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RETHINKING FLOOD DISASTER AS ENVIRONMENTAL PROBLEM AND FLOOD RISK MANAGEMENT AS A NATIONAL APPROACH

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Abstract

This study holistically examined flood disaster. Flood occurrences as seen in parts of Nigeria is an environmental problem. Hence, inorder to bring about solution, the study made an exegesis through which people will understand the causes, types, impacts and flood risk management as a coping mechanism. The research adopted human adjustment theory and survey methodology to prosecute the study. It discovered that a number of factors such as social, economic, cultural, political, environmental and geographical contexts in which people live affect their exposure to flood risk.

Keywords: *Flood, displacement, dam failure, rainfall and hazard.*

Introduction

Flood is an overflowing or irruption of a great body of water over land not usually submerged (Oxford English Dictionary). It is an extreme weather event naturally caused by rising global temperature which results in heavy downpour, thermal expansion of the ocean and flakier melt, which in turn result in rise in sea level. Thereby causing salt water to inundate coastal lands flooding is the most common of all environmental hazards and it regularly claims over 20.000 **per**year and adversely affects around 75 million people world-wide (Smith, 1996).The Merriam-Webster (2012), describes flood as arising and overflowing of a body of water, particularly onto normally dry land. The term "flood" comes from Old English; /flod/, a word to Germanic common languages (compare German /Flut/, Dutch /vloed/ from the same root as is see **in**/flow, float/; also compare with Latin /fluctus/, /flumen/), and was first used in 1663. There is no single definition of what constitutes a flood (WHO, 2013). The presence of water in ordinaeily dry locations that considerably disturbs or interferes with human and social activity', according to current standards (Jonkman&Kelman, 2005). Flooding can also be characterized as a rise in the level of water in a stream, lake, reservoir, or even a coastal zone (CRED, 2010), as well as any situation in which land becomes buried in water (GUKANI, 2010). Other authors, on the other hand, define flood as a big amount of water covering a normally dry area or the overflowing of a huge body of water over territory that is not regularly inundated (Olajuyigbeet ah, 2012). Nwafor (2006) defined flood as a natural hazard similar to drought and desertification that occurs as an extreme hydrological event. Flood, on the other hand, is defined by Abam (2006) as a large volume of water that arrives and occupies the stream channels and flood plain in such a short period of time that its damage cannot be avoided. Flooding is defined as an excess of water on normally dry land, as well as inundation caused by high flow or overflow of water in an established watercourse, such as a river, stream,

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or drainage ditch. A flood can occur anywhere, at any time, and is caused by a large amount of rain falling in a short period of time (New Delhi Municipal Corporation (NDMC), 2012).

Flooding occurs when a typically dry region is flooded by water from a river overflowing or heavy rain; it happens naturally in flood plains; it also happens when water in a river overflows its banks; and it happens occasionally as a result of a poorly planned dam. It happens unexpectedly, with a surprise delivery that always comes in an unsuspecting area (Etuonovbe, 2011). Floods are a natural element of the water cycle, sometimes known as the "hydrologic cycle." In this water cycle, the sun's energy causes water to evaporate and form clouds, which migrate inland and produce rain. Excess surface water will either flow straight into river systems or be absorbed into the soil to produce groundwater flow following rains. Floods happen when rivers' capacity is insufficient to convey the water that has entered the system, forcing the banks b overflow. As a result, a floodplain is a term used to describe a region that is regularly flooded (EMA, 2014). The aforementioned writers have differing viewpoints on what a flood is, but in a word, they are all going in the same direction: a flood is a big volume of water covering an area that was previously dry. However, we do know that several sorts of floods will occur depending on the follow pattern, length, and location.

