African Scientist Vol. 23, No. 1 March 31, 2022
Printed in Nigeria

1595-6881/2021 $10.00 + 0.00

http://www.niseb.org/afs

AFS2022003/23103

An Overview of Flood Disaster Management in Nigeria

Odiana S.*[1], Mbee D.M.[2] and Akpoghomeh O.S.[2]

[1]Department of Environmental Management and Toxicology, Faculty of Life Sciences, University of Benin, P.M.B. 1154, Benin City, Edo State, Nigeria.
[2]Department of Geography and Environmental Management, Faculty of Social Sciences, University of Port Harcourt, P.M.B. 5323, Port Harcourt, Rivers State, Nigeria.

*Corresponding author; Email: odiana09@yahoo.com Tel: +234 (0) 703 055 9493

(Received January 16, 2022; Accepted in revised form January 31, 2022)

ABSTRACT: Flood can be seen as a process that bring about a short-term immersing of a land with water that does not ordinarily occur. It is one of the most common environmental hazards in developing countries like Nigeria. Flooding, a recurrent events in Nigeria occur mostly in locations that are flat or low lying especially places with inadequate or no surface drainages, or where existing ones have been filled with refuse and other sediments. The exposure to flooding is due to a range of socio-economic factors, like income, occupation, information technology, access to loan facilities, etc. Floods, although a natural disaster, could also be as a result of human activities and obstructions to natural processes, likes rise in built areas or population growth located in locations susceptible to flooding. It brings about destructions to lives, property and livelihood thereby exacerbating poverty and food insecurity. It is also among the major causes of human displacement in Nigeria. In order to ameliorate the consequence of flooding in the nation, the federal government launched the early warning system. As a way of informing the general public on the imminent menace of flooding, the federal government equipped the Nigerian Meteorological Agency (NIMET) to enable it provide accurate weather forecast. Residents also engage in diversification of income, the use of materials that can alleviate damage due to flood, the use of improved crop varieties for farming and change in time of planting. Despite the measures applied, in most cases, residents are still affected by flood. Therefore, government at all levels and other stakeholders in flood related matters, need to improve on their efforts towards flood management in Nigeria.

Keywords: Flooding, Destruction, Lives, Property, Ameliorate, Nigeria

Introduction

Flooding is one of the most frequent and widespread disasters affecting life, livelihood and properties globally. It basically accounts for nearly more than half of all the natural disasters in both developed and developing nations of the world (UNISDR, 2012). The explanation for this as opined by Agusomu (2013) cited in Oyatayo *et al*., (2016) is based on the extensive geographical spreading of river flood plains and low lying coast, in addition to this, is their attraction for human settlement. In Nigeria, flood disaster frequently occurs. As such most states are experiencing increased distress from yearly flooding most often during the rainy seasons due to rainfall (Aja and Olaore, 2014). Flood disaster in this country can be mainly attributed to anthropogenic cause which is being aggravated by poor urban planning and inadequate environmental infrastructure. The non-existence of Flood Risk Management (FRM) strategy or all-inclusive flood risk maps in the country, for instance, is evidence that flooding issues are poorly attended to (Oladokun and Proverbs, 2016).
It is important to note that the incidences of flooding are changing at a considerable rate due to increase rainfall events and storm surges (IPCC 2012). In urban areas, the rise in the use of impermeable surfaces help to intensifies the severity of flooding as a result raising it potential for destruction and increasing vulnerability. A location can be said to be vulnerable due to its exposure or inability to be resilient, handle or recover from

damage due to flooding (Balica *et al*., 2012). It can be attributed that poor governance, social and environmental injustice are among the causative factors of flood risk (Pelling and Wisner, 2012). For instance, a location with a minimal basic infrastructure, unplanned growth and rapid urbanisation in addition with the effects of climate change means heavy rainfall could bring about flooding (Baker, 2012).

Flooding which is one of the frequently occurring disasters in Nigeria is often in the form of river floods, flash floods, urban floods or coastal floods (Collins and Sampson, 2007). In the history of flooding in Nigeria, the severest case occurred between July and October 2012 when 363 persons lost their lives, 2.1 million persons across ten states were displaced and 18,282 were injured (NEMA, 2012) cited in Owolabi and Ekechi (2014). Similar ill-fated event happened in the ancient city of Ibadan in August of 2011 where many lives were lost and properties worth ₦20 billion were destroyed. This exceptional flood of 2012 reaches Edo state in the month of September, 2012 ruining economic activities in the farming communities. NEMA noted that the uncontrolled flood affected 100,000 persons in Edo State. In some localities only farm lands were affected while in others both buildings and farm lands were all swept away. This kind of flood was calamitous than any known event leading to numerous damages and indescribable travails to residents of Edo state (Udo and Aniekan 2017). The frequent occurrences of flooding in Nigeria with disastrous effects indicate the nation's poor preparedness and lack of effective disaster management measures by the government and other relevant agencies (Owolabi and Ekechi, 2014).

In most disaster events like flooding, people have always been caught unawares because there had not been any effective disaster preparedness and management mechanism in place and as such each time it occurs, it often cause massive loss of lives and properties. In addition is their capacity to cope. Capacity has to do with all the attributes and resources available within a community, or individual to cope and lessen disaster risks and intensify resilience. At the individual level it can be achieved formally through education and training and progressively through networking, leadership development, action learning, and multi-stakeholder platforms (Datta *et al.,* 2012). It can however be influenced by high prevalence of urban poverty.

Incidences of Flood Hazards in Nigeria

Historically, flooding in Nigeria dates back to the early 1950's with coastal and fluvial floods. Such floods which affected mainly coastal environments were induced by seasonal disruption of major rivers and water pouring over their natural and artificial blockades (Akintola, 1994). Fluvial flood is responsible for most of the flood disaster happening in areas along the plains adjoining major rivers in the country, including rivers Niger, Benue and Hadeja. The states in Nigeria most often affected are Adamawa, Kano, Niger, Jigawa, Kaduna, Cross River and Kebbi (Iloje 2005, Agbola *et al.,* 2012). One of the worst fluvial flood in Nigeria was the Kano state flood disaster of 2006 which affected hundreds of thousands of lives with economic loss worth millions of US dollars (Adebayo and Oruonye, 2013).

