

## **FLOODING: CAUSATIVE FACTORS AND PREVENTIVE MEASURES IN AKURE, NIGERIA**

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### **Abstract**

Flooding is a natural environmental disaster that can be worsened by uncontrolled human development. In Nigeria, floods have caused significant damage including loss of life, building collapses, property destruction, harm to agricultural produce, land loss and increased government spending. This paper focused on the causative factors and preventive measures of flood in Akure. The study utilized both primary and secondary data. Primary data were sourced through structured questionnaires while secondary data were sourced from literatures on flooding. A total of three hundred questionnaires were administered to the respondents in the study area randomly. Data collected were analysed through the use of descriptive statistical analysis. The study revealed that heavy rainfall, impervious urban surface, inadequate drainage systems, dumping of refuse in drains and drainage paths, lack of pre-flooding warning and increase in development are causes of flooding in the study area. Preventive measures for flooding were proper dumping of refuse, proper land use planning, reduction in concretization of urban surface, empowerment of government agencies to monitor residential and commercial building construction. The study recommends environmental appropriate environmental laws that will restrict indiscriminate refuse disposal into the water body and sponsoring of public awareness and educative programs on how man's activities has contributed to flood occurrence, repair and construction of drainage system should also be sponsored by the government at various level and appropriate response techniques in mitigating flooding via implementation of flood control policies.

**Keywords:** Flood, Environment, Development, Causative factors, Preventive measures

**Sub-Theme:** Flood prediction, forecasting, risk management and food security

### **Introduction**

Floods represent a significant source of anthropogenic and ecological damage, impacting socio-economic conditions, public health and ecosystems. They occur when rainfall exceeds the soil's infiltration capacity, leading to excessive runoff that overwhelms natural and man-made drainage systems, resulting in widespread inundation (Allaire, 2018; Parida, 2019). Rapid urbanization and extreme weather events have exacerbated this issue, leading to numerous fatalities and substantial economic losses annually. In urban areas, construction on floodplains, extensive roadworks, encroachment and improper waste disposal contribute to increased flood risks (Onifade, 2014). Urban flooding is particularly disastrous, often exacerbated by the limited ability of built environments to absorb rainfall. This can result in severe consequences such as loss of life, injuries and long-term health issues from drowning, accidents, or structural collapses. Additionally, economic impacts include damage to transportation networks and businesses (Hammond et al., 2015). Pluvial floods, which occur when heavy rainfall overwhelms urban

drainage systems, are increasingly common in areas where natural landscapes have been altered by development (Galloway et al., 2018; Serrano, 2010).

In Nigeria, flooding has led to significant loss of life, displacement of populations and extensive property damage. Over 200 people have died from flooding with hundreds of thousands displaced and property worth millions of naira destroyed (Oluduro, 1988). Contributing factors include development in flood-prone areas, driven by rapid urbanization and industrialization which has led to large-scale destruction of vegetation and farmland. Uncontrolled urban development often violates planning objectives, leading to disordered land use and increased flood risk, particularly in third world cities (Okechuckwu, 2008; Adeniyi and Omole, 2015). The interplay between human activities and inadequate consideration of geological factors has intensified flood risks undermining environmental sustainability (Oludare et al., 2012). The persistent challenges of flooding especially in developing countries with high land use intensity and unplanned urbanization have led to severe flood events in cities like Ibadan, Osogbo, Yobe, Akure and various coastal areas in Nigeria (Montoya, 2002; Olatona et al., 2017). For instance, the 2022 floods in Nigeria affected 27 states, displacing over 1.3 million people, injuring 2,407 and causing extensive damage to houses, farmland and infrastructure (Daves, 2022).

