use planning. Flooding is an age old phenomenon in Nigeria which has claimed lives and property. Flood impact is acknowledged and documented in Nigeria with varying spatio-temporal magnitude, risk, exposure and vulnerability depending on the location and primary cause of the flood. Several policies are being put in place by different levels of government in Nigeria in the form of

adaptation and mitigation to check the menace of flooding in the country.

Keywords: Climate Change, Flood, Impacts, Adaptation, Nigeria

Introduction

Flooding is an age-old environmental disaster associated with a rise in the water level of oceans, rivers and lakes as a result of excessive rainfall, dam breakage or melting glaciers inundating large areas of land (Otomofa et al., 2015; Tawari-Fufeyin, Paul & Goodleads, 2015; Bello, Durosinmi & Abdulkarim, 2017; Akukwe, Oluoko-Odingo & Krhoda, 2020). The annual occurrence of flooding in Nigeria, particularly in recent times, is associated with climate change, and unplanned and uncoordinated land use (Lasage et al., 2014; Ugonna, 2016; Nkwunonwo, Whitworth & Baily, 2020). The rate of human exposure and vulnerability to flooding is unprecedented, particularly in developing countries (Ologunorisa, 2004; Ologunorisa & Adeyemo, 2005; Wim, Terpsta & Philippe de Maeyer, 2013; Magami, Yahaya & Mohammed, 2014). The ultimate impact of climate change is linked to water quality and quantity challenges which are further exacerbated by socio-economic changes and induced-increase in extreme rainfall which amplify the intensity and probability of flood (Roy, Leconte, Brissette & Marche, 2001; Jongman, 2018). Flooding is a leading disaster in Nigeria that displaces people and destroys settlements, causing damage to property and claiming lives (Magami et al., 2014). The geographical location of Nigeria makes it vulnerable to hydro-meteorological disasters, especially flooding, drought, desertification, rising ocean level and erosion (Ologunorisa, 2004; Ologunorisa & Adeyemo, 2005; Tawari-Fufeyin et al., 2015; WHO, 2015; Hossain, Sohel & Magige, 2020).

Climate change is the biggest environmental threat of this century, ravaging every sector of the economy. This is expected to exacerbate the global hydrological cycle causing overwhelming precipitation and resulting in rivers over flowing to adjoining lands, thereby intensifying flooding in many parts of the world, including Nigeria (Olaore, 2014; Ogbonna et al., 2017; Hossain et al., 2020). The impacts of climate change are expected to continue based on the projections by several climate change models. According to the B2 (continuously increasing population) and A2 (A world of independently operating, self-reliant nations) emission scenarios and SRES A2 (Special report on Emission Scenarios),

SRES B1 and CIMP3 (Coupled Model Intercomparising Projects) models, precipitation in Nigeria is expected to increase, especially in the Sahel region (Adejuwon, 2006; Abiodun, Lawal, Salami & Abatan, 2012; Niang et al., 2014; Odunuga, Badru & Bello, 2014). In addition, rising ocean and sea levels, and coastal tides associated with changing climate are a threat to coastal communities as they exacerbate flooding along the coastal areas of Nigeria (Ologunorisa, 2004; Magami et al., 2014; Otomofa et al., 2015; Tawari-Fufeyin et al., 2015). Decadal records have shown a relentless upward movement in flood disasters with resulting environmental and socio-economic impacts (Simonovic, 2012). The impact of flooding goes far beyond direct damage to assets and infrastructure. Economic losses resulting from business disruption, welfare effects and supply chain shocks can oftentimes equal or exceed physical damage.

Dealing with flood entails adaptation and mitigation and, particularly keen interest in understanding the flood disaster through academic research and a significant increase in publications in academic journals such as *Applied Geography*, *GeoJournal*, *Environmental Science and Pollution Research and Global Environmental Change*, *African Journal of Sustainable Development* (Ologunorisa, 2009). Recently, adaptation to climate-related hazards such as flooding has dominated global discussions and international policies (Wiering et al., 2017; Wilby and Keenan, 2012). In recognizing the impact of flooding, the need arises for both government and multilateral agencies to mainstream strategies for flood risk reduction in Nigeria. This can be achieved through a national development plan which would include a technical master plan for flood control and relief measures, enforcing public and private land laws, enhancing institutional capacity in climate-related hazards as well as prediction, sensitization and outreach to communities, and provision of necessary infrastructure to adapt and mitigate the impact of flooding (Adekola & Lamond, 2018).