Coastal floods in Nigeria affect the low-lying locations in the southern part of the country (comprising for examples Lagos, Rivers, Delta, Cross River, Akwa-Ibom and Bayelsa states). The consequences of such floods have been adverse as a result of the number of persons exposed because of the attractions of coastal areas for economic and social events (Adelekan 2010). Globally, Nigeria is ranked among the top 20 countries exposed to coastal flooding based on present population and future scenarios in the 2070s.

Flooding due to pluvial events which usually occurs annually during rainy seasons, between July and October, ruining many cities within the country is most commonly occurred. Currently, the incidences of such floods which is caused by poor urban planning (particularly insufficient drainage system and the range of urban utilities) is a concern of global importance within the contexts of climate change and flood risk mitigation (Adeloye and Rustum 2011).

Therefore, the occurrence of flood disaster in the country has been taking place for a long time with devastating effects to lives, livelihood and properties. Flooding is a recurrent events in locations along flat or low lying environment particularly places with little or no surface drainages, or where existing ones have been filled with refuse and other sediments. This is further exacerbated with increasing rate of urbanization in the country resulting to urban areas facing the challenges associated with deteriorating environment, urban decay, un-cleared refuse, etc (Babanyara *et al.,* 2010; Etuonovbe, 2011).

Ibadan for example, had first experience of flooding in 1948. Subsequent events were in 1963, 1978, 1980, 1985, 1987, 1990, etc causing destructions to lives and livelihood. In Lagos, in 2010 about 700 inhabitants of settlements along the River Ogun were moved out to refugee camp after an overwhelming flood that troubled that area. **(**Adedeji *et al.,* 2012**).** In Osogbo, it occured in 1992, 1996, 2002, etc. In Yobe it occurred in 2000, in Akure, flood disaster occurred in 1996, 2000, 2002, 2004, 2006. In 2001, Abia, Adamawa and Akwa-Ibom states witnessed heavy downpour which affected about 5,000 people. Farmlands, properties, buildings were

submerged and destroyed. About 12,300 persons were displaced by torrential rain in Zamfara. Similarly, in 2005, inTaraba state massive flood displaced over 50,000 people (Obebi, 2013). In coastal cities of Lagos, Port Harcourt, Calabar, and Warri, there were numerous cases of flooding that desstroyed many lives and properties worth millions of naira. Abutu (2012), cited in Nwala (2014), found that serious flooding hit Junta-Yola in Adamawa State after a heavy down pour on August 26, 2012. The 2012 flood disaster was also reported to have ravaged 32 States in Nigeria (NEMA, 2012). The cause of the flood was blamed on the release of water from Lagdo dam in the Cameroon.

On 22nd August 2012, torrential rain resulted to the rise of water level in Lagdo dam Cameroon. As a result, the Cameroon authority informed the Nigerian government on 23rd of August of the need to open the dam and release excess water. Consequently, the dam was opened on the 24th of August 2012 following the alert given to the Nigeria government a day earlier. The release of the water from the dam coincided with the release of water from the Kainji and Jebba dams located in Niger state into the River Niger. This resulted in flooding of major towns downstream along river Niger-Benue and its tributaries. The unprecedented flood hits Edo state in the month of September 2012 destroying economic activities in the agrarian communities. NEMA noted that the raging flood affected 100,000 persons in Edo State. In some areas only farm lands were affected while in others both homes and farm lands were all swept away. The unprecedented flood was disastrous than any known event resulting in several damages and untold sufferings to inhabitants of Edo State and entire Nigeria warranting federal disaster declarations (Udo and Aniekan, 2017).

Causes of Flooding in Nigeria

Climate change is believed to have caused more rainfall than in the past which has exacerbated flooding, in Nigeria, flooding is majorly of anthropogenic cause and intensified by human-nature interactions (Aderogba, 2012). Some major flood disaster cases in Nigeria are summarized in Table 1 (Oluwaseyi, 2017).

Table 1. Some flood disaster cases in Nigeria

State	Associated Hazards	Affected Population	Year
Ogun	Residential houses, public and private buildings collapsed, market places destroyed, farmland washed away	350,000+ affected in several communities	2012, 2017
Oyo	500 houses demolished, properties destroyed, bridges collapsed; 300+ houses destroyed in 2017	50,000 displaced; 300+ in 2017	1948, 1963, 1978, 1980, 1982, 1985, 1987, 1990, 2011, 2017
Lagos	Buildings collapsed, markets submerged, properties destroyed	Over 300,000	from the early 1970s to date
Kano	Schools, houses, farmlands, animals destroyed	300,000+ displaced in 1988; 20,445 in 2001	1988, 2001
Yobe	Houses and farmlands submerged, houses razed, animals affected	Over 100,000	April and September, 2001
Sokoto	Houses and farmlands destroyed	Over 16000	July 2001
Taraba	80 houses swept away; 410 houses extensively destroyed	50,000+ displaced	August 2005
Osun	Houses and schools destroyed	17,000+	April 2001
Niger	Houses, schools, animals and farmland affected	200,000+ displaced	1999, 2000
Kogi	Houses, schools and farmland destroyed	1500 displaced	March and May 2001
Imo	1000 houses; 150 electric poles; 40,000 oil palms destroyed	10,000+ displaced	April 2001
Ekiti	Public schools, 890 houses	2100 affected	April 2001
Edo	560 houses destroyed in 2001; State-wide devastation in 2012	820 affected in 2001; 3.8 million affected in 2012	March 2001, 2012
Delta	Houses, schools, markets and farmlands submerged	425,839 affected	1999, March and April 2001
Bayelsa	Houses, schools, markets and farmlands submerged	273,266 affected in 1999; 382,000 affected in 2001	1999, March 2001
Akwa Ibom	367 houses washed away	4000	March 2001