African nations have also been badly affected by floods. Media and aid organizations in Sub-Saharan Africa, which resulted from several days of rain fall (Paeth, Fink, Pohle, Keis&Samimi, 2010).In Nigeria, flooding displaces more people than any other natural disaster with an estimated 20% of the population at risk (Komolafe, Adegboyega&Akinluyi, 2015).In 2010, approximately 1550 people died and 258,000 displaced by 19 floods incidents (Agbola, Vayi, TaiwoandWahab, 2012). Two years later in 2012, floods claimed 361 lives and displaced 3.8 million inhabitants (Tokunbo&Ezigbo, 2012). Recording a monetary loss of approximately 6.5 billion in damages despite an effort, the years before, to make the environment more habitable (Tokunbo et al, 2012). The Nigeria National Emergency Management Agency (NEMA) stated that the flooding disaster from 2012 caused an estimated loss equivalent to 4.1% gross domestic product. This type of disaster has had a ripple effect on the livelihood andactivities of communities where people literally were washed away and drowned, properties destroyed and socio-economic activities suffered (Oluwaseyi, 2007).While this type of natural disaster could be avoided or limited, there seems to be a cause and effect to the kind of havoc the people face- especially in some local government areas in Bayelsa, Delta and Rivers State.

It should be stated that flood occurrence is not new in Nigeria, especially in the Niger Delta

States, especially, the coastal areas of Bayelsa, Delta and Rivers State. There have been incidences of flooding (flash flood, urban floods, channel floods, back-swamp floods, coastal inundation etc.) in the last 30 years with its consequences. The highlight of these floods was that of 2012which took the nation by surprise. The flood according to the National Emergency Management Agency (NEMA) affected 30 of the 36 States of Nigeria, 7 million people were affected in these States, 597, 476 houses were destroyed, 2.3 million displaced and 363 deaths were reported with large track of farmland and other means of livelihood destroyed, animalsand other biodiversity were also gravely impacted upon (Amangabara&Obenade,

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2015).

Theoretical Framework

The theory adopted for this study is the human adjustment theory. Kates (1971) used this theory to examined choices made by people living in hazardous areas and variations in human behaviour. For Ward and Kennedy (1994), humans are constantly adjusting from the moment they are born, because humans live in a condition of constant, often rapid change. A person's ability to adapt to changes in their physical, vocational and social environment is herewith referred to as adjustment. Adjustment to hazard perspective assumes that the potential range of alternative choices are usually much wider than the choices that are practiced and raising awareness of neglected alternatives, opening access to blocked choices and adding new alternatives. Therefore, adjustment to a flood catastrophe comprises a process in which one develops behavioural variations inorder to create harmony with oneself and the environment.

Methodology

The research design used is the descriptive survey method. The reason for choosing this method is due to the fact that variables are diverse and this method helped in easy collection and compilation of literature, data, and predicative judgment.

Major Causes of Flooding

Indeed, over the years, occurrences of natural and man-made disaster remain a major threat to lives, property, household and natural environment in the Niger Delta, especially, the coastal towns and villages in some local government areas in Bayelsa, Delta and Rivers State. The household is worst hit in the flood impacted areas, in effect, the flood has serious consequences community's health and household well-being. The health effects are complex and far reaching and may include physical injury and even mortality. These impacts go beyond the mediate consequences arising fromthe direct health effects and include long-term impacts on community and household livelihood and environment that take place through multiple pathways including hazards from exposure to storm, displacement of people and interruption of services including health care programs, exposure to secondary hazards such as polluted drinking water,moulds in the house, mental health effects such as psychological distress, anxiety and depression due to traumatic or stressful experiences during and after the floods (Lane, Guzonan, Wheeler, Abid, Graber & Matt, 2013).Fundamentally, the consequences of flooding, which has become an annual occurrence are gave, Thus, previous research has outlined different causes, effect/impacts of flood and coping strategies, however, there has not been any methodological review on strategies in the coastal areas in the Niger Delta region of Nigeria.

Floods have happened all throughout the world as a result of the occurrence and reoccurrence of long periods of heavy rain (Aderogba, 2012). During the rainy season, flood disasters are frequently reported in newspapers and journals, as well as on television (Dow &Dowing, 2006). Floods are caused by a variety of factors, including excessive rainfall, quick snowmelt, severe winds over water, exceptionally high tides, tsunamis, and dam, levee, retention pond, or other structure collapse. Flooding can be exacerbated by increased impervious surface area

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or other natural disasters such as wildfires, which reduce the availability of vegetation capable of absorbing rainfall (Welch, Symons &Narver, 1977).Excessive runoff from continuous rainfall or rapid snow melts can result in heavy rains from storm and tropical depressions, foreign winds, and warm rain impacting snow pack. Unexpected drainage obstructions, such as landslides, ice, or debris, might cause slow flooding upstream of impediment (USEPA, 2002).Flooding can occur as a result of convective precipitation (heavy thunderstorms) or a sudden release from an upstream impoundment constructed behind a dam, as well as a landslide(Thompson, 1964).Flooding can also occur as a result of a combination of marine tidal surges and hurricane-force winds. Storm surge from a tropical cyclone or an extratropical cyclone falls under this category (Rosenberg &Snor, 1975).

