



Ineffective development control and flood susceptibility in Lokoja, Nigeria

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General Note

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ABSTRACT

This paper examines the ineffectiveness of development control measures in addressing flood susceptibility in Lokoja, Nigeria. In carrying out this study, buildings susceptible to flooding were identified and factors influencing their vulnerability were determined. As part of this study, a total of 285 questionnaires were administered to residents of the study area. Random-stage sampling techniques were adopted. A quick bird eye image of 20 meter resolution was used to identify and map out the buildings in the area considered vulnerable to flooding using a 100 meter setback from the river banks, as prescribed by the state town planning board. The study reveals that 1,201 buildings were built in breach of building development standards of Lokoja, while building along river

bank was found to be strong factors influencing susceptibility to flooding in the area. The study also revealed that 23.5% of buildings in Lokoja were developed on marginal land, amidst other factors. The study recommends that development control measures should be strictly enforced by the Kogi State Town Planning Development Board.

Keywords: Flood, Susceptibility, Development control, Lokoja

1. INTRODUCTION

Developing countries', including Nigeria has in fact been experiencing rapid urbanization in the recent decades. This disturbing rate of urbanization experienced in these countries usually are supplemented with oodles of challenges (Adetunji & Oyeleye, 2013), specifically in urban areas with weak adherence to physical planning standards. Death of critical infrastructures, poor environmental management and sanitation practices, housing deficiencies and multiplication of improperly erected housing structures and informal settlements are some of the challenges that are associated with urbanization (Junaid, 2017). Flood incidence has become perennial in many cities of the developing countries, in which numerous lives and property valued millions of US Dollars are lost yearly, in addition to the displacement of numerous socio-economic activities (UN-Water, 2011). However, many state capitals and cities are constantly dealing with many of these problems, most especially the danger of poor waste management practices and flooding (Potschin, 2009) which appeared to have despoiled many of the solutions adopted over the years (Nkwunonwo, 2016).

Lokoja is one the neighboring urban settlement bordering Abuja, Nigeria's federal capital city, which delivered residency to countless numbers of low income workers in Abuja who could not manage to pay the excessive rent of housing charged. Accordingly, Lokoja became a sanctuary to a number of helpless low-income groups. This has led to the development of all forms of substandard housing structures, sometimes on marginal lands and are most times built without a planning permit (Salami, 2019).

According to Aderoju *et al.*, (2014), a large percentage of the landmass of Lokoja was inundated by the 2012 flood in which over 96 people were killed and properties worth millions of naira were destroyed. Also in about 5 years after (July, 2017), 18 people were recorded to have lost their lives as a result of flood event and properties worth of tens of millions naira were wrecked. Similarly, hundreds of people were made homeless by the flood event. The cause of the devastating flood event was attributed to blockage of drainages with solid waste and buildings erected along water channels (Bwala *et al.*, 2015). Building professionals also vied that, drainages obstructed by solid waste would keep flood plain soil inundated and as such erected buildings erected along these channels would, become vulnerable to flooding at the slightest rise in water flow rates (Bwala *et al.*, 2015).

However, urban planners viewed the perennial flood experienced in Lokoja and also in other urban centres in Nigeria, was human induced and could be linked to the poor implementation and enforcement of 1992 Nigeria Urban and Regional Planning Law (Mohammed, 2018) where development control requirements were clearly stated. Mohammed (2018) further argued that if various development control instruments were effectively deployed, the incidence of flood experienced in Lokoja would have been prevented.

Part two of the 1992 Nigerian Urban and Regional Planning Law (FGN, 1992), subsection 31 (a) suggested that development should be disallowed if not in accordance with an approved plan. While subsection 31 (e) of the same Part postulated that, any building that creates a nuisance to the inhabitants of the community or contains such additional facilities that are not, in the estimation of the physical development plan for the community, should not be approved by the planning authorities. These provisions indicates that, when development control tools are strictly enforced by planning authorities, buildings on marginal land or along waterways would be non-existent. It is against the above-mentioned that this study examines development control as a tool for addressing or and preventing urban flood in Lokoja, Nigeria.