The human- nature interactions that bring about flooding in Nigeria include the following:
Poor or non-existent drainage systems: Insufficient and poorly managed drainage system can be considered as a main influencing factor to the rise in the rate of flooding in Nigeria (Ocheri and Okele 2012; Dalil *et al.,* 2015). It is a main causative factor of flooding in the country (Ogundele and Jegede, 2011). This is because many residential areas in Nigeria have little or no drainage systems thereby relying on natural drainage channels. Often buildings and other infrastructure are built in such a way that they obstruct these natural drainage channels which bring about flooding during the rainy season (Nabegu 2014). Furthermore, the inadequate and poorly managed drainage facilities result to many depending on rivers and tributaries that flow in their communities, this scenerio was particularly observed in Ilorin, Kwara State as reported by Kolawole *et al.* (2011). Similarly, Abaje *et al*. (2015) in their study, found that in some communities in the Northern part of the country have no accesses to drainage systems. The increase in urbanization in the country is resulting to rise in impervious surfaces thereby reducing the rate at which water percolate. This could bring about flooding which is further intensified by inadequate and poorly maintained drainage that could easily drain away surface runoff (Adeloye and Rustum, 2011). It is important to know that the absence of drainage network is a leading contributor to flooding in Nigeria. Therefore, there is a critical need for drainage network to be constructed so as to properly address the menace of flood (Etuonovbe, 2011).
Poor waste management system: Poor waste management is one of the leading contributors and exacerbating factors to flood disaster in Nigeria (Ojo and Adejugbagbe, 2017). The unfortunate approach of Nigerians to waste disposal has been extensively discussed in studies reported by Olukanni *et al.* (2014), Eneji *et al.* (2016), Ojo and Adejugbagbe (2017). The disposal of waste in drains is common in most urban areas in Nigeria. Similarly, the dumping of waste on roadside, canal and during rainfall is also common amongst the people. These most often cause blockage and bring about flooding during rainy season (Onwuemele, 2012).
Unregulated urbanization: The development of urban communities in Nigeria has been known to be inadequately handled. Lack of proper spatial planning, poor land use management and absence of good corporate governance characterizes urban development in Nigeria (Adedeji *et al.,* 2012; Abaje *et al.,* 2015; Dalil *et al.,* 2015). Flooding and urbanization are closely related in both developing and developed nations. In Nigeria, over 50% of the people live in urban areas (Farrell 2018) as such experiencing high rate of urbanization (Aderogba, 2012). However, development as a result of urbanisation is done without appropriate control thereby aggravating flood disaster (Dan-Jumbo *et al.,* 2018). Urban planning in Nigeria is inadequate and it is aggravated by several compliance issues; this weak planning is a fundamental cause of flood disaster in Nigeria. Therefore, flooding in this country is associated with poor urban development (Omoboye and Festus, 2014). The poor implementation of urban development planning procedures have for a long tine brought about significant twist of ecological systems and, in the words of Odufuwa *et al.* (2012), battered the flood plains notably in the low lying areas. These deteriorations to the ecosystems include the progressive replacement of the natural and absorptive soil cover with impervious surfaces and the filing up of drainage channels (Adedeji *et al.,* 2012). For instance, deforestation, which has the potentials of escalating the quantity and rate of runoff, and through soil erosion, may have added to the rise in the incidences of mud and landslides during floods in recent years in Nigeria (Iyang 2014; Ezeji 2015).
Weak implementation of planning laws and corruption: Planning laws in the country are adequate but are poorly implemented (Nnaemeka-Okeke 2016). Political meddling in planning work, understaffing and inadequate tools are among the hindrances to achieving efficient planning and the performers of tasks by the planners (Nnaemeka-Okeke 2016; Oluwaseyi 2019). The deficiencies in implementation of planning laws result to developments on natural floodplains and storm water ways thereby exacerbating flooding. Corruption is another causative factor resulting to flood disaster. It is a common practice for town planning officials to accept bribes and overlook certain issues that could bring about flooding (Oladokun and Proverbs 2016). This weak or non-implementation of the laws is a problem to attaining sustainable urban development. Loose planning and the absence of valid building approvals are the root cause of improper developments with resultant negative effects (Adeloye and Rustum 2011).
Substandard infrastructures induced flooding: The causal relationships that exist among numerous elements of the modern built environment system provide a basis for comprehending the distinctive challenges of flood in Nigeria. While Nigeria has made substantial progress in infrastructures like road networks, bridges, etc for the betterment of the citizens, but the processes of planning, designing and constructing such facilities have not adequately show much ecological concerns. Also due to corruption, mismanagement and incompetence, many of the projects are substandard and collapse long before their supposed life span (Lanrewaju 2012). For example, when a substandard bridge or road segment collapses during rainy season, which most often occur in Nigeria, the debris and sediments end up silting or lowering the carrying capacity of the drains. This will eventually result to 'induced' flooding of the neigbourhood**.** Also when a road segment fails as a result of poor and substandard materials, commuters will normally use alternate routes thereby over stretching them. For instance, heavy truck are left with little or no options but to ply over low capacity bridges and roads which will

lead to more roads and bridges to collapse and the chain continues. Invariably, substandard materials in an area could be a remote cause of increasing risk of flooding in other locations in a built environment. In a study by Abaje *et al*. (2015), it was observed that about 69% of the houses in a state in Northern Nigeria were built with unbaked mud and on foundations of loose sandy soil, while Anosike and Oyebade (2012); Ewa and Ukpata (2013) reported that sandcrete blocks, used in over 90% of Nigerian urban houses, are below required standards. Thus, these buildings are highly exposed and vulnerable to flood damage. The inadequacy of enforcing regulations' in the building sector have been liable for the majority of weak structures (Fagbenle and Oluwunmi 2010; Ayedun *et al.,* 2011 Mbamali and Okotie 2012).

