

**NEWPORT INTERNATIONAL JOURNAL OF CURRENT
RESEARCH IN HUMANITIES AND SOCIAL SCIENCES
(NIJCRHSS)
Volume 3 Issue 1 2023**

Challenges of Flood Risk Management in Nigeria: the way forward

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ABSTRACT

There has been an observation that while the increased incidence of floods in recent times has increased levels of awareness and raised the tempo of flood management activities in Nigeria, there is a general lack of coordination and integration across several important FRM systems and processes. Flood management approaches and responses have been generally geared toward sub-sector or sub-regional optimization. There is an absence of holistic or system thinking in urban system planning and development. There is a disconnection between FRM systems and other subsystems of the built environment, resulting, inadvertently, in inefficient and ineffective FRM systems. While enormous resources and investment have been put into a number of structural FRM measures, there has been a limited adaptation of these technologies to the Nigerian socio-technical environment as well the absence of the required knowledge transfer to Nigerian experts. Meanwhile, there are several socio-cultural features, characteristics as well as techno-economic and development opportunities which support the adoption of sustainable, integrated FRM systems in Nigeria and also favor the pursuit of Blue-Green infrastructural development approaches at relatively lower cost. Accordingly, these potentials can be optimally exploited if there is a framework for understanding the interactions of the urban development process and FRM system in Nigeria.

Keywords: Flood, Management, Infrastructure, Environment and Risk

INTRODUCTION

Incessant floods coupled with the lack of coping capacity and high levels of vulnerability of the people have continued to put many lives and properties at risk. Stakeholders are therefore increasingly concerned about the threats of flooding to communal safety and national development. While there have been various interventions in the past, there is a lack of integrated and sustainable Flood Risk Management (FRM) systems and practices in Nigeria. Sustainable FRM system reflects the ecological make up, infrastructural development, institutional behaviour and other techno-socio-economic characteristics of its environment. Meanwhile, it has been observed that the literature is sparse in many critical areas of flooding and FRM for Nigeria. For instance Egbenta et al. [1] observed that there is a paucity of information on the effects of flood hazard on the values of properties in Nigeria while Nkwunonwo et al. [4] asserted that only journalistic and non-quantitative evidence are available on some critical aspects of flooding in Nigeria. A recent review by Komolafe et al. [2] highlighted the absence of the use of state of the art flood models integrating all hydrological processes for accurate prediction and mapping of flooding and its associated risks in Nigeria. Moreover, while Nigeria is the most populous country and has the largest economy in Africa, case studies on Nigerian flooding are scant or absent in many important global flood studies and documents. For instance in a major World Bank document on guidelines for FRM in developing countries, not a single case study or reference was made to Nigeria. Therefore, this study aimed to provide a critical evaluation of FRM in Nigeria.

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Elements of the Nigerian Flood System

Until recently, major flood disasters rarely occur in Nigeria. Recorded cases of flooding in Nigeria date back to 1963 when Ogunpa River flooded Ibadan city causing loss of lives and properties with reoccurrences in 1978, 1980 and 2011. The 1980 flood, which caused huge loss of lives and properties, brought some notoriety and attention to the disaster potential of the river and immediately provoked a flurry of FRM responses such as the initiation of the Ogunpa channelization project, educative radio and television jingles on FRM practices, relocation of structures and properties from flood plains [6]. However the sense of urgency and priority attached to these FRM projects waned after some years of respite. For instance, the channelization project was abandoned for a long period, radio and television jingles ended, and by the late 90s, it was clear that city planning authorities had gone back to old habits of allowing structures on floodplains obstructing flood channels. Agbola et al. [5] noted that while the rainfall of August 26, 2011 was not the highest in the recorded history of the city, the monetary value of damages to property that resulted from the event, was by far the most costly. The official estimated losses and damages from the 1980 single flood episode rainfall of 274.0 mm was put at N300 million (\$1.9 million) while that of 2011 rainfall of 187.5 mm was put at N2.1 billion (\$13.3 million). Some twelve anthropogenic factors were identified to have contributed to the exaggerated level of devastation that trailed the 2011 Ibadan flood [5]. Also the 2011 flood event motivated the Nigerian government to approach the World Bank to finance a long term major FRM project in Ibadan city. While responses to the past flooding events have been piecemeal, mainly focusing on alleviating immediate and short-term needs such as rebuilding of destroyed assets, the Ibadan Urban Flood Management Project (IUFMP) recognizes the imperative of a long term integrated approach to FRM for the city. The project with a closing date of June 2022 and objective of improving the state's capacity to manage flood risk in Ibadan is on course [7]. Meanwhile, because the meantime between floods can be irregular and deceptively long, stakeholders tend to forget the lessons of the 'last' flood disaster and become relaxed until another flood strikes. Nigeria has poor flood warning systems as well as a poor flood insurance scheme. Hence, building resilience capability to cope with increasing climate variability remains the most viable option for FRM in Nigeria. Nigeria flood prone areas: With increased and rapid urbanization of Nigeria, the landscape of flood prone communities and assets are on the increase. Some key causes of the increasing vulnerability of Nigerian Urban areas to flooding were summarized by Odufuwa et al. [8] to include inadequate drainage systems and increased replacement of natural and absorptive soil cover with impervious materials such as concrete. The authors also blamed deforestation of hillsides which leads to increase in the quantity and rate of runoff.