Flood management is a holistic approach to reducing flood hazards through a combination of policies, and institutional, regulatory and physical measures in addressing and minimizing the risk and vulnerability of flooding (GWP, 2001 cited in Amangabara and Gobo, 2010). In other words, flood control or management refers to the process, methods and techniques used to reduce or alleviate the environmental and socio-economic impacts of flooding. Flood mitigation involves

structural measures that alter the physical characteristics of the flood through ordinary maintenance and engineering works, and the non-structural measures which involve the necessary procedures for altering the exposure of lives and property which involves monitoring and forecasting, land use regulations, insurance coverage, evacuation planning, education and public information (Amangabara and Gobo, 2010; Fortebraccio, Gallenga & del Consiglio, 2017).

Flood studies conducted in Nigeria have been regional and/or localized covering specific locations, state(s) or local government areas. This study therefore reviews literature on flooding across the country. It highlights the latest trends in flooding in Nigeria and provides a review of its impacts, management and adaptations.

Materials and Methods

The study area

Location, position and size

Nigeria is the most populous country in Africa with a population of 193,392,517 million, according to a 2016 projection by the National Bureau of Statistics (2018). It is located at the extreme inner core of the Gulf of Guinea on the west coast of Africa and occupies an area of approximately, 923,768 sq.km, extending about 1,127km E-W and 1,046km N-S. Nigeria is approximately located on 4° and 14° N and 3° and 15°E of the equator. She shares her borders with Niger Republic to the north, Chad to the northeast, Cameroon to the east, Benin to the west, and the Atlantic Ocean (Gulf of Guinea) to the south.

The weather and climate patterns of the area are dictated by Intertropical Discontinuity (ITD). The ITD represents an area of low pressure over West Africa separating the southwest monsoon moisture bearing winds from the Atlantic Ocean and the harmattan bearing winds or northeast trade winds from the Sahara desert (Akande, Costa, Mateu & Henriques, 2017). However, rainfall varies from the coast recording ≥ 2000mm of rainfall and decreasing toward the hinterland, recording 400-600mm in the Sahel savanna zone. The temperature varies across the country and depending on the season. On the average, the temperature ranges from 26°C to 28.2°C, depending on the location and season. In the

Sahel region the daily temperature reaches as high as 45°C around April-May.

The northern region is characterized by sandy soils, the interior zone featuring laterite soils, while the southern belt is associated with forest soils and the coastal zone is dominated by alluvial soils. Cervigni, Valentini and Santini (2013) reported a decrease in precipitation in the southern part of the country toward the mid-21st century and stated that "the southern part of the country is likely to be less affected by extreme higher temperatures". They project dryness in the short and medium term in the southern plateau and along southwestern Nigeria. According to Merem et al. (2019), by 2040-2065, southern Nigeria is expected to record an increase in temperature of 1.5-2.3°C and higher in hotter days, while the sea level is expected to rise by 0.2-2.0m.

According to the Köppen climate classification, Nigeria has four climatic zones: the warm desert climate in the northeast, the warm semi-arid climate in the other parts of the north, the monsoon climate in the Niger Delta, and the tropical savannah climate in the middle-belt and parts of southwestern Nigeria (Akande et al., 2017). The study area is drained by two prominent rivers, the rivers Niger and Benue, with many tributaries. The two rivers meet at Lokoja (making a confluence) and drain into the Atlantic Ocean.

Temperature has been rising constantly in Nigeria since 1901. This increase was gradual until the late 1960s to early 1970s when the country witnessed a sharp increase in temperature which has persisted till date. The mean air temperature was 26.6°C between 1901 and 2005, but has increased by 1.1°C in the last century (Akpodiogaga and Odjugo, 2010). This is higher than the global mean temperature increase of 0.7°C. If this trend continues, Nigeria should anticipate a 2.5^0C to 4.5^0C temperature rise by 2100 (Akpodiogaga, and Odjugo, 2010). Conversely, the rainfall trend showed a decline of 81mm between 1905 and 2005, especially in the dryland areas (northern Nigeria), and increased precipitation in the coastal areas, particularly the Gulf of Guinea. All of these trends are evidence that the climate is changing due to the notable impact of declining rainfall toward the hinterland and increasing rainfall in the coastal areas. Other noticeable impacts include: drying up of rivers and lakes, particularly Lake Chad, flooding, coastal flooding, desert encroachment, drought, expansion of sand dunes, conflicts, resettlement

and migration, rangeland degradation, ocean surge, abandoning of farmlands due to degradation, loss of forest reserves, loss of biodiversity, erosion, bush fires, rainfall variability, increase in temperature, storm surge, low agricultural productivity and heat wave (Sayne, 2011; Jonathan and Emmanuel, 2017; Haider, 2019).