High prevalence of urban poverty: Poverty is a major factor of development in Nigeria (Ike and Uzokwe 2015; Lame and Yusoff, 2015). Demographic data reveal that more than 64% of the nation's population live on less than $1 a day (Joshua *et al.,* 2014). Studies have shown that people, notable women, lower in the social strata experienced much impacts and slower recuperation after flooding (Ajibade *et al.,* 2013). Increasing poverty levels in addition with security challenges in the Northern part on the country in recent times have brought about massive relocation to the low-lying and coastal areas in the South like Lagos. Unfortunately, the high cost of land and housing in these locations entails that many of these migrants end up living in 'affordable' slums or turn existing areas into slums. While swampy and low level areas may be cheaper to get they are normally very expensive to develop. Swamps and waterlogged lands need large scale investments in concrete foundations, sand filling, dredging, networks of drainage and other infrastructures required to minimize the impact of flooding. The number of slum areas in the country is increasing (Adelekan 2010). Also, with the lack of dependable potable water sources (Adesogan 2014), many houses in the country rely on shallow wells and streams, usually located not far away from pit latrines and sewage soak away pits, for water supply. The water supply sources therefore become prone to contamination during flooding causing health and water supply related problems. Poverty can be attributed to be a major causative factor of flooding. The flooding in turns could exacerbate poverty whereby people lose their properties and livelihoods. Therefore, there is a vicious cycle of flooding and poverty (Douglas *et al.,* 2008 and Adelekan 2010)**.** To this end, a sustainable flood risk management scheme must embrace social justice (Johnson *et al.,* 2007).

Effects of Flooding in Nigeria

Flooding is one of the major factors that prevents Africa's growing population of city dwellers from escaping poverty, and stands in the way of the UN 2020 goal of achieving 'significant improvement' in the lives of urban slum dwellers' (Action Aid, 2006). Floods are the most frequent natural disasters globally, affecting over 2.8 billion people and is responsible for over 200,000 deaths over the past three decades (Hashizume, 2013). The occurrence of environmental hazards such as flooding is not new. However, what is new is the increasing level of damages to lives and properties witnessed as a result of high magnitude and highly frequent floods experienced in the developing counties like Nigeria. Studies on water, poverty and flood have observed that there was an increasing rate of flood occurrences and severity in recent years; resulting to loss of lives, injuries, homelessness, damage to environment and infrastructure as well as impacting on agriculture, health and education (Sadiq, 2012; Bariweni *et al,* 2012; Efobi and Anierobi, 2013). In recent years, the ravaging effects of flooding in Nigeria became so drastic that it was seen as a national disaster.

The socio-economic impacts of flooding are felt as soon as floods occur. In their study, Bariweni *et al.,* 2012, revealed that the floods of 2012 in Nigeria had a major impact on socioeconomic life for days, weeks and even months in some areas. Roads and buildings were submerged and victims were trapped due to blockage of road and damaged bridges. Children could not go to school, workers could not go to work and traders could not open their stores at the markets. These automatically took its toll on the economy as businesses were being affected. The damages and destruction of buildings, bridges, dams, embankments, drains, roads, railways, electricity wires/poles, (Etuonovbe 2011) all amounted to billions of Nigerian Naira due to the extent of property damage and infrastructures (NEMA 2012).

Close to a billion people around the globe live in abject poverty characterized by serious hunger (Lobell and Burke, 2010) and majority of this number lies within Africa which is heightened by the conflicts, degradation of resources and poor adaptive skills (IPPC, 2007). With Nigeria being the most populous nation on the African continent (Etuonovbe 2011), and 70% of this population living in poverty, any unrest or disasters such as flooding will have a huge impact (Agwu and Okhimamhe, 2009) especially on food security which is vulnerable to extreme events such as flooding (Nzeh, *et al.* 2012 cited in Ifeanyi-Obi *et al*. 2017). NEMA 2012 and Aderogba 2012 showed that many farmlands have been washed off by the floods. Afolabi (2013), reported that in Lafia, Nassarawa State, a $90 million rice farm cultivated was inundated by the floods. Previous flood

disasters also had similar impacts, washing away, farmlands and destroyed livestock, which is an integral part of agriculture in the North (Ibrahim *et al.*, 2010).

Other studies describing the impacts of flooding in Nigeria: Odunuga *et al.*, (2012) revealed that 81% of respondents to a survey reported increased in transportation costs and breakdown of vehicles making travel difficult. Adelekan & Asiyanbi (2016), reported that more than half of all respondents to a survey had experienced property and damage worth more than NGN 52,000 (USD 330), which is more than one month's income for three-quarters of the respondents. One recent paper reports that in August 2015, a flood in Calabar submerged at least 100 houses and displaced about 400 people (Lamond & Adelekan, 2016). Adelekan (2010), reported that 91% of their respondents described 'recurrent visits to health centres because of ill-health and an increase in medical expenses as a major outcome of floods'. By collecting data from multiple sources including newspaper articles, Adelekan (2020) estimates that 129 people were killed, 9,112 houses were damaged, and 3,102 houses were destroyed by flooding in Ibadan from 2000-2015. In September, 2020, flooding was reported to have displaced 15,385 people, with the National Emergency Management Agency providing food and building supplies to assist residents (National Emergency Management Agency, 2020). The aftermath of the 2019 floods in Adamawa State showed that an estimated 381 houses damaged, 493 houses were partially damaged, with over 365 water and sanitation facilities destroyed affecting over 12,000 individuals (DTM, 2019) cited in Abubakar *et al.* (2020). Most of the farmlands were submerged leading to heavy crop and livestock lost and an estimated figure of about 12,000 persons were displaced from the selected communities for this study (Abubakar *et al.*, 2020).