Flood can be caused by severe sea storms or another danger, such as a tsunami or hurricane (Powell, 2009). Floods can also be caused by a large and unexpected event, such as dam failure, or by another hazard (e.g., earthquake or volcanic eruption). Accidental floods can also be produced by workmen damaging tunnels or pipes in towns (Esu, 1999). Other sources of floods are outlined by Bariweni, Tawari&Abowei (2012) as follows: while rainfall is relatively **modest**,the shoreline of lakes and bays can be flooded by powerful winds that blow water into the shore areas, such as during hurricanes. Coastal areas are occasionally flooded by extremely Sigh tides, such as spring tides, which are exacerbated by severe winds and storm surges. Tsunamis are big, high-energy waves that are often triggered by undersea earthquakes, volcanic eruptions, or enormous explosions, resulting in seawater flooding on buildings near the sea and even beyond. Temperature Change, according to Bariweni et al. (2012), is another factor that contributes to floods because when the climate warms, it causes the following:

Heavy rains,Relative sea level continues to rise around most shore, Extreme sea levels will be experienced more frequently.

As a result, climate change is anticipated to considerably and gradually increase flood risk over time.Low-lying coastal areas will be particularly vulnerable as sea levels rise, as will places that are not now prone to fluvial or tidal flooding, as more intense rainfall leads to a greatly increasedrisk of flooding from surface runoff and an overburdened drainage system. However, according toEtuonovbe (2011), flooding in Nigeria can be caused by either natural or human reasons, and she categorizes the causes as follows:

Natural causes:

Heavy rainfall, Oceans storms and tidal waves usually along the coast, Lack of Lakes, Silting

Human causes:

Other human sources of flooding in Nigeria may include one or more of the following:

Burst water from main pipes, Dam failures, Population pressure (especially in the city of Lagos), Deforestation (such as North part of Nigeria), Trespassing on water storm drains (key cause in Southern Nigeria), Unplanned urbanization (in many cities it's the key cause of urban flooding),

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Poor Sewerage Management, Neglecting warnings from hydrological system data (major cause of 2012 flooding in Nigeria), Lack of flood control measures (especially by government)risk of flooding from surface runoff and an overburdened drainage system. However, according toEtuonovbe (2011), flooding in Nigeria can be caused by either natural or human reasons, and she categorizes the causes as follows:

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Major Types of Floods

Flood can happen anywhere, at any time, and are one of the most common meteorological

Disasteron the planet. Floods can happen in a couple of minutes. Flood effects can be local, Meeting a neighborhood or a town, or they can be widespread, affecting entire river basins and various places (NOAA, 2013). Flooding is classified in several ways. According to the New Dr Municipal Corporation (2012), floods are classed based on their duration and location as follows:

Based on the duration of the flood:Slow-Onset Flooding, Rapid Onset, Flooding, Flash Flooding.

Based on the location of the flood:CoastalFlooding, Arroyo's Flooding, River Flooding, Urban Flooding.Flood can be categorized or labeled in a variety of ways; for example, Bariweniet al. (2012) floods as follows:

Tidal flooding: where a combination of low-pressure weather systems and peak high tides may overtop or break both sea and river fortifications Storms with strong wind speeds produce tall and forceful waves, while low pressure fronts cause sea levels to surge above normal. High tide levels change with the lunar and' solar cycles, and when these variations are combined with other tidal fluctuations, extraordinarily hightides arise. The advent of these floods from the sea and tidal rivers is frequently unexpected, and the immense forces propelling them pose a substantial risk to life. Because of the regularity of the tide and trackability, it is typically possible to forecast this type of flood with acceptable precision. The cycle of the tides where drainage is available also- limits the duration of this form of flooding (Dance & Hynes, 1980). Based on its location, this sort of flood is a coastal flood, and its

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duration can be moderate, quick, or even flash.