Methodology

Search strategy, steps and procedure

Published articles, technical reports, newspaper reports, reports from government agencies and reports from non-governmental organizations on flood events in Nigeria from 2000 to 2020 were systematically retrieved. The reviewed documents were obtained from Web of Science, Research Gate, Google, Google Scholar, Scopus Index, and Elsevier, as well as reports from government and NGOs. In the search for documents, the review used the search string "flood" in combination with keywords such as causes or impacts, management, property loss or productivity loss, injuries or deaths, early warning system, river management, or relocation. However, according to this review, climate change simply refers to any change in climate over time, whether due to natural variability or as a result of anthropogenic influences (Berrang-Ford, Ford & Paterson, 2011).

Selection criteria

This review considered articles published between 2000 and 2020 as the most recent decades and contains up-to-date information on contemporary Nigeria, and more pronounced flood events that took place within the study period. The inclusion and exclusion criteria are presented in table 1.

Scope

The review also considered articles published on floods or reporting flood causes, impacts and management.

Table 1: Inclusion and exclusion criteria

Inclusion	Exclusion
2000-2020	Pre 2000
Nigeria focused	Not focused on Nigeria
Keywords search in English	No English
Index in ISI Web of Knowledge	Not available via ISI Web of Knowledge
Reviews, articles, reports, news	Abstract, editorial, meetings
Phase 2: title and abstract review (Full text review for categorization)	
Causes	Articles that did not identify cause(s) of flood
Impacts	Articles that did not identify impact(s) of flood
Management	Articles that no identify flood management(s)

Adapted and modified from Berrang-Ford et al. (2011)

Procedure for documents review

After thorough screening, 79 documents met the inclusion criteria and were selected for the analysis. However, articles were also considered based on general characteristics such as authorship, year published and regional interest within Nigeria. Therefore, the review mainly focused on: (i) perceived causes of flood, whether anthropogenic, natural variability, or a combination of both; (ii) associated impacts of floods, the degree of the impacts; and (iii) management activities outcome and or expected outcome in managing flood disasters.

Analysis

The selected articles were analysed by categorization, developing themes and codes. At the end of the classification, the data were summarized qualitatively.

Results and Discussion

Nigeria's vulnerability to climate change

Temperature

Several models and scenarios continue to predict rising temperatures in Nigeria, particularly in the Savannah zones (northern Nigeria). The B2 scenario predicts a warming of 0.2°C, while the A2 scenario predicts a maximum warming of 0.8°C (NIMET, 2010; Abiodun et al., 2012; Niang et al., 2014; NIMET, 2015). Cervigni et al. (2013) reported a 1-2°C warming by 2050. Surface temperature is projected to be on the increase over Nigeria; in the first quarter, the projections ranged from 27.2°C to 27.6°C; the 0.4°C spread may become 1.2°C (28.8°C-30°C) by the late 21st century (Cervigni et al., 2013; Amadi and Udo, 2015;; NIMET, 2016).

Both regional climate models (RCM) and general circulation models (GCM) predict increases in temperature over Nigeria and the impacts would be felt differently depending on ecological zones and seasons. The central part of Nigeria comprising the guinea savannah (7°-12°N) would experience a 3.5°C warming from June-August by 2056-2065 and core northern Nigeria would witness 2.8°C increase in temperature (Ater and Aye, 2012; Cervigni et al., 2013 Ojekunle et al., 2014). Temperatures in the north-central region are predicted at 36-38°C. The highest temperature of 38-40°C will be experienced in the northern region (Amadi and Udo, 2015; Yusuf, Okoh, Musa, Adedoja & Said, 2017; Akinbile, Ogunmola, Abolude & Akande, 2019), particularly the north-eastern region which has the highest projection increase of 4.5°C by 2081-2100 (United States Agency for International Development, 2012; Bibi, Kaduk & Balzter, 2014).

Southern Nigeria, particularly the Niger Delta region, would experience less warming. The coastal areas of south-eastern Nigeria are predicted to record temperatures of 30-33°C while the coastal areas of south-western Nigeria are predicted to experience temperatures between 33-36°C.