Coping and Preparedness Strategies to Flooding in Nigeria

Flooding which is more or less an annual event is getting worse and people become more vulnerable to it as a result of changing climate. In a study done in the states of Akwa Ibom, Ondo and Rivers states, it was observed that land management practices especially the use of mounds was commonly used by farmers to combat the menace of flood disaster. A total of 30% of male farmers and 39% of female farmers used this strategy as reported in Umoh, (2013). In the wetland areas of Ondo state, farmers cultivate flood resistant or flood tolerant varieties of crops. Farmers have also expanded their sources of income to include other activities so as to get by with environmental disasters. Another study conducted by Fabiyi and Oloukoi (2013) among the Ilajes, Itshekiris and ijaw tribes who live in coastal rural communities observed that these communities have local understanding of meteorology which is centered on observation, traditional practices and belief systems. This local knowledge enables them to envisage flooding on seasonal and long term basis.

In order to ameliorate the consequence of flooding in the nation, the federal government launched the early warning system after flood disasters in major cities like Lagos, Kano and Kaduna. This system was improved in 2014. The federal ministry of environment installed 307 web-based flood warning systems all over the nation. Community-based flood warning systems were also installed in Ondo, Niger, Cross River, Imo, Anambra, Lagos, Oyo, Osun, Ogun, Nassarawa, Rivers, Kwara, Akwa Ibom, Abia and Enugu states of Nigeria. The Ministry also purchased and mounted four stand-alone automated functional flood early warning facilities along rivers Alamutu, Eruwa and Owena River basins (Okoruwa, 2014). In order to inform the public on the pending menace of flooding, the federal government furnished the Nigerian Meteorological Agency (NIMET) to enable it provide accurate weather forecast. There are plans to build Kashimbilla/gamovo multipurpose dam, Ose Dam and hydropower project in Taraba state to accommodate any excess water flowing from Cameroun in the events of overflow. The dams are to serve as mitigation measures to flood disaster (Anugwara and Emakpe, 2013 cited in Jonathan *et al*. 2020).

Historically, Nigeria focuses more on post-disaster flood response than control (Cirella and Iyalomhe 2018). Lessening and tackling exposure to flood risk is recently considered a top priority in the nation's disaster risk management agenda. A national framework, now in place, targets at refocusing reactive flood response and recovery to pro-active risk management, however, not much has been done (FGN. 2013; Okoye 2019). This is discouraging regardless of the all-inclusive post-disaster needs assessment carried out in 2012 by the federal government with international collaboration. Funds are usually released for post-floods activities but no much is done for pre-floods to forestall it. In 2017 for instance, the Nigerian government released as much as ₦1.6 billion as a post-flooding response (Adekola and Lamond, 2018).

Coping measures are means whereby people or communities learn from previous disasters and alter existing practices for future changes in hazards as well as vulnerability contexts thereby enhancing their preparedness to flood disaster should it occur. Communities have divergent thinking on what disaster is and come up with different strategies to bear with its effects. The ability to cope with flood disaster outcome varies. It is determined by social group factors like the poor and the rich, men and women, young and old, etc. Some

persons tried to migrate from the flood-prone locations to safer places with no success majorly due to high cost of rent. Most people living in vulnerable areas are most often aware of the risk associated with flooding and have in most cases put in efforts to cope with the problems of flood. There are many coping strategies adopted by local people to bear with the consequences of flood. These can be grouped as economic, technological/structural and social coping measures. The concept of economic coping measures has to do with diversification of economy, for instance, having multiple sources of income. The technological/structural coping measures have to do with the structural activities applied by households residing in the flood-prone environment to bear with the menace of flood for instance, building of structures to check floods in the areas. It can also be seen as the use of materials that can alleviate damage due to flood. For instance people in flood prone environment like Lagos, Ibadan and Abeokuta have resorted to constructing their house with reinforced material and some buildings with more than one floor to protect their lives and belongings against flood. The social/organizational coping strategies are those activities and or social relationship and network among the community and local government that can assist people in minimising the consequences of flood. For example the distribution of relief materials and formation of refugee camps to carter for displaced persons until the flood subsides (Adedeji *et al.*, 2012).

Kabir *et al.* (2012) and Ashraf *et al. (*2013) stressed that engagements of farmers in other non-farming activities will ameliorate people's vulnerabilities to the consequences of flood disaster. Okeleye *et al.* (2016) in their work in Oke-Ogun region of Oyo State Nigeria reported that most of the farmers (83.6%) have other sources of income that could reduce their vulnerability and enable them to cope with the problems of flood disasters. 24.5% are accessible to flood early warning system; 13.2% are accessible to flood local sign; 3.8% have access to community flood management committee and 5.2% are accessible to insurance facilities. Similarly, the work of Armah *et al.* (2013) revealed that farmers as a way of coping to flood disaster are involved in untimely gathering of crops. Other strategies include reliance on food from previous farming seasons and relocation to other settlement.

Odunola *et al.* (2015) evaluated the level of households' preparedness on flood management along Apete River in Ibadan, Nigeria. A structured questionnaire focusing on socio-economic characteristics of residents, causes, effects of flood disaster, control measures and households' level of preparedness on flood management was administered to 172 households' heads in the study area. In depth interviews were carried out with community representatives on coping measures applied. The findings showed that there is significant relationship between the effects of flood disaster and household's preparedness on flood management in the study area. Ezemonye and Emeribe (2014) examined Disaster Risk Reduction (DRR) in the light of household preparedness in Benin City, Nigeria. The study's findings revealed that there is no household preparedness in relation to flood. The ANOVA test shows that there is a significant difference among households in terms of their flood disaster preparedness. A multiple correlation analysis indicated that religious belief and lack of funds influence household preparedness as these two variables explain the highest variance in the socio economic factors prompting utilization of flood disaster preparedness measures. Even though preparedness is an efficient flood disaster alleviation strategy, it is barely applied by households in areas recognised to be susceptible to flooding in Benin City. Rather the households rely more on reconstruction and rehabilitation which are capital intensive measures and actions taken in most cases after the flood has had devastating effects on the people. Basically, household/community preparedness can ameliorate the outcome of flood disasters particularly to the most vulnerable in flood prone areas.

