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A REVIEW OF URBAN FLOODS AND UNCONTROLLED WASTE DISPOSAL: ANALYSIS OF THEIR OCCURRENCE AND CONSEQUENCES

[1] ALIYU HASSAN

[1]AIR FORCE INSTITUTE OF TECHNOLOGY, KADUNA

Abstract

Urban floods and indiscriminate waste disposal are growing environmental challenges that significantly impact urban areas, particularly in developing countries. Flooding in developing nations is caused by a variety of factors, including unchecked rapid population expansion, inadequate preparedness, lack of political will, heavy precipitation, building on streams, sea level rise, soil moisture regime, and dam operations, particularly near borders This review explores the interconnectedness between poor waste management practices and the increasing frequency of urban flooding. Improper disposal of solid waste, including plastics and other non-biodegradable materials, often clogs drainage systems, leading to blockages that exacerbate flood risks during heavy rainfall. The study examines the occurrence of such floods and their social, economic, and environmental consequences, highlighting the role of ineffective waste management policies and infrastructure. Furthermore, it identifies key strategies to mitigate the impacts, including improving waste management systems, enhancing urban planning, and promoting public awareness. The findings emphasize the need for integrated approaches to address both waste disposal and flood prevention in urban settings.

Keywords: Urban floods, Indiscriminate waste disposal, Solid waste management, Drainage blockages, Flood risk, Environmental impact, Waste management policies

1.0 INTRODUCTION

1.1 BACKGROUND

Urban flooding has become a recurrent issue, especially in fast-growing cities with inadequate infrastructure. While climate change and excessive rainfall contribute to this phenomenon, poor waste disposal practices have also emerged as a significant factor. Uncontrolled waste disposal, particularly of non-biodegradable materials such as plastic, often blocks drainage channels, making urban areas more vulnerable to floods.

Worldwide, flooding is thought to be the most destructive natural disaster (Komolafe et al, 2015). Flooding is the result of excess water flooding onto normally dry terrain (Djimesah et al 2007), such as when rainfall exceeds the soil's capacity to absorb it. This has serious negative effects on the environment (Nwachukwu et al 2018). According to Peduzzi et al. "the rate of flood occurrence in recent times has been unprecedented, with over 800 million people living in flood-prone areas and 70 million people globally exposed to flooding every year." (Peduzzi et al 2009). "1.47 billion people, or 19% of the world population, are directly exposed to substantial risks during 1-in-100year flood events," according to Rentschler and Salhab's (Rentschler and Salhab's 2020) estimate.

Flooding in developing nations is caused by a variety of factors, including unchecked rapid population expansion, inadequate preparedness, lack of political will, heavy precipitation, building on streams, sea level rise, soil moisture regime, and dam operations, particularly near borders (Adetunji and Oyeleye 2013, Hunt 2005).

The research would finally, offers insights into possible interventions, including improved waste management systems, infrastructure development, and increased public awareness.

1.2 OBJECTIVES OF THE STUDY

i. To review the occurrence and causes of urban floods linked to poor waste management.

ii. To explore the social, economic, and environmental impacts of floods exacerbated by indiscriminate waste disposal.

iii. To propose actionable solutions for mitigating urban floods through improved waste management and urban planning.

2.0 LITERATURE REVIEW

2.1 URBAN FLOODS

Urban flooding is defined as the overflow of water in densely populated areas, primarily due to insufficient drainage infrastructure. According to recent studies, the frequency and intensity of urban floods have increased due to factors such as rapid urbanization, climate change, and improper land use planning.

According to Pagasa. dost (2013), flooding is a "natural hydrological phenomenon and its occurrence is usually the aftermath of metrological events such as seismic activities, astronomically influenced phenomena (high tides coinciding with high rainfall), construction of temporary dams, as well as the failure of hydraulic and other control structures." Among the most catastrophic natural disasters in the world, flooding, particularly river floods, claims more lives and damages more property than any other natural occurrence (Adeaga, 2008).