Study Area

Lokoja is located within latitudes 7° 45' N and 7° 51' N and longitudes 6°41'E and 6°45'E. It is the administrative headquarters (Capital) of Kogi State situated at the confluence of the Niger and Benue rivers within the lower Niger trough with an estimated area of 63.82 sq. km (Figure 1). The status of Lokoja as an administrative headquarters of Kogi State brought some institutions like the Federal University, Lokoja, Kogi State Polytechnic, the Federal Medical Centre, Kogi State Specialist Hospital and a host of other institutions in the city. Lokoja is one of the ancient towns in Nigeria. Lokoja Local Government Area has a population of 196,643 (NPC, 2006). It is a rapidly growing medium-sized city whose growth was in part attributed to its closeness to Abuja, the nation's capital city with a distance of about 152 kilometers.

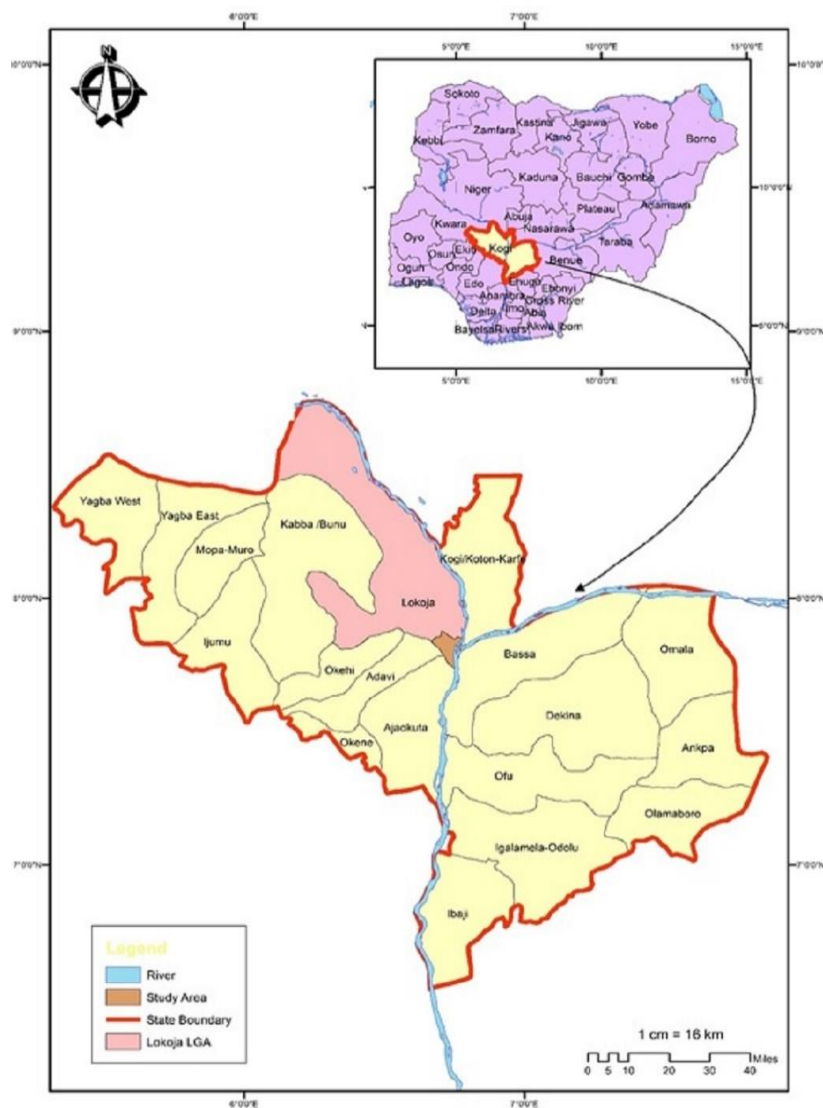


Figure 1 Map of Study area in the context of Kogi State, Nigeria (Source: Kogi State Town Planning Development Board)

Conceptual and Theoretical Framework

Theory of resilience

As defined by Holling (1973) resilience is the system's ability to absorb disturbances and without losing its original characteristics. Persistence is the chief focus of the ecological concept, or remaining within the same regime defined by the same structures, processes, identity, and feedbacks (Walker et al., 2004).