Conclusions and recommendations

Flooding is almost a yearly incidence in Nigeria where it continues to cause economic and social problems in an uncontrolled manner. Effort made by the government, relevant agencies and residents to anticipate the problem has not yielded the needed result expected, mainly as a result of enormous improvements in the built environment. These changes without equal control measures for flood, relate to unwanted outcomes to residents and the environment at large. Basically, human activities have worsened flood related problems by cutting down trees, removing vegetation thereby uncovering soil, thus increasing soil erosion and enhancing the effect of flooding. Government of Nigeria has made some efforts to combat flood but there is the need to do more because despite the measures put in place, residents are inadequately prepared and cannot sufficiently cope with flooding. Setting up control measures is good but there is the need to improve on awareness of the general public to adhere to them. Residents should stop dumping refuse on drainages and building on flood plains. The government should be proactive and invest greatly in flood management measures like building of dams, dredging of rivers, clearing of drainages and natural waterways. Finally, relevant flood management agencies should be well funded and the funds carefully monitored to avoid mismanagement.

References

Abaje IB, Ogoh AO, Amos BB, Abashiya M: Climate change, flood disaster assessment and human security in Katsina State, Nigeria. Am J Hum Biol, 4(4): 47-56. 2015.

Abubakar B, Umar H, Barde MM Adamu S: Socio-economic impact of flooding on the riverine communities of River Benue in Adamawa State, Nigeria. FUTY J Environ 14 (2), 116-124. 2020.

Action Aid: Climate change, urban flooding and the rights of the urban poor in Africa. A report by Action Aid International. pp. 1-6. 2006.

Adebayo AA, Oruonye, ED: An Assessment of the Effects of the 2012 Floods in Taraba State, Nigeria. A paper delivered at the Annual National Conference, organized by the Association of Hydrological Science at University of Agriculture, Abeokuta, Ogun, state, Nigeria. pp. 13-18. 2013.

Adedeji OH, Odufuwa BO, Adebayo OH: Building capabilities for flood disaster and hazard preparedness and risk reduction in Nigeria: Need for spatial planning and land management. J. Sustain. Dev. 14(1):45-58. 2012.

Adekola O, Lamond J: A media framing analysis of urban flooding in Nigeria: current narratives and implications for policy. Reg Environ Change, 18(4): 1145–1159. 2018.

Adelekan IO: Vulnerability of poor urban coastal communities to flooding in Lagos, Nigeria. Environ Urban, 22(2): 433–450. 2010.

Adelekan, IO: Urban dynamics, everyday hazards and disaster risks in Ibadan, Nigeria. Environ Urban, 32(1): 213–232. 2020.

Adelekan IO, Asiyanbi AP: Flood risk perception in flood-affected communities in Lagos, Nigeria. Nat Hazards, 80(1): 445–469. 2016.

Adeloye A.J, Rustum R: Lagos (Nigeria) flooding and influence of urban planning. Urban Des Plan, 164(3): 175-187. 2011.

Aderogba KA: Qualitative studies of recent floods and sustainable growth and development of cities and towns in Nigeria Int J Acad Res Econ Manage Sci, 1(3)*:* 187-203. 2012.

Adesogan SO: Strategies and techniques of providing adequate and affordable potable water in rural areas of Nigeria. Int J Water Resour Environ Eng, 6(1): 32–39. 2014.

Afolabi B: Nigeria made $900M from cocoa export in 2012. Retrieved from www.thenationonline.net. 2013.

Agbola BS, Ajayi O, Taiwo OJ, Wahab BW: The August 2011 flood in Ibadan, Nigeria: Anthropogenic causes and consequences. Int J Disaster Risk Sci, 3: 207-217. 2012.

Agusomu TD: *The Perception of and response to flood in the Niger Delta Basin of Nigeria*. (Unpublished Ph.D. Thesis). Department of Geography and Planning, University of Jos, Jos, Nigeria. 2013.

Agwu J, Okhimamhe A: Gender and Climate Change in Nigeria: A Study of Four Communities in North-Central and South-Eastern Nigeria. Retrieved from http://ng.boell.org. 2009.

Aja GN, Olaore AY: The impact of flooding on the social determinants of health in Nigeria: a case for North-South institutional collaboration to address climate issues. Dev Stud, 4: 6–12. 2014.

Ajibade I, McBean G, Bezner-Kerr R: Urban flooding in Lagos, Nigeria: Patterns of vulnerability and resilience among women. Glob Environ Change, 23(6): 1714–1725. 2013.

Akintola EO: Flooding phenomenon. Ibadan Region. Ibadan: Rex Charles Publication, pp.244-255. 1994.

Anosike MN, Oyebade AA: Sandcrete blocks and quality management in Nigeria building industry. J Eng Proj Prod Manage, 2: 37–46. 2012.

Anugwara B, Emakpe G: "Will Federal Government save Nigerians from another` Tsunami'? Retrieved from http://www.mynewswatchtimesng.com. 2013.

Armah RN, Al-Hassan RM, Kuwornu JKM, Osei-Owusu Y: What influences farmers' choice of indigenous adaptation strategies for agrobiodiversity loss in Northern Ghana. Br J Appl Sci Technol, 3:1162 – 1176. 2013.

Ashraf MY, Rafique N, Ashraf M, Azhar N, Marchand M: Effect of supplemental potassium on growth, physiological and biochemical attributes of wheat grown under saline conditions. J Plant Nutr, 36: 253-259. 2013.

Ayedun CA, Durodola OD, Akinjare OA: An empirical ascertainment of the causes of building failure and collapse in Nigeria. Mediterr. J Soc Sci, 3: 313–322. 2011.

Babanyara YY, Usman HA, Saleh UF: An overview of urban poverty and environmental problems in Nigeria. J Hum Ecol, 31: 135-143. 2010.

Baker J: *Climate Change, Disaster Risk, and the Urban Poor: Cities Building Resilience for a Changing World*: World Bank Publications, Washington, DC. pp. 12-28. 2012.

Balica S, Wright NG, van der Meulen F: A flood vulnerability index for coastal cities and its use in assessing climate change impacts. Nat Hazards 64: 73–105. 2012.