The areas and sources of major flooding can be categorised as follows

1. Coastal cities and settlements: Nigeria has over 853 km (530 mi) of coastline with extensive low-lying areas, and heavily industrialized areas prone to flooding. Lagos, the main commercial hub of West Africa, Warri and Port Harcourt, hosting Nigeria's Petroleum infrastructures, are increasingly exposed to ocean flooding.
2. Communities and settlements along the two major Rivers, (Niger and Benue), cutting across the nation. Urban and rural communities along the River Niger and its tributaries have been shown to be most affected by flooding. Communities downstream of dammed rivers and on the banks of other major rivers: For instance, Ilorin, a North central city, has been severely flooded by River Asa that runs through the city.

Factors Responsible for Flooding Hazard in Nigeria

There are a number of factors in Nigeria that induce and aggravate the impacts of flooding.

- i. Substandard infrastructures induced flooding: The causal relationships that exist among various elements of the modern built environment system provide a credible platform for understanding the peculiar challenge of FRM in Nigeria. While Nigeria has made considerable investment in infrastructure projects such as road networks, bridges, and other modern facilities for the growing population, the process of planning, designing and constructing such facilities has not reflected any serious system thinking. Also due to corruption, mismanagement and incompetence, many of the facilities are substandard and collapse long before their expected life span [9]. For example, when a substandard bridge or road segment collapses during a rainy season, which is a common occurrence in Nigeria, the debris and concrete materials end up blocking or reducing the carrying capacity of the channel. This will eventually cause 'induced' flooding of the adjoining area upstream to the collapsed bridge. Also when a road segment fails due to poor and substandard civil work, commuters will ultimately divert traffic to some alternative routes thereby over stretching these other routes. For instance, heavy truck drivers are compelled to move over low capacity bridges and roads which will in turn cause more bridges to collapse and the chain continues. Invariably, substandard elements in one region of the built environment will remotely increase the risk of flooding of some other regions in the built environment. Unfortunately, in many instances, it can be a complicated process to trace

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- back the original cause, especially if the affected infrastructures fall within different authorities. The standards and type of materials used for many buildings in Nigeria cannot withstand mild floods. In a study by Abaje et al. [10], 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 [11] reported that sandcrete blocks, used in over 90% of Nigerian urban houses, are below required standards. Consequently, these houses are highly exposed and vulnerable to flood damage. The activities of unqualified builders and poor culture of regulations' enforcement in the building sector have been blamed for the preponderance of weak structures. Meanwhile, poorly built infrastructural systems, such as high voltage power lines, bridges, unprotected construction sites, and uncompleted buildings, readily collapse during flooding thereby aggravating the number of fatalities and injuries. With the absence of reliable potable water network, majority of Nigerian houses depend on shallow wells and streams, mostly located close to faecal pit latrines and sewage soak away pits, for water supply. The water supply system thus has become easily and readily contaminated during flood events leading to further health and water supply issues.
- ii. Poorly planned and managed urbanization process: The growth and expansion of urban communities in Nigeria has been known to be poorly managed. Lack of proper spatial planning, poor land use management and absence of good corporate governance characterizes urban development in Nigeria [3]. The suburbs of big cities like Ibadan are notorious for this. Town planning officials in many of these cities have become compromised such that residents, companies, government agencies and NGOs alter the design and use of buildings without proper approvals. Potential flooding inducing alterations like dump sites, borrow pits, trenches, water dredging, and sand filling can occur without properly carried out environmental impact analysis. The use of geotechnical studies and other pre-design studies to ascertain the suitability of an area is uncommon. This absence of a proper urban development planning process has over the years resulted in the gross distortion of ecological systems and, in the words of Odufuwa et al. [8], abused the flood plains especially in the low lying cities. These damaging distortions to the ecosystems include the replacement of the natural and absorptive soil cover with concrete and the silting up of drainage channels [3]. For instance, deforestation of hillsides, which has the effect of increasing the quantity and rate of runoff, and through soil erosion, may have contributed to the increase in the reported incidence of mud and landslides during floods in recent years in Nigeria.
 - iii. High prevalence of urban poverty: Poverty is a major challenge to development in Nigeria. Demographic data show more than 64% of the nation's population, of over 160 million, live on less than \$1 a day. Studies have confirmed that residents, especially women, in the lower income neighbourhoods recorded higher impacts and slower recovery after flooding Ajibade et al. [12]. Increased poverty levels coupled with insecurity in the Northern region in recent times have resulted in increased movement to the low-lying and coastal cities in the South like Lagos. Unfortunately, the high cost of land and housing in these cities means that most internal migrants end up living in 'affordable' slums or turn existing areas into slums. While swampy and low level areas may be cheaper to acquire per plot, they are usually very costly to develop. Swamps and waterlogged lands require heavy investments in deep concrete foundations, high volume of sand filling and dredging, networks of drainage and other infrastructures required to minimize the impact of flooding. The number and resident population of the slum areas in major Nigerian cities have continued to rise. Fragile and inadequate sewage systems become overburdened and collapse, refuse and solid waste management facilities become overstretched to the extent that drainage networks get blocked and flooding becomes inevitable. So poverty is a primary driver of urban flooding, the flooding in turn creates further poverty as uninsured residents lose their properties and livelihoods to flood disasters. Hence, there is a vicious cycle of flooding, poverty and deprivation [13]. Attempts in the past to relocate people from swampy slums have met stiff and violent resistance due to absence of adequate engagement of stakeholders through consultations, advocacy, and education. Such relocations should be seen to be socially equitable with fair compensation. This has not been the case in the past where relocation from flood prone areas has been used as a pretext by the ruling elites to take possession of lands close to the various beaches and water front without fair compensation. A sustainable FRM scheme must embrace social justice [14].
 - iv. Absence of water drainage network: Inadequate and poorly maintained drainage networks have been identified as a major contributory factor to the increased frequency of urban flooding in Nigeria.