Table 2: Climate Change Scenarios for Nigeria

Model	Prediction	References
B2 scenario	Predicts consistent warming of 0.2°C per decade from 2000 till last quarter of 2100	Abiodun et al. (2012), Niang et al. (2014)
A2 scenario	Projects a warming of 0.4°C per decade from 2000 till mid-century (2046-2065) and 0.8°C per decade for 2080-2100	Abiodun et al. (2012)
SRES A2	Projects increase in annual rainfall from 730mm in 2000 to 839mm in 2100 in the Sudan ecological zone and from 2373mm in 2000 to 2628mm by 2100 in the forest ecological zone	Adejuwon (2006), Odunuga et al. (2014)
SRES B1	Projects rainfall increase in Sudan savannah from 730mm in 2000 to 803mm in 2100, and from 2372mm in 2000 to 2518mm by 2100 in forest ecological zone	Adejuwon (2006), Odunuga et al. (2014)
CIMP3 and CIMP5	The model projects wetter condition, variability and delay in rainfall by the end of 21st century	Niang et al. (2014)
RCP 8.5 and RCP 2.6	According to RCP 8.5, about 548,300 people will be affected by flooding due to sea level rise between 2070-2100, while RCP 2.6 projects that about 334,900 people will be affected by flooding if no meaningful adaptation measures are put in place. In addition, prevalence of malaria will be high.	WHO (2015)

Precipitation

The spatio-temporal distribution of rainfall varies across Nigeria. The southern region records the highest amount of rainfall with more than 2500mm; the amount declines toward the hinterland averaging 350-400mm per annum. Rainfall in Nigeria is influenced by the migration of the inter tropical convergence zone (ITCZ), where the tropical continental air mass from the Sahara desert meets the tropical maritime air mass, a moisture-laden air crossing the Atlantic Ocean towards Nigeria. The mean annual rainfall is estimated at about 1150mm-1000mm in the central guinea savannah zone, 500mm in the northeast, and 3500mm along the coastal areas of Nigeria (Cervigini et al., 2013; Akinbile et al., 2019). According to the GCM perturbation, there will be little significant difference in rainfall prediction between 1976-2065 and 2001-2065. However, the GFDL model predicts significant variability in the average precipitation over Nigeria, especially in the first quarter of the 21st century, ranging from 3 to 3.5mm/d, which would become 1.4mm/d by the end of the century. It was projected that by 2020, 53% of Nigeria's area would be wetter, 10% would experience less rainfall, 35% would be in optimum condition, and the remaining 2 per cent would experience high variability and uncertainty. By 2050, 41% of the country is expected to be wetter, 14% drier, 20% will have stable conditions and 25% will remain uncertain.

However, both A2 and B2 scenarios show an increase in rainfall over Nigeria (Abiodun et al., 2012) on the average from 1990-2100; the number of days with 20mm rainfall will increase by 3 days on the average (World Health Organization, 2015). For the first half of the century, annual rainfall will decline over Nigeria. The 2046-2065 precipitation projection predicts wetter conditions and an additional 15cm of rainfall annually, and drier climates in the northeast with 7.5cm less rainfall annually compared to present climate (Odekunle, Balogun & Ogunkoya, 2005; USAID, 2012).

Mean sea level rise

The projected mean sea level rise in the coastal areas of Nigeria indicates that a 1m rise in sea level by 2100 is expected to threaten 18,000km^2 of land and put 3.2 million people at flooding risk (French, Awosika & Ibe, 1995 in Effiong and Ushie, 2019, p.536; Udo-Akuaibit,

2017) and destroy over 800 villages and 17,000km^2 of wetlands in the low-lying Niger Delta (Effiong and Ushie, 2019). However, on the coast of the south-south, especially Cross-River State, a 0.3-0.5m rise in sea level is expected to destroy 237 houses and displace 2,133 people (Effiong and Ushie, 2019). The downscaled scenario graduations at 0.5m, 1m, 2m, 5m and 10m would lead to inundation in various coastal areas of Nigeria (Agboola & Ayanlade, 2016). The Locally Oriented Economic Development Scenario (LOEDS) predicts that a 3m sea level rise would inundate 18.8 ha of land while a 5m sea level rise would inundate about 702.5 ha of land on the coast of south-western Nigeria (Odunuga et al., 2014). Sea levels in Nigeria are projected to rise between 0.5 and 1.0m by the end of the century (USAID, 2012).