Bariweni PA, Tawari CC, Abowei JFN: Some environmental effects of flooding in the Niger Delta Region of Nigeria. Int J Fish Aquat Sci, 1: 35-46. 2012.

Cirella GT, Iyalomhe FO: Flooding conceptual review: sustainability-focalized best practices in Nigeria. Appl Sci 8: 1558-1572. 2018.

Collins E, Sampson L: *The Impact of Climatic Change on Insuring Flood Risks*. Australia: Institute of Actuaries, p.1-38. 2007.

Dalil M, Mohammad NH, Yamman UM, Husaini A, Mohammed SL: An assessment of flood vulnerability on physical development along drainage channels in Minna, Niger State, Nigeria. Afr J Environ Sci Technol, 9: 38–46. 2015.

Dan-Jumbo N, Metzger M, Clark A: Urban land-use dynamics in the Niger Delta: the case of Greater Port Harcourt Watershed. Urban Sci, 2: 108-131. 2018.

Datta A, Shaxson L, Pellini A: Capacity, complexity and consulting Lessons from managing capacity development projects. Overseas Development Institute (ODI). Retrieved from www. odi.org. 2012.

Douglas I, Alam K, Mahgenda M, Mcdonnell Y, Mclean L, Campbell J: Unjust waters: climate change, flooding and the urban poor in Africa. Environ Urban, 20: 187–205. 2008.

Efobi K, Anierobi C: Impact of flooding on riverine communities: The experience of the Omambala and other Areas in Anambra State, Nigeria. J Econ. Sustain Dev, 4: 56-63. 2013.

Eneji CVO, Eneji JEO, Ngoka V, Abang M: Attitude towards waste management and disposal methods and the health status of Cross River State, Nigeria. SCIREA J Agric 1: 231-247. 2016.

Etuonovbe AK: The devastating effect of flooding in Nigeria. pp. 1-15. Available at www.fig.net. 2011.

Ewa DE, Ukpata JO: Investigation of the compressive strengths of commercial sandcrete blocks in Calabar Nigeria. Int J Eng Technol, 3: 447–482. 2013.

Ezeji JI: Reducing risks of contamination breaching the drinking water system through catchment sensitive farming in eastern Nigeria. Pollut Effects Control, 3: 148-152. 2015.

Ezemonye MN, Emeribe CN: Flooding and household preparedness in Benin City, Nigeria. Mediterr J Soc Sci, 5: 2039-2117. 2014.

Fabiyi OO, Oloukoi J: Indigenous knowledge system and local adaptation strategies to flooding in coastal rural communities of Nigeria. J Indig Soc Dev, 1: 1-19. 2013.

Fagbenle OI, Oluwunmi AO: Building failure and collapse in Nigeria: the influence of the informal sector. J Sustain Dev, 3(4), 268–276. 2010.

Farrell K: An inquiry into the nature and causes of Nigeria's rapid urban transition. Urban Forum 29: 277- 298. 2018.

Federal Government of Nigeria (FGN): *Nigeria Post-disaster Needs Assessment*. A report by the Federal Government of Nigeria, with Technical Support from the European Union, United Nation, World Bank, and other Partners, Nigeria Post-Disaster Need Assessment 2012, 154p. 2013.

Hashizume M: Precipitation and flood hazards: Health effects, risks and impacts, Climate Vulnerability 1, 115-121. 2013.

Hula MA, Udoh JC: An assessment of the impact of flood events in Makurdi, Nigeria. Civil Environ Res, 7(10), 53-60. 2015.

Ibrahim MK, David AM, Okpanachi GU: Climate change, agriculture and food management in Nigeria. J Environ Issues Agric Dev Ctries 2(2): 37-41. 2010.

Ifeanyi-Obi CC, Togun AO, Lamboll R, Adesope OM, Arokoyu SB: Challenges faced by cocoyam farmers in adapting to climate change in Southeast Nigeria. Clim Risk Manag. 17: 155-164. 2017.

Ike PC, Uzokwe UN: Estimation of poverty among rural farming households in Delta State. J Poverty Invest Develop, 11: 86–93. 2015.

Iloje NP: A New Geography of Nigeria:, Longman publishers, Lagos 200p. 2004.

Inyang MP: The role of landslide education in preventing environmental hazards and promoting health in Niger Delta Region of Nigeria. Int J Environ Sci Technol, 3: 427–433. 2014.

IPCC: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK. 582p. 2012.

Johnson C, Penning-Rowsell E, Parker D: Natural and imposed injustices: the challenges in implementing 'fair' flood risk management policy in England. Geogr J, 173: 374–390. 2007.

Jonathan A, Owolabi MT, Olatunji IB, Duntoye BT, Henshaw EE: Economic analysis of the effect of flood disaster on food security of arable farming households in Southern Guinea Savanna zone, Nigeria. J Agric Food Sci, 18(1): 59-69. 2020.

Joshua IA, Makama JG, Joshua WI, Audu O, Nmadu AG: Disasters in Nigeria: A public health perspective. J Commun Med Prim Health Care, 26: 59–75. 2014.

Kabir MS, Hou X, Akther R, Wang J, Wang L: Impact of small entrepreneurship on sustainable livelihood assets of rural poor women in Bangladesh. Int J Econ Finance, 4:265-280. 2012.

Kolawole OM, Olayemi AB, Ajayi KT: Managing flood in Nigerian cities: Risk analysis and adaptation options–Ilorin City as a case study. Arch Appl Sci Res, 3: 17-24. 2011.

Lame SM, Yusoff WFW: Poverty reduction in Nigeria: The role of entrepreneurship education. J Educ Lit, 3: 63–71. 2015.

Lamond J, Adelekan I: Mitigation of climate risks through adaptation and urban management in Nigerian cities. In P.T. Costa, D. Quino, & R.A.C. Garcia (Eds.), International Conference on Urban Risks. Centro Europeu de Riscos Urbanos (CERU). http://www.cerueuropa. 2016.

Lanrewaju AF: Urbanization, housing quality and environmental degeneration in Nigeria. J Geogr Reg Plan, 5(16), 422–429. 2012.