### **Statement of Problem**

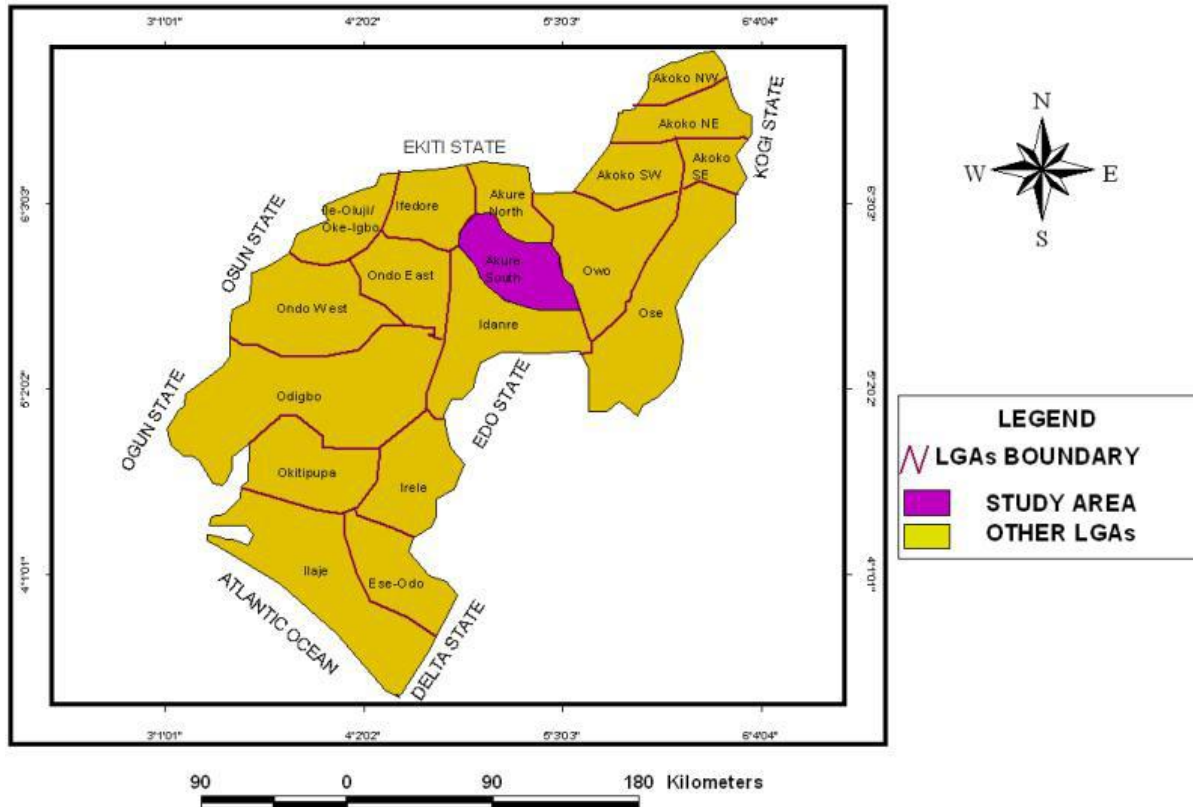
In Nigeria, flooding has become a persistent issue in urban areas, resulting in significant property damage and loss of life. This problem is not limited to low-lying coastal regions but also affects wetlands and inland areas. The combination of rapid population growth and urbanization has intensified pressure on available land, leading to widespread encroachment into river basins. Poor drainage systems, compounded by the misuse of drains as dumping grounds, have caused blockages, redirecting runoff water onto roads and adjacent lands. Environmental challenges we face today can often be traced back to historical and ongoing human activities. As cities around the world attract more residents, the high population densities place immense strain on both urban areas and their surrounding landscapes. To accommodate growing populations, natural and cultural landscapes are often altered, hilly areas are levelled, valleys filled, beaches reclaimed and wetlands converted for development. These modifications frequently result in the creation of new man-made lands that may not be suited to support the structures built upon them. Oriola (2000) notes that while floods are environmental phenomena, human mismanagement of the environment often exacerbates the problem.

In Akure, a city with a long history of flood-prone areas, accelerated population growth and changes in land use have exacerbated flooding issues. Despite the frequent occurrence of floods, government and relief agencies have primarily focused on rescue operations and providing aid, with little effort directed towards preventing floods or mitigating their risks (Jeb and Aggarwal, 2008). Given the severe impact of flooding, there is an urgent need to identify its underlying causes and develop preventing strategies to address future occurrences. This study aims to evaluate the flood situation in Akure and propose measures to reduce the incidence and impact of flooding in the area.

### **Materials and Methods**

## Study area

Akure is a city in South-West of Nigeria and capital of Ondo State. The region lies within Latitude 7°15' N and longitude 5°15' E. The area is located within the humid tropical climate of the forest region, which experiences two climatic seasons namely the rainy season (April-October) and the dry season (November-March). The area is underlain by the basement complex rocks of the Southwestern Nigeria.



## Research Design

The data was gathered from primary and secondary sources. The primary source of data was gathered through the use of 300 questionnaire. The sampling technique adopted for the study is random sampling techniques. Documentary data was also acquired from books and public journals, the internet, newspapers and magazine and other published and unpublished records from government organizations and agencies. Simple descriptive, analytical and statistical tools such as tables, percentage and frequencies were used in data analysis.

## Results and Discussion

### Flood Occurrence in the Study Area

Findings showed that 9.3% of the respondents stated that flood occurrence is every year, 13% of the respondents stated that flood occurrence is once in two years, 63.7% of the respondents revealed that they experience flood every wet season while 14% of the respondents stated that they experience flood just twice in a year. This suggested that the problem of flooding in the study area occurred every wet season thereby posing threats to lives and properties of the people in the study area (Table 1).

Table 1: Flood Occurrence in the Study Area

Occurrence	Frequency	Percentage
Every year	28	9.3
Once in two years	39	13
Every wet season	191	63.7
Twice in a year	42	14
Total	300	100

Source: Authors' fieldwork (2023)

### **Causative Factors of Flooding**

According to Babatolu (1997), several factors contribute to flooding in Nigerian urban areas, including prolonged rainfall, land use patterns, refuse dumping into water channels, inadequate and poorly maintained drainage systems, topography, urban land surface characteristics, building types and storm basin parameters. Understanding these causes is crucial for addressing the impacts of flooding on lives, property and resources, which in turn affects overall sustainability.