The resilience theory was applied to this study because it would help the populace, stakeholders and concerned agencies in being proactive in addressing flood risk and vulnerability. Also, policy makers, academia, and urban planners would understand and be aware of the likely causes of disasters (both man-made and natural) and how these issues can better be mitigated, monitored and managed. This is because, the theory of urban resilience promotes the concept of awareness, detection and avoidance, and proper sensitization of the public on the intending danger associated with building along waterways and indiscriminate solid waste disposals most especially in drainages in the study area (Walker et al., 2004).

Concept of Vulnerability

In 2004, the International Strategy for Disaster Reduction (ISDR) described vulnerability as the conditions influenced by social, environmental, economic and physical processes or factors, which increase the susceptibility of a community to environmental hazards. The concept explains which of the factors is more relevant to community vulnerability. What this implies is that, a particular community could be susceptible to flooding because of its physical and social circumstances. The poor and the marginalized segments of the population have been identified as the most vulnerable group of people to the event of flooding (ISDR, 2004). It is,

therefore, essential to emphasize that no proper or effective flood control measures can be placed without first identifying elements that are vulnerable and the causes of their vulnerability.

2. METHODOLOGY

Data for this study were collected from both primary and secondary sources. To determine the buildings susceptible to flooding and those that contravened development control measures, a high resolution satellite image (Quick Bird) of 15-meter resolution was acquired through "SAS Planet" application. The analysis was performed using the analysis tool in the Arc toolbox of ArcGIS 10.2 software. Buildings that falls within the buffer line were digitized on ArcGIS 10.2 and their actual numbers were determined on the attribute table created for the buildings. Due to the large area coverage of Lokoja settlement and for visibility sake, two sections (X-X and Y-Y) were exported differently from ArcGIS 10.2. The Digital Terrain Model of Lokoja was produced through the interpolation of the contours of the study area; hence a vulnerability map was produced for the study area. Data collected through the Kobo collect tools box were downloaded in excel format and cleaned, and then imported into SPSS 16.0 software and a descriptive statistic was carried out on the collected data.

Data on development control standards, particularly those relating to setbacks for rivers and canals were obtained from the Kogi State Town Planning Development Board (KSTPDB). Also, data relating to request and issuance of development permits were obtained from the Kogi State Town Planning Development Board (KSTPDB). As part of measures of assessing flood susceptibility in Lokoja, oral interviews were held with a few urban planning officials on their activities and challenges, while questionnaires were administered to selected residents using Kobo Collect, to obtain relevant data. A sample size of 285 residents representing 1% of the 28,480 total numbers of residents in Lokoja rural was sampled.

3. RESULTS AND DISCUSSIONS

Socio-economic characteristics

The field survey revealed (Table 1) that the study area was dominated by male with more than half of the population (57.5%). This implies that there are more male dominated households in the study area. This attests to the findings of Salami (2019) that, male-dominated households were commonplace in Lokoja.

The study also reveals that the study area was dominated by people between the age group of 20 to 29 years resulting to about 29.1% of the total respondents, 26.7% were between the age of 30 to 39 years, 24.2% were between the age of 40 to 49 years, 11.9% were between the age of 50 to 59 years, while 4.2% and 3.9% were between the age group of less than 20 years and above 60 years respectively.

By and large, the respondents earn above Nigeria minimum wage (₦18, 000) as at the time this study was carried out. Table 1 shows that about 30.9% of the respondents' monthly income was between ₦ 60,000 - ₦ 79,000, 22.8% monthly income was between ₦40,000 - ₦ 59,000, 19.6% monthly income was between ₦ 20,000 - ₦ 39,000, 15.5% earns between ₦ 80,000- ₦ 99,000 monthly, just 7% earns below ₦ 19,000 monthly while 4.2% monthly income was greater than ₦ 100,000. The study further revealed that, civil service and trading are the most common occupation in the study area with 28.8% and 24.2% of the total respondents respectively.