Lobell D, Burke M: Climate effects on food security: An overview. Adv Glob Chang Res, 37*:* 13-30. 2010.

Mbamali I, Okotie AJ: An assessment of the threats and opportunities of globalization on building practice in Nigeria. Am Int J Contemp Res, 2: 143-150. 2012.

Nabegu AB: Analysis of vulnerability to food disaster in Kano State, Nigeria. Greener J Phys Sci, 4: 22–29. 2014.

National Emergency Management Agency (NEMA): Preventing Flood Disaster in Nigeria. Retrieved from http.//www.nemanigeria.com. 2012.

National Emergency Management Agency: Update on Flood 2020 Response. National Emergency Management Agency. https://nema.gov.ng/flood-updates/ 2020.

National Emergency Management Agency (NEMA): Annual report on Flood, National Emergency Management Agency, Official Gazette, Abuja. 2012.

Nkwunonwo UC: A review of flooding and flood risk reduction in Nigeria. Glob J Hum Soc Sci, 16 (2), 23-42. 2016.

Nnaemeka-Okeke R: Urban sprawl and sustainable city development in Nigeria. J Ecol Eng 17: 1-11. 2016.

Nwala BA: Press coverage of 2012 Flood in Nigeria (A Study of The Guardian, The Nation and Punch Newspapers). Retrieved from www.unn.edu.ng. 2014.

Nzeh, EC, Eboh RO, Eboh E, Nweze N, Nzeh C, Orebiyi J, Lemchi J: *Climate Change Adaptation in Nigeria and its Challenges in Agricultural Sector: Empirical Information*. Retrieved from Academia.edu. 2012.

Obebi F: Mitigating the impact of flood disasters in Nigeria. Retrieved from http://pointblanknews.com. 2013.

Ocheri M, Okele E: Social impact and people's perception of flooding in Makurdi town, Nigeria. Hydrology for Disaster Management, pp. 97–105. 2012.

Odufuwa BO, Adedeji OH, Oladesu JO, Bongwa: A: Floods of fury in Nigerian cities. J Sustain Dev, 5: 69–79. 2012.

Odunola OO, Balogun FA: Analyzing household preparedness on flood management in riverside: a focus on Apete Community in Ibadan, Nigeria. J Humanit Soc Sci, 20: 7-32. 2015.

Odunuga S, Oyebande L, Omojola AS: Social-Economic Indicators and Public Perception on Urban Flooding in Lagos, Nigeria. Hydrology for Disaster Management. pp. 82-96. 2012.

Ogundele J, Jegede AO: Environmental influences of flooding on urban growth and development of Ado-Ekiti, Nigeria. Studies Soc Sci 2: 89-93. 2011.

Ojo OO, Adejugbagbe JA: Solid waste disposal attitude in Sango Ota, Ogun State: implication for sustainable city development in Nigeria. J Environ Waste Manage, 4: 253–260. 2017.

Okeleye SO, Olorunfemi FBS, Ogbedji JM, Aziadekey M: Impact assessment of flood disaster on livelihoods of farmers in selected farming communities in Okeogun region of Oyo State, Nigeria. Int J Sci Eng Res, 7: 67-83. 2016.

Okoruwa E: "Federal Government Installs 307 flood warning systems nationwide." Retrieved from http://leadership.ng/news. 2014.

Okoye C: Perennial flooding and integrated flood risk management strategy in Nigeria. Int J Econ Commerce Manage, 7: 364-375. 2019.

Oladokun V, Proverbs D: Flood risk management in Nigeria: a review of the challenges and opportunities. Flood Risk Manag Response 6: 485-497. 2016.

Olukanni DO, Adebayo RA, Tenebe IT: Assessment of urban drainage and sanitation challenges in Nigeria. Int J Emerg Technol Adv Eng, 4: 100–105. 2014.

Oluwaseyi OB: Assessment of physical planning administration in Nigeria. Environ Anal Ecol Stud, 5(1): 451-470. 2019.

Oluwaseyi, AB: Plant genetic resources (PGR) in Nigeria and the reality of climate change: a review. Asian J Environ Ecol 2:1-24. 2017.

Omoboye IF, Festus IA: Environmental challenges in Nigeria: typology, spatial distribution, repercussions and way forward. Am Int J Soc Sci 2: 246-253. 2014.

Onwuemele A: Chapter 11 cities in the flood: vulnerability and disaster risk management: Evidence from Ibadan, Nigeria in urban areas and global climate change, edited by W. G. Holt, pp. 277–299. Emerald Group Publishing Limited. 2012.

Owolabi TOS, Ekechi CO: Communication as critical factor in disaster management and sustainable development in Nigeria. Int J Dev Econ Sustain, 2:58-72. 2014.

Oyatayo KT, Songu GA, Adi TA, Jidauna GG, Ndabula C: Assessment of people's awareness and perception of flooding in Donga Town, Taraba State, Nigeria. J Geosci Environ Protect, 4(5): 54-62. 2016.

Pelling M, Wisner B: Urbanisation, human security and disaster reduction. In: M. Pelling and B. Wisner (eds.), Disaster risk reduction: Cases from urban Africa, pp. 3–16, Routledge, New York. 2012.

Sachs W: *Climate change and human rights*, The Pontifical Academy of Sciences Scripta Varia 106*:* 349–368. 2006.

Sadiq A: A look at Nigeria's Bourgeoning Emergency Management System: Challenges, Opportunities, and Recommendations for Improvement. Retrieved from https://training.fema.gov. 2012.

Samir KC: Community vulnerability to floods and landslides in Nepal. Ecol. Soc. 18: 8. 2013.

Udo EA, Aniekan E: River inundation and flood hazard zonation in Edo State Using Geospatial Technique, Int J Eng Sci, 6: 48-59. 2017.

United Nations International Strategy for Disaster Reduction (UNISDR): *How to Make Cities More Resilient: A Handbook for Local Government Leaders.* Retrieved from http://www.unisdr.org. 2012.