Table 2 indicates that most of the respondents (19.3%) attribute flooding primarily to heavy rainfall episodes. Rainfall intensity and volume are often considered the main causes of flooding in tropical regions, with climatological factors playing a significant role. Additionally, some respondents (18.7%) pointed out that the dumping of refuse into drainage systems is another significant cause. Many residents dispose of their waste in gutter or burn it there, leading to blockages that prevent proper water flow. As a result, even minor increases in water volume can cause these blocked gutters to overflow, leading to localized flooding. Poor waste management exacerbates the flooding problem, as blocked drainage systems overflow more readily during the rainy season (Ojo and Adejagbagbe, 2017).

Increased urban development is also a factor contributing to flooding indicated by some of the respondents (17.7%). Many buildings in the area do not adhere to planning regulations such as the required 30 meter setback, leading to inadequate land use and planning that exacerbates flooding. 16.3% of respondents considered inadequate drainage systems as a cause of flooding in the area. Inadequate drainage systems are significant human-induced factor worsening flooding in Akure. Many residential areas lack proper drainage systems and rely on natural channels, which are often obstructed by construction, leading to increased flooding during the rainy season. Additionally, impervious urban surfaces (15%) contribute to flooding by preventing water from being absorbed into the ground while 13% of the respondents indicated that lack of pre-flooding warning is also a factor.

Table 2: Causative Factors of Flooding in the Study Area

Causes of Flooding	Frequency	Percentage
Heavy rainfall	58	19.3
Impervious surface	45	15
Inadequate drainage systems	49	16.3
Dumping of refuse in drains and drainage paths	56	18.7
Lack of pre-flooding warning	39	13
Increase in development	53	17.7
Total	300	100

Source: Authors' fieldwork (2023)

### **Preventive Measures**

- Reduction of Impervious urban surfaces: in urban areas, the prevalence of impervious surfaces such as concrete and asphalt prevents natural greening and inhibits rainfall from seeping into the ground. This lack of percolation contributes to flooding even during moderate rainfall. By reducing the extent of impervious surfaces, more rainwater can be absorbed into the soil which will help decrease flooding by reducing surface runoff.
- Enforcement of setback regulations: it is crucial to enforce setback regulations for buildings situated near rivers and valleys. Local governments should be given the authority to oversee and regulate the construction of residential and commercial properties to ensure compliance with these regulations thereby protecting these vulnerable areas from encroachment and potential flood damage.
- Proper waste disposal education: Current practices in the study area show that residents often discard refuse into drainage systems particularly during rainy periods. This behaviour should be addressed through public education campaigns that promote proper waste disposal methods and highlight the health risks associated with improper waste management.
- Upgrading drainage infrastructure: to manage stormwater effectively, it is essential to repair and construct drainage systems as needed. A well-designed drainage infrastructure capable of handling heavy localized rainfall should be developed by both state and local governments. Improving drainage systems will enhance their ability to manage surface runoff and mitigate flooding.
- Implementation of early warning systems: Early warning systems are vital for effective flood management and preparedness. According to Robinson et al. (2023), meteorological forecasting and real-time monitoring are key to issuing timely flood warnings, which can significantly reduce both casualties and property damage by enabling communities to take precautionary measures.

### **Recommendations**

Based on the study's findings, this paper suggests several solutions to address and mitigate flood-related issues in the study area. The recommended measures are as follows:

1. **Infrastructure Development:** The government should prioritize the provision of standard infrastructural facilities, including effective surface drainage systems and a reliable potable water supply. This will support both immediate flood relief and long-term prevention.
2. **Public Education:** Organize public enlightenment campaigns to raise awareness about the dangers of flood disasters, emphasizing the negative impact of littering in drainage systems and river channels. Additionally, establish government information programs to guide the public on effective flood response.
3. **Road Network Upgrades:** Address the inadequacies in the road network by constructing wide and deep drainage systems capable of handling heavy rainfall. The state and local governments should collaborate on this infrastructure enhancement.
4. **Drainage Improvement:** Necessary repairs and new construction of drainage systems should be undertaken to enhance stormwater management and reduce flood risk.
5. **Funding for Disaster Management:** Ensure adequate funding for disaster management agencies to enhance their operational effectiveness in flood prevention and response.

## **Conclusion**

Flooding in Nigeria is a multifaceted issue influenced by climatic, geographical and socio-economic factors. It is a natural disaster that affects virtually all areas in the world with similar causes. The study discovered that causes of flooding in the study area are heavy rainfall, inadequate drainage systems, dumping of refuse in drains and drainage paths, lack of pre-flooding warning, impervious surface and increase in development. There is an urgent need for government and stakeholders to support town planning, engineering and other professional agencies to combat flooding to avoid long range consequences.

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