Fluvial flooding: Flooding happens in river floodplains when the capacity of water channels is exceeded due to rainfall or snow and ice melt in catchment areas upstream. Watercourse and flood channel blockages, which may result in increased water levels. River barriers may then be breached due to higher water levels or by huge debris objects carried at high water velocity. In some catchments with continuously rising water levels, the beginning of this type of flood can be quite sluggish. This flood type is river based on location. However, it may be flash or slow- onset depending on the speed of the water or the condition of the ground.

Flash flooding: Flash flooding is more common in steep catchments and is far more severe. River flooding, particularly in established floodplains, can typically be anticipated with reasonable accuracy. Flash floods caused by heavy rains, on the other hand, continue to put detection and forecasting technologies to the test. Water deeper than around 250 mm can carry waste, especially in metropolitan areas, and it can alsobe very cold. Even at modest speeds, this can be exceedingly dangerous to anybody trapped in it.

Groundwater flooding: As ground water levels rise, low-lying areas resting above aquifers may flood on a regular basis. This form of flooding is frequently seasonal and so may be accurately expected; nevertheless, it is frequently slow to begin.

Pluvial flooding: Surface water flooding is caused by rainwater and runoff from low-absorbency urban and rural areas. Increased development intensity in metropolitan areas has resulted in land with a higher proportion of non-permeable surfaces, an issue that is frequently worsened by overburdened and out-of-date drainage systems. These conditions, when combined with heavy rain, might result in localized flooding.This type of flooding frequently happens outside of designated floodplains, and it is extremely difficult to forecast because it is produced by very localized weather conditions. Its onset can also be very quickly, and the flooding can be severe.

Flooding from sewers: Flooding from sewers can occur when the capacity of combined storm and foul sewers is surpassed owing to huge amounts of surface water run-off in a short period of time. Poor cleaning and maintenance can cause drainages to get clogged, resulting in local floods.

Flooding from man-made infrastructure: Canals, reservoirs and other manmade structures can fail causing flooding to downstream areas. Industrial activities, water mains and pumping stations can also give rise to flooding due to failure, though this type of flooding is rare.

Flood is classified as one of five major types by the US National Oceanic and AtmosphericAdministration (NOAA) (2013)

Flash flood: This type of flood provides the shortest amount of warning time. They are defined as a sudden and considerable rise in water level caused by a major rainfall event. These floods occur when rainfall rates are so high that the ground cannot absorb the water

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quickly enough to prevent severe runoff, and they are particularly common in locations with steep slopes. A dam or levee failure can also cause flash floods. These floods can happen in less than an hour, destroying structures, bringing down trees, and washing out roadways with little to no notice. Although flash floods do not continue as long or cover as much ground as other floods, their fast start and strength allow them to cause destruction in a relatively short amount of time.

River flooding: This occurs on a slower time scale than flash floods in many places of the world each year. They occur when water runoff accumulates in rivers and streams to the point where it overflows the banks. When this happens, the flood can cover a large region and harm downstream places even if they did not receive much rain. Although river flooding may be forecast, its effects can inflict considerable damage to riparian towns, even over extended time periods.

Coastal flooding: When Ocean water is pushed inland, it causes floods. Hurricanes and tropical storms can produce enormous waves and even raise sea levels, resulting in storm surge along coastlines. Earthquakes can cause massive amounts of water tobe displaced, causing tsunamis to rush ashore. Extremely high tides, occasionally linked with a full moon, can cause minor coastal flooding on a much smaller scale.

Urban flooding: These can be produced by flash flooding, river flooding, or coastal flooding, but they are most usually produced by excessive rainfall rates over developed regions that do not have the ability to absorb the water or poorlymaintained drainages. Water runoff can be increased by up to 6 times in urban areas compared to natural terrain. These floods have the potential to cause significant economic damage to companies and homes.

Areal flooding: Areal floods, which are similar to urban floods, are the most common flood threat in many cities near major natural lakes. Standing water is caused by a real flooding in low-lying areas and open fields. They are frequently caused by high rainfall across a vast area in a short period of time. Furthermore, a prolonged duration of rainfall can cause flooding, often resulting in dangerous inundation of low-lying areas. These floods can cause agricultural losses, and stagnant water can act as a breeding ground for insects and illness.