Causes of flooding in Nigeria

Causes of flooding can be categorized into natural and anthropogenic. The natural causes include: the occurrence of heavy or torrential rainfall, and ocean storms and tidal waves that occur in the coastal areas of Nigeria. The main human cause of flooding is dam burst levee failure and dam spills. Moreover, flooding occurs in different forms: coastal flooding, river flooding, flash flooding, urban flooding, dam burst levee failure and dam spills (Ologunorisa, 2004; Efe, 2007; Nwigwe and Emberga, 2014). Nwigwe and Emberga (2014) identified the substantive causes of flooding in Nigeria as: illegal structures across drainage channels, land reclamation, poor physical planning, inadequate drainage channels, climate change, blockage of canals, negligence, government policies, collapse of dams, nature of terrain, torrential rainfall, base water flows, poor waste management, ocean lagoon surge, among others.

Overview of recent floods in Nigeria

For decades, Nigeria has been experiencing floods in almost all regions of the country but the impact has been more devastating in recent decades. The degree of impact and severity differs among regions in the country. These floods have caused serious environmental threats and challenges leading to the loss of lives and property, injuries and loss of productivity across the country (Ojo, 2011). A list of floods in Nigeria in the last two decades is presented in Table 3.

Table 3: Recent floods in Nigeria

Date	State/Region	Location	Causes	Impact	References
April-August 2001	Jigawa State	Hadeji, Auyo, Miga	Heavy storm	Destroyed many houses, farmlands, livestock and displaced over 450,150 persons across the state	Cirella & Iyalomhe (2018)
March 2001	Edo State	Benin City	Heavy downpour	560 houses destroyed and 820 people displaced	Etuonovbe, 2011 in Magami et al. (2014)
April 2001	Ekiti State	Ado-Ekiti	Heavy storm	Public schools and 890 houses destroyed	Etuonovbe, 2011 in Magami et al. (2014)
April 2001	Imo State	Owerri	Heavy storm	100 houses destroyed, electric poles and oil palm farms destroyed	Etuonovbe, 2011 in Magami et al. (2014)
July-Sept. 2006	Rivers	Port Harcourt	Heavy rainfall	Claimed lives and property	Chiadikobi et al. (2011), Peter et al. (2015)
September 2010	Sokoto State	Kagara, Sokoto-north, Sokoto-south, Rabah, Biyi, Goronyo, Silame, Shagari, Kware, Isah, Kebbe	Heavy storm	Destruction of bridges and disruption of academic activities at Usman Danfodio University, Sokoto, 49 people reported dead, 50 villages submerged and 130 people displaced	Etuonovbe (2011), Magami et al. (2014), Nwigwe and Emberga (2014)
July 2011	Lagos State	Ikorodu	Release of water from Oyan dam	25 people died and 5,393 persons were displaced	Adelekan (2016)

Date	State/Region	Location	Causes	Impact	References
July 2012	Niger Delta Region	Abia, Akwa-Ibom, Bayelsa, Cross-River, Delta, Edo, Imo, Ondo, Rivers	Heavy rainfall	Displaced thousands of people, destroyed bridges, schools, and farms	Reuters (2012), Agbonkhese et al. (2014), Magami et al. (2014), Nkwunonwo et al. (2015), Prekeyi (2015)
May 2017	Oyo State	Ibadan	Heavy rainstorm	Destroyed over 300 houses	Yoade et al. (2020)
September 2017	Kogi State	Lokoja	Overflow of rivers Niger and Benue	10,000 people displaced	Copernicus (2017)
July 2018	Katsina State	Jibiya, Kwata, Dantudu, Sabuwar Tukare, Tsohuwar Tukare and Unguwar mai Kwari	Caused by reverse order of Gada river	Destroyed 500 houses, 44 people reported dead and thousands displaced	CGTN Africa (2018)
August 2018	Nassarawa State	Mararaba	Heavy rainfall	Destroyed houses, bridges and farms	Copernicus (2018)
June 2020	Kwara State	Oko-Erin	Collapsed of bridge	1 person died and 2 people missing	Copernicus (2020a)
June 2020	Akwa Ibom State	Eket	Heavy downpour	100 houses destroyed and 300 people displaced	Copernicus (2020b)
July 2020	Niger State	Suleja	Torrential rainfall lasting for several hours	Destroyed houses, telephone lines, roads, power outage and seven people reported dead	Copernicus (2020c)
September 2020	Kano State	Dambatta and Rogo Local Government Areas	Heavy rainfall	Destroyed about 5200 houses, 2 people dead and many sustained injuries	Vanguard (2020)