2.2 INDISCRIMINATE WASTE DISPOSAL

Indiscriminate disposal of waste, particularly solid waste, is a common practice in many urban areas. This includes illegal dumping in rivers, streets, and open spaces, which often leads to clogged drainage systems. The proliferation of non-biodegradable materials like plastics, which do not decompose easily, makes the situation worse by causing long-term blockages.

It is not unusual for certain locals to take advantage of the rainy season to get rid of their trash. Researchers have also seen firsthand how locals dispose of their garbage in canals and drains whenever it starts to rain (Egbinola et al 2017). This garbage obstructs rainwater's natural flow, which overflows and floods the surrounding area.

Solid waste frequently clogs the nation's drainage infrastructure, raising the risk of flooding everywhere (Echendu 2023, Nkwunonwo et al 2016). It is customary to dispose of household waste into drains, particularly in open areas or after a rainstorm (Eneji et al 2016, Nkwunonwo et al 2016). Even while there is some knowledge among individuals regarding the connection between careless waste disposal and flooding, the lack of options serves to perpetuate the widespread attitude toward bad trash disposal (Lucas 2021). The concept of disposing of waste, namely urban waste, into rivers, streams, and artificial drainage channels is a significant contributing factor to flooding and warrants careful examination.

2.3 IMPACT OF WASTE DISPOSAL ON URBAN FLOODS

Various studies highlight a direct correlation between poor waste management and increased flooding risks. Drainage systems, meant to carry rainwater away, are often blocked by solid waste, leading to water accumulation and subsequent flooding. A lack of adequate waste management infrastructure, combined with population growth, has exacerbated the problem.

3.0 METHODOLOGY

3.1 RESEARCH DESIGN

This study adopts a qualitative approach, involving a review of existing literature, reports, and case studies from urban areas prone to flooding. The research examines how waste management practices influence flood risks and what interventions have been implemented in various cities.

3.2 DATA COLLECTION

Data were collected from a variety of sources, including academic articles, government reports, and case studies of cities that have faced urban flooding due to poor waste disposal practices. Cities from both developed and developing nations were considered for comparison.

3.3 CASE STUDIES

Key case studies included:

Lagos, Nigeria: where recurrent flooding is linked to poor waste management and inadequate drainage systems.

Mumbai, India: where urban floods are exacerbated by blocked drainage caused by non-biodegradable waste.

Manila, Philippines: where floods and improper waste disposal have led to severe economic losses and health risks.

In cities like Lagos, Mumbai, and Manila, there is a clear link between waste disposal practices and urban flooding. Blockages in drainage systems have been identified as the leading cause of water accumulation during heavy rainfall. In all cases studied, waste management systems were found to be insufficient to handle the growing waste volumes, contributing to the increased flooding risks.

4.0 FINDINGS

4.1 OCCURRENCE OF URBAN FLOODS DUE TO WASTE DISPOSAL

The main causes of flooding in Nigeria and Ghana, according to Echendu (Echendu 2021), are anthropogenic and exacerbate the consequences of heavy rainfall; however, the effects of these can be lessened by risk-management techniques and infrastructure planning.

The Nigeria Hydrological Services Agency lists the following as the main factors contributing to flooding in the country in its annual flood outlook (Nigeria Hydrological Services Agency, 2020) : soil moisture, extreme weather brought on by climate change, the state of dams, particularly those along the country's borders, and terrain.