According to Folorunsho&Awosika (2001) &Ologunorisa (2004), floods occur in Nigeria in three ways: coastal flooding, river flooding, and urban flooding. Coastal flooding occurs along the coast in the low-lying belt of mangroves and fresh water marshes. River flooding occurs in the flood plains of bigger rivers, whereas flash floods are connected with rivers in inland places where heavy rainfall can quickly transform them into destructive torrents. Urban flooding, on the other hand, happens in towns, on flat or low-lying terrain, particularly when little or no provision has been made for surface drainage, or where existing drainage has been clogged by municipal garbage, garbage, and degraded soil sediments (Folorunsho&Awosika 2001; Ologunorisa, 2004). Although many of the numerous types of floods stated above occurred in Nigeria, Etuonovbe (2011) believed that flooding happens throughout Nigeria in the following forms; Coastal flooding, river flooding, flash flooding, urban flooding, levee

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failure, dam fracture, and spills are all possibilities.

Impact of flood

Floods are the most frequent type of natural disaster and occur when an overflow of water submerges land that is usually dry. Floods are often caused by heavy rainfall, rapid snowmelt or a storm surge from a tropical cyclone or tsunami in coastal areas. Floods can cause widespread devastation, resulting in loss of life and damages to personal property and critical public health infrastructure. Between 1998-2017, floods affected more than 2 billion people worldwide. People who live in floodplains or non-resistant buildings, or lack warning systems and awareness of flooding hazard, are most vulnerable to floods. Between 80-90% of all documented disasters from natural hazards during the past 10 years have resulted from floods, droughts, tropical cyclones, heat waves and severe storms. Floods are also increasing in frequency and intensity, and the frequency and intensity of extreme precipitation is expected to continue to increase due to climate change.

Drowning accounts for 75% of deaths in flood disasters. Flood disasters are becoming more frequent and this trend is expected to continue. Drowning risks increase with floods particularly in low- and middle-income countries where people live in flood prone areas and the ability to warn, evacuate, or protect communities from floods is weak or only just developing. Deaths also result from physical trauma, heart attacks, electrocution, carbon monoxide poisoning or fire associated with flooding. Often, only immediate traumatic deaths from flooding are recorded. Floods can also have medium- and long-term health impacts, including:

water- and vector-borne diseases, such as cholera, typhoid or malaria, injuries, such as lacerations or punctures from evacuations and disaster cleanup, chemical hazards, mental health effects associated with emergency situations, disrupted health systems, facilities and services, leaving communities without access to health care, damaged basic infrastructure, such as food and water supplies, and safe shelter.

Flood hazards may include floodable plains, proximity to river channels, or heavy and concentrated rainfall. Risk, on the other hand, relates' to the "likelihood of a hazard event Halting in an adverse condition that causes injury or damage" (FEMA, 2001), which is a function of hazard characteristics, vulnerability of exposed entity, and the level of exposure. Usually defined with reference to a specific hazard, vulnerability connotes the degree to which un individual, household, community or system can anticipate, cope with, resist and recover from the impact of a natural or man-made hazard (IFRCS, 2012; Samuel et a]., 2014).

The magnitude of impact of a flood event is dependent on the individual's or community's level ofexposure to a hazardous situation and their ability to resist and recover from losses associated with such risk (Vedika&Ravindra, 2012). The rate of exposure is in turn a function of the frequency and intensity (magnitude) of the flood hazard, locational proximity to hazard source and other situational factors such as quality of building (Bello &Ogedegbe, 2015). Existing **studies**on flood hazard revealed that people living close to a hazard source such as a river, dam, and on flood plain have higher exposure, while those who live in poorly built homesteads sustain greater losses in the event of a flooding than their counterparts located

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away from the hazard source and whose homes are built with durable materials (Jha, Bloch &Lamond, 2012). Various reasons have been adduced for the reluctance of people living close to hazard sources to relocate to safer locations. These reasons include maintaining family ties, livelihood opportunities, proximity to work or business location, being native to the community, low cost of land and housing, and accessible social amenities (Mmom&Aifesehi, 2013).