Date	State/Region	Location	Causes	Impact	References
September 2020	Kebbi State	Several parts of Kebbi State	Heavy rainfall	Destroyed 500,000 ha of farmland, mainly rice, estimated at over 5 billion naira Claimed lives and properties	DailyTrust (2020)

The perennial flooding which occurs in Nigeria results in serious damage to the environment, property, individuals and communities. Apart from houses that collapse, schools, market places and religious centres also collapse or are sub-merged due to flooding (Nwigwe and Emberga, 2014). The impact of flooding aggravates health-related issues and water-borne diseases, destroys lives and property, farms, food and crops; disrupts services and degrades agricultural land; renders the soil infertile due to the water logging, leaching and erosion of rich top soils and prolonged flooding; delays traffic and interferes with the economic uses of land (Nwigwe and Emberga, 2014; Otomofa et al., 2015).

Flood disasters are on the rise, with grave consequences for the survival, dignity and livelihood of individuals, particularly the poor, women and children. The trend of flooding is compounded by increasing vulnerabilities related to climate change, socio-economic conditions, unplanned land use, environmental degradation and changing demographics (ECA, 2015). Flood disasters are mainly the result of unprecedented high intensity rain, unwholesome land use practices, and the release of excess water from rivers and dams within and outside Nigeria (ECA, 2015). The flooding has varying impact across Nigeria from year to year, depending on the intensity and magnitude of the primary cause of the flooding.

Strategic Flood Management in Nigeria

Early warning system

An early warning system is a proactive mechanism in which certain agencies recognized by government are involved in climate studies and predict the occurrence of climate-related hazards, such as flooding. These agencies provide warnings to individuals and government with a view to effectively plan for and curb flooding, and avoid loss of lives and property (Agbonkhese et al., 2014). An early

warning system enhances flood disaster preparedness for effective response. Early warning systems help to reduce economic losses and mitigate the number of injuries or deaths from a disaster by providing information that allows individuals and communities to protect their lives and property. Early warning information empowers people to take action prior to a disaster. In Nigeria, the Nigerian Meteorological Agency (NIMET) is responsible for weather monitoring, prediction, and the issuing of early warnings to the public.

Community engagement

As the rainy season approaches, communities in flood prone areas engage their members in making embankments of sand-filled sacks to prevent their communities from being submerged by flood water. This helps to divert the flood water away from the communities. The effectiveness of this strategy has been seen in various places in Jigawa State, especially communities in Auyo and Guri local government areas, where at the community level, the youth construct man-made channels to divert flood water.

Temporary evacuation of the affected communities

The temporary relocation of the affected communities to internally displaced persons camps or nearby alternatives, such as schools, for temporary shelters is mainly done by the federal and state agencies responsible for disaster management, such as the National Emergency Management Agency (NEMA). Internally displaced persons are camped in a defined area and provided with relief materials such as food, clothing, water and medication. When the flood water recedes, displaced people are expected to relocate back to their various communities (Nkwunonwo et al., 2015).

Adaptation to flood

In coastal communities, flood boards and elevated homes are built to allow for flooding during the wet season, and community members adjust to using canoes and boats when the roads are inundated. However, the cropping system cycle depends entirely on the advance and receding of flood water (Amangabara and Gobo, 2010). Fortification is another adaptation strategy employed by flood zone communities. Villages are surrounded with sand-filled sacks to prevent and divert flood water

away from the villages. Other adaptation measures include: receiving relief materials from government, NGOs and philanthropists; relying on the goodwill of familiy, friends and neighbours; relying on God and prayer; buying of flood insurance; planting of more trees; relocation to safer places; acquainting themselves with the radio/TV for obtaining weather-related information from radio or television.

Conclusion

Flood disaster is on the rise in Nigeria, particularly the recent decades. It affects every sector of the economy and has devastating impact, especially during the wet season, causing destruction to houses, schools, markets and religious centres. Several models predict increase in rainfall at different intervals in the country, which will exacerbate the frequency of flood occurrence. Directly or indirectly the impact of flooding exacerbates health-related issues and diseases associated with polluted water. It causes destruction of crops, loss of lives and properties and disruption of economic activities. Year after year, flood menace affects different parts of Nigeria though the impact varies from location to location depending on the cause of the flood, its intensity and magnitude. To check the impact of floods, the study recommends the construction of dams, artificial levees, channel straightening, diversion of spillways, afforestation, floodplain zoning, wetland restoration and river restoration.

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