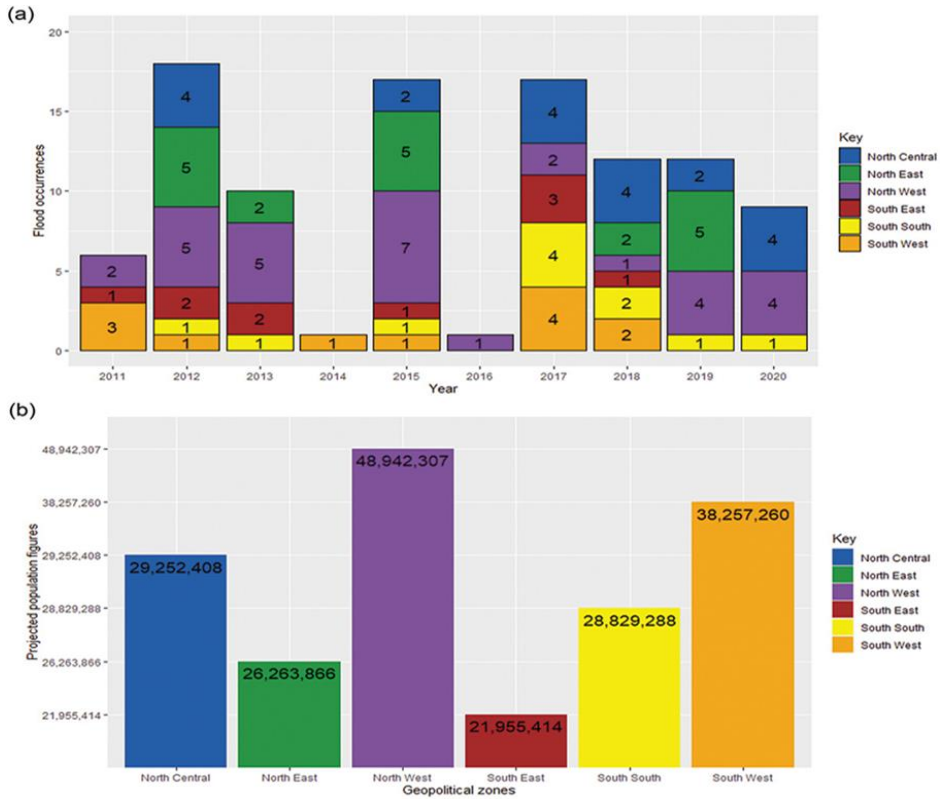
4.2 IMPACTS OF FLOODING IN NIGERIAN

Nigerians have seen two significant floods in the past 50 years: in 2012 and in 2018 (Maiduguri Flood September 2024 more than 414,000 people are affected, 37 deaths, 58 people injured reported cause by heavy rain and structural damage of Alau Dam in Kondugal LGA the dam collapse caused flash flood)

Due to days of intense rain throughout the nation and the release of excess water from the Lagdo Dam, which is located in northern Cameroon to the east of Nigeria and is utilized for agriculture and energy generation, Nigeria saw its worst flooding in more than 40 years in 2012. Of the 32 states, 24 were badly impacted by the incident. Over 7 million people were impacted by the floods, which happened in July and October of that particular year .

Year	Numbers of People Affected		Value of Damages ('000 US$)		Numbers of Deaths	
	Nigeria (% contribution in Africa)	Africa	Nigeria (% contribution in Africa)	Africa	Nigeria (% contribution in Africa)	Africa
2011	30,915 (2.19)	1,414,579	4,500 (0.45)	1,006,500	174 (25.89)	672
2012	7,000,867 (75.26)	9,302,672	500,000 (49.45)	1,011,115	363 (42.81)	848
2013	81,506 (3.48)	2,345,261	--	147,024	19 (2.59)	735
2014	10,000 (1.05)	948,522	--	126,000	15 (3.02)	496
2015	100,420 (3.99)	2,519,490	25,000 (5.46)	458,000	53 (6.40)	828
2016	12,000 (0.88)	1,369,507	--	295,700	18 (1.91)	943
2017	10,500 (0.66)	1,595,141	--	12,000	20 (5.67)	353
2018	1,938,204 (56.09)	3,455,250	275,000 (35.80)	768,100	300 (40.43)	742
2019	123,640 (2.74)	4,516,338	--	57,100	36 (3.94)	914
2020	193,725 (2.95)	6,575,132	100,000 (22.52)	444,000	189 (14.09)	1,341
Total	**9,501,777** (27.91)	**34,041,892**	**904,500** (20.91)	**4,325,539**	**1,187** (15.08)	**7,872**

Table 1 shows the total number of flood incidents by Nigerian state from 2011 to 2020. Data taken from (Centre for Research on the Epidemiology of Disasters, 2021) as the source.