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- Compared to the UK and other developed nations, Nigeria's urban areas lack drainage network for waste and flood water with many depending on rivers and tributary streams flowing through them.
- v. Cultural resistance to change: Ignorance due to low level literacy, superstitious beliefs such as rivers regarded as deities to be appeased when they overflow their banks are common among many Nigerian tribes. In many cities, drainage systems have been blocked with refuse by residents who dump wastes in drainages.

Way Forward

- i. **Emerging infrastructures:** BG FRM revolves around the concept of 'living with water', developing resilience to flooding and making space for water through BG infrastructures. With relatively little investment in modern urban infrastructure, Nigeria has the opportunity to urbanize with Blue-Green (BG) systems. Nigeria does not face the constraint of space, which escalates the cost of retrofitting of BG infrastructures into urbanized catchments, like many developed countries. Blue systems include ponds, flowing waterways, wet detention basins and wetlands existing within the drainage network. Green infrastructures refers to natural land and plant based ecological treatment systems and processes made up of assets such as open spaces, parks, recreation grounds, woodlands, gardens, green corridors etc [15].
- ii. Stable geological zone: Nigeria is located in an environment not prone to serious natural hazards such as earthquakes, landslides, tsunamis, hurricanes, volcanic eruptions [2]. Relative to other parts of the globe, destructive geological events in Nigeria are rare and mild. Dealing with floods without the aggravated effects of these factors makes planning less complicated and allows for effective modelling.
- iii. Young population and huge land area: Relocation of residents from a flood prone area will usually be more complicated for older populations with some deep rooted attachments to 'their' communities and properties. It is usually traumatic for older people to part with their homes or be relocated involuntarily after a flood event [16]. However, with a demographic distribution dominated by young people with weak economic ties, implementing relocation programs with appropriate incentives may face less resistance in Nigeria. Moreover, given the infant state of Nigeria's infrastructural development and the nation's relatively huge land expanse outside flood plains, the economic cost of relocation programs will be greatly moderated.

CONCLUSIONS/RECOMMENDATION

It has been observed that while the increased incidence of floods in recent times has increased levels of awareness and raised the tempo of FRM activities in Nigeria, there is a general lack of coordination and integration across several important FRM systems and processes. Meanwhile, there are several socio cultural features, characteristics as well as techno-economic and development opportunities which support the adoption of sustainable, integrated FRM systems in Nigeria and also favor the pursuit of Blue-Green infrastructural development approaches at relatively lower cost. Accordingly, these potentials can be optimally exploited if there is a framework for understanding the interactions of the urban development process and FRM system in Nigeria.

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Onoh Purity Ifeoma Eze (2023). Challenges of Flood Risk Management in Nigeria: the way forward. *NEWPORT INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN HUMANITIES AND SOCIAL SCIENCES (NIJCRHSS)*, 3(1):19–23.