Table 1 Socio-economic Characteristics of Respondents

Sex of Respondents	Frequency	Percent
Male	164	57.5
Female	121	42.5
Age of Respondents		
< 20	12	4.2
20-29	83	29.1
30-39	76	26.7
40-49	69	24.2
50-59	34	11.9
>60	11	3.9
Occupation		

Trading	69	24.2
Retiree	16	5.6
Unemployed	5	1.8
Others (Specify)	8	2.8
Fishing	18	6.3
Lumbering	9	3.1
Farming	25	8.8
Civil Servant	82	28.8
Student	32	11.2
Sand mining	13	4.6
Artisan	2	0.7
Driver	6	2.1
<hr/>		
Income		
<hr/>		
< N 19,000	20	7
N 20,000-N 39,000	56	19.6
N 40,000-N 59,000	65	22.8
N 60,000-N 79,000	88	30.9
N 80,000- N 99,000	44	15.5
> N100,000	12	4.2

Source: Authors' Field Survey

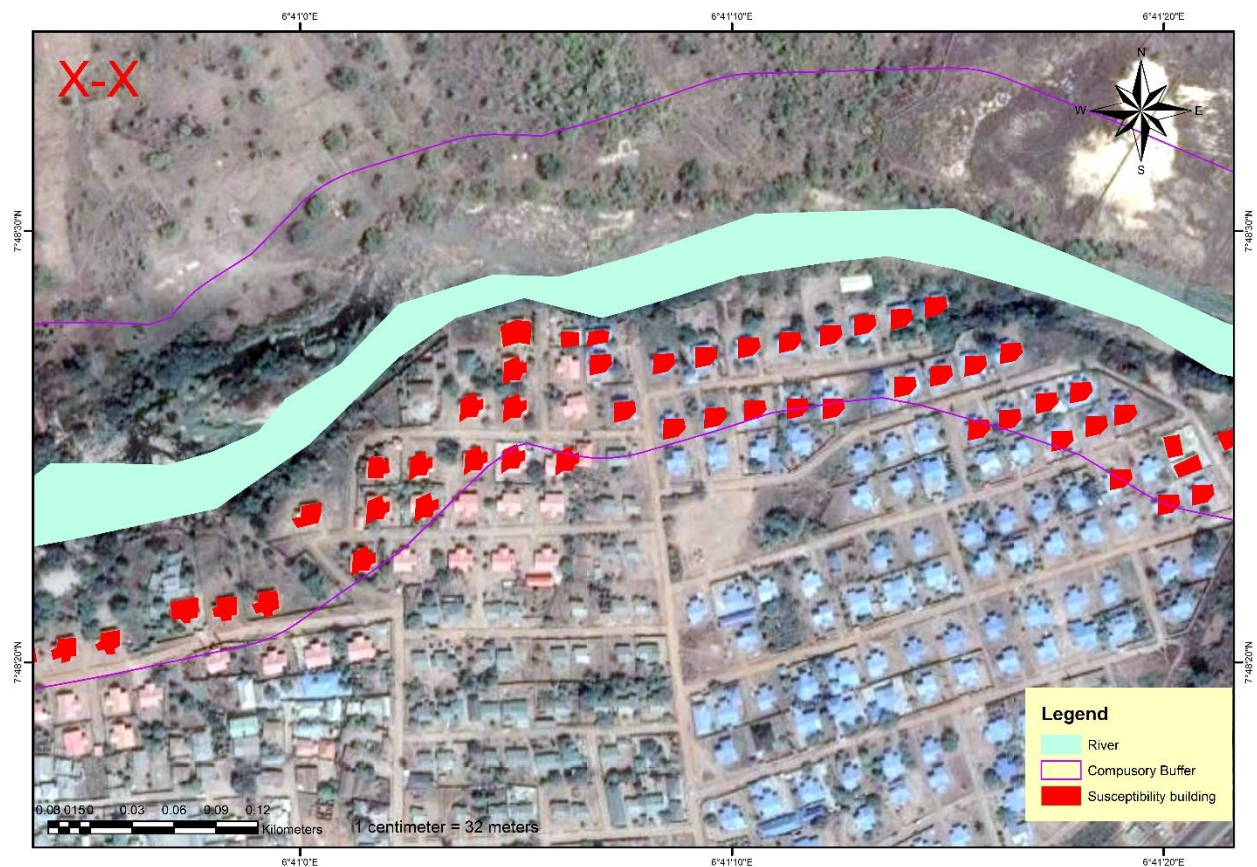


Figure 2 X-X section of the Susceptible/Contravening Buildings in Lokoja (Source: Authors' Field Survey)

Flood Susceptibility

In order to determine buildings susceptible to flood in Lokoja, a buffer