In Figure (a), the frequency of major flood occurrences in Nigeria between 2011 and 2020 is represented by a stacked bar chart by geopolitical zone (Source: data compiled from the Centre for Research on the Epidemiology of Disasters (accessed 21 January 2021); the projected population figures for 2016 are represented by a bar chart by geopolitical region (Source: National Population Commission demographic statistics bulletin). Federal Capital Territory (FCT) is included in the North Central zone for the purposes of this calculation.

The National Population Commission's estimated 2016 population data are displayed in Figure (b) taken from the demographic statistics bulletin. (National Bureau of Statistics, 2018). With an estimated 49 million inhabitants, the North-West zone—where flooding occurs most frequently—has the largest projected population in the nation, followed by the South-West with 38,257,260. With an estimated population of 22 million, the South-East zone had the lowest population projection while experiencing the fewest floods. Due to its higher projected population size (as of 2016) and higher frequency of flood occurrences over the past ten years, the North-West zone should therefore receive higher priority for flood mitigation measures.

4.3 IMPACTS ON SOCIETY AND ENVIRONMENT

Economic Impact: Urban floods lead to significant economic losses, including damage to infrastructure, homes, and businesses. Recovery costs for flood-affected areas are high, placing a burden on local governments and individuals.

Social Impact: The social implications of urban flooding include displacement, loss of livelihoods, and increased health risks due to waterborne diseases. Communities living in low-lying areas and informal settlements are particularly vulnerable.

Environmental Impact: Frequent urban flooding leads to environmental degradation. Floodwaters often carry waste and pollutants into rivers and oceans, damaging ecosystems and marine life.

4.4 INADEQUATE WASTE MANAGEMENT POLICIES

The research reveals that most cities experiencing urban floods have inadequate waste management policies and weak enforcement. Waste segregation, recycling, and efficient disposal are often lacking, and many cities rely on outdated waste management systems that cannot cope with current demands.

5.0 DISCUSSION

5.1 THE ROLE OF URBAN PLANNING

Poor urban planning is a significant contributor to urban flooding. Cities that have rapidly expanded without proper drainage and waste management systems are particularly vulnerable. Inadequate zoning and land-use planning, combined with the encroachment of natural water bodies, have made cities more prone to floods.

5.2 WASTE DISPOSAL PRACTICES

Effective waste management is critical in preventing urban flooding. Public awareness campaigns, waste segregation at the source, and the development of better waste collection and recycling systems are essential to reduce the burden on drainage systems.

5.3 CLIMATE CHANGE AND FLOOD RISKS

Climate change, with its increased rainfall and extreme weather events, has made urban floods more frequent. The need for cities to adapt their infrastructure to cope with these changes is becoming increasingly urgent.

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The study concludes that urban flooding is closely linked to indiscriminate waste disposal practices, particularly in cities with poor waste management systems. The impacts of these floods are far-reaching, affecting economic stability, social well-being, and environmental sustainability.

6.2 RECOMMENDATIONS

Improved Waste Management Systems: Cities must invest in modern waste management infrastructure, including waste segregation, recycling programs, and proper disposal methods.

Urban Planning Reforms: Urban areas should be redesigned to accommodate proper drainage systems, and natural water bodies should be protected from encroachment.

Public Awareness: Increased efforts to educate the public on the importance of proper waste disposal and the consequences of blocked drainage systems are essential.

Policy and Enforcement: Governments should implement stricter regulations and ensure their enforcement to prevent illegal dumping of waste, especially in waterways.

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