A number of factors including social, economic, cultural, political, environmental, and geographical contexts in which people live (Wisner, Blaikie, Cannon, & Davis, 2004) affect their exposure to flood risk. In the field of flood risk management, the impact of flood hazards is measured in terms of the direct and indirect losses sustained by the affected people (Jha, Bloch &Lamond, 2012). Direct effects of flood hazard on people may include but are not limited to loss of lives, personal injuries, damage to buildings, displacement of people from their homes, loss of valuable properties, and disruption of socio-economic life of individuals and groups (Bello and Ogedegbe, 2015). In 2010 alone, over 8,000 deaths were directly attributed to flooding worldwide (Jha, Bloch &Lamond, 2012), with children and the elderly being at higher risk of getting drowned than younger adults (Bartlett, 2008). Jonkman&Kelman (2005) have observed that two-thirds of deaths recorded during flooding were the result of drowning while other causes such as electrocution, health related problems and injuries suffered while struggling to escape account for the rest. Other direct impacts such as loss of farmland, farm produce, income, structural and household properties, and the outbreak of epidemics that threaten the health of survivors have also been reported (Bello &Ogedegbe, 2015). In the study of the causes and effects of flood in parts of Ibadan, Nigeria, Adetunji&Oyeleye (2013) found that 25.6% of the respondents reported the loss of lives as a major impact while another 27.6 reported injuries to household member(s). The authors also noted property loss, economic losses and outbreak of diseases as direct impacts of the flood.

In addition to the direct impacts of flooding, there are also impacts that result from “complex interactions within the natural environment and the human use of resources in cities and towns" (Jha, Bloch &Lamond, 2012:161) which are not immediately noticeable and hence cannot be easily quantified. These impacts include damage to environmental resources like the vegetation, the soil that supports human and animal lives, and a host of other psycho-social effects on the affected people arising from the trauma experienced and loss sustained during the flood event. Adelekan (2010), in her study of the vulnerability of poor urban coastal communities to flooding in Lagos, Nigeria, identified such indirect impacts of flooding to include shortage of potable water increased incidence of water borne diseases, and disruptions of social and economic life of the people. Jha, Bloch &Lamond, (2012) have observed that survivors of flood events are severely traumatized, and many of them may experience symptoms of posttraumatic stress Ifcorder (PTSD), depression, and anxiety (Mason, Andrews, &Upton, 2010).

Rainfall patterns in Nigeria (1978 to 2007), suggests that rainstorms are getting more intense. The data show that there are fewer rainy days, yet the total yearly amounts of rainfall have

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not changed much from previous decades. In addition to more intense rain storms, the other possible cause of flooding in coastal regions is rising sea levels. Although up-to-date data on the rising levels in Nigeria are scarce, it's believed that if nothing is done, this is likely to aggravate flooding in the future, particularly in coastal cities. Areas at risk include south-south States, which are on the coast, as well as the whole of Niger Delta region which has many low-lying ns and villages. Being on the coast also makes these places more susceptible to storm surges. While these areas are no stranger to floods, evidence suggests that floods have come increasingly common and intense in recent times. In Nigeria's cities, the most common cause of flooding after excessive rains is poor drainage systems that can't cope. This is called pluvial flooding. Selected flooding prone Local Government Areas in Bayelsa, Delta and Rivers provides a good case study.

Hewitt (1997) defined resilience as a measure of the rate of recovery from a stressful experience, reflecting the social capacity to absorb and recover from hazardous events. This also is related to lie socio-economic profile of the affected people and the social network and institutional support systems that are in place (Nelson &Finan, 2008; Mmom&Aifesehi, 2013; Chacowry, 2014). Kates et al. (2006) have also identified a number of structural measures that can help in flood hazard mitigation. Such measures include building waterways, levees, and flood-resistant buildings. Forms of institutional support such as early warning systems, emergency relief operations, insurance cover, education, capacity building, and awareness raising (UNISDR, 2005) have also been found to aid individual, household and community resilience. In a regional study of the public perception of flood hazards in the Niger Delta region in Nigeria, Ologunorisa (2006) Ologunorisa&Adeyemo (2005) identified physical relocation and the building of embankments and pavements as major adjustment measures that respondent adopted in the event of a flood. Other measures adopted by people to cope with the effect of flood include the raising of building heights, the construction of houses with flexible structures, the removal of moveable properties to nearest neighbours, and early planting/change in farming regime (Mmom&Aifesehi, 2013). In the case of physical relocation, there is ample evidence that affected people are usually reluctant to relocate to a new site (Mmom&Aifesehi, 2013).

Causes of flooding in Nigeria

While climate change has led to more rains than in the past which has increased the incidence of flooding, Nigeria's flooding is mostly human induced and exacerbated by human-nature interactions (Aderogba 2012). The human- nature interactions that cause flooding in Nigeria form the focus of this paper and include, but are not limited to:

Poor or non-existent drainage systems: This is a major human-induced exacerbate of the flooding experienced in Nigeria (Ogundele&Jegede 2011). Most residential areas in Nigeria have no drainage system and rely on natural drainage channels, and it is common for buildings and other infrastructure to be constructed in a manner that actually obstructs these drainage channels which results in flooding during the rainy season (Nabegu 2014). Nigeria's increasing urbanization has seen a growing proportion of ground surfaces concreted, which means there is no percolation of water, and adequate drains are not in place to take care of the surface

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runoff (Adeloye&Rustum 2011). The lack of provision for drainage is one of the main causes of urban flooding in Nigeria. There is a pressing need to construct drainage systems to tackle the flooding problem (Etuonovbe 2011).

Poor waste management system: Poor waste management is one of the anthropogenic factors contributing to, and worsening the already difficult flooding problem in Nigeria (Ojo&Adejugbagbe 2017). The poor attitude of Nigerians to waste disposal has been widely discussed in various studies (Eneji et al. 2016; Ojo&Adejugbagbe 2017; Olukanni, Adebayo, & Tenebe2014; Sridhar &Ojediran 1983). Drainage blockages linked to poor sanitation practices are common in Nigeria's highly populated urban areas. Roadside dumping, canal dumping, and dumping in rains is commonly practiced among a large proportion of the population. This causes blockage and results in flooding during the rainy season (Onwuemele, 2012).

Unregulated urbanization: Flooding and urbanization are intricately related in both developing and developed countries. Over 50% of Nigerians live in urban areas today (Farrell, 2018). Nigeria is witnessing high urbanization rates without commensurate provision of urban infrastructure and amenities (Aderogba 2012). Agricultural lands are also being increasingly converted to residential areas to accommodate housing needs and development is carried out without proper controls and infrastructure in place, thus worsening the flooding problem (Dan-Jumbo, Metzger, & Clark 2018). Urban planning in Nigeria is poor and this is compounded by numerous compliance problems; this poor planning is a primary cause of the flooding being experienced in Nigeria. Nigeria's flooding is therefore inextricably linked to poor urban development practices (Omoboye& Festus, 2014).

Weak implementation of planning laws and corruption: Nigeria's current planning laws are standard but their development and implementation are poorly controlled (Nnaemeka-Okeke 2016). Political interference in planning work, understaffing and a lack of working equipment are factors that negatively impact effective planning and the execution of duties by the planners (Nnaemeka-Okeke 2016; Oluwaseyi 2019). The lax implementation of planning laws mean construction projects on natural floodplains and stormwater paths are approved, which exacerbates the flooding problem and impacts on sustainability. Corruption is also a factor. It is not uncommon for town planning officials to accept bribes and overlook issues - these may include the unauthorized use of land, the alteration of approved construction plans in areas that obstruct drains and natural waterways, sub-standard construction of infrastructure like bridges which subsequently collapse during the rains (Oladokun& Proverbs 2016). Resulting debris reduces the carrying capacity of the channels which induces flooding and worsens the problem originally being addressed.

The people also capitalize on the loophole of ineffective development control and a lot of times extend their buildings over the approved areas and in some cases go as far as building over drainages. This non-implementation of the laws is inimical to achieving sustainable urban development. Lax planning and the lack of valid building approvals are the root cause of irresponsible developments with attendant consequences (Adeloye&Rustum, 2011).

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Recommendations and Conclusion

Flood Risk Management (FRM) and Spatial Planning in Nigeria

Flood Risk Management (FRM) comprises measures aimed at reducing the likelihood and impact of floods. It encompasses the prediction of flood hazards, socio-economic factors and consequences, and measures/tools for risk reduction (Schanze, 2006). It is not a static approach but adapts to changing circumstances. The adoption of a particular flood risk management strategy is influenced by numerous factors from environmental (geographical features of an area and the type of flood risk an area is prone to) to socio-economic factors and can include both structural and non-structural measures (Adelekan 2016; Bubeck et al. 2017). Countries adopt approaches that suit their own local situation (Bubeck et al. 2017).Historically, Nigeria has been more focused on post-disaster flood response than control (Cirella&Iyalomhe 2018). Reducing and addressing exposure to flood risk is now a national priority in the Nigerian government's disaster risk management agenda. A national framework, now in place, aims at moving reactive flood response and recovery to pro-active risk management, however, nothing concrete has been done and a national FRM strategy to ensure harmonizationof practice is still not in place (FGN., 2013; Okoye2019). This is not encouraging despite the comprehensive post-disaster needs assessment conducted in 2012 by the federal government with international collaboration. This raises questions on the political will to achieve this goal. Funds are readily released post-floods but not pre-floods to avert it. In 2017 alone, the Nigerian government released as much as N1.6 billion as a post-flooding response (Adekola& Lamond2018).

Inadequate attention has been paid to flood control and management on a nationwide level and efforts aimed at addressing the challenge have lacked proper coordination and therefore, failed (Okoye 2019). Despite evidence of flood interventions in the past, the lack of an integrated FRM practice means that sub-optimal solutions are adopted and in numerous cases, more problems are created in the process. For instance in 2017, parts of Port Harcourt city witnessed massive flooding as a result of improper channeling of drains to a burrow pit which got filled up during the rainy season causing water to flow into the surrounding suburbs and cause flooding of unprecedented magnitude (Ezeaku 2017).

The government is not lacking research institutions and agencies with the skills to design an FRM strategy, for instance, the National Emergency Management Agency (NEMA) has a department of planning utilizing Geographical Information System (GIS) to work on flood data but there is no still no effective national early warning system in place for floods at all levels of federal, state, and local governments, while the National Meteorological Agency (NIMET) provides seasonal rainfall predictions, but communication remains a problem (FGN. 2013). Integration and coordination are lacking among the existing government bodies who sometimes carry out flood control projects without liaison with each other and control projects become ineffective due to improper coordination (Oladokun& Proverbs 2016). FRM in Nigeria is mainlycarried out by the state governments with inadequate federal input but there is also a lack of coordination among the states which ensures that different practices are obtainable even in citieswith similar environmental problems and characteristics. Some of the state-level FRM have been critiqued for being deficient. For, example, the FRM of Lagos state

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has been critiqued for lacking evaluation and early warning systems which makes it ineffective (Adelekan 2016; UgonnaNkwunonwo, Whitworth, & Baily 2016). The lack of flood data has also been decried in the FRM plan of Oyo state (Egbinola, Olaniran, &Amanambu 2017).

To address the shortcomings of current practices, spatial planning is advocated as a suitable FRM strategy for Nigeria because it has the potential of integrating existing practices. It is recognized as the most sustainable flood risk management method. The adoption of coordinated and sustainable spatial planning involving relevant agencies, planning practitioners, and stakeholders are an important tool for mitigating flooding. This is because spatial planning provides for managing flood risks, and influences factors like type, location, function, and design of development (Porter &Demeritt 2012; Ran &Nedovic-Budic 2016). Currently, the planning system in Nigeria is weak and there is an absence of integration of planning with existing FRM in Nigeria (Nkwunonwo, Malcolm, & Brian 2015; Oladokun& Proverbs 2016). Focusing contemporary flood risk management in Nigeria on spatial planning is best suited to the local situation given that the country is located in a relatively stable geological zone which is not prone to extreme natural disaster events like landslides, cyclones, hurricanes which cannot be controlled. This removes uncertainties from not knowing when the next geological disaster will eventuate (Egbenta, Udo, &Otegbulu 2015; Oladokun& Proverbs 2016).

The adoption of modern concepts of spatial planning like collaborative and sustainable planning, which is flexible, and involves the public, and integrates environmental issues to take the lead inthe urban growth process and effectively manage flooding ' (Dyachia et al. 2017; Lagopoulos 2018; Oyefara 2013). Spatial planning incorporating sustainable drainage systems as an FRM strategy could also be combined with ICT/technological tools like applications that residents can use to communicate with the relevant authorities in the event of an emergency or blockage of drains and onset of flooding. Integrating spatial planning and FRM is key to controlling flooding and moving Nigeria a step closer to achieving the SDGs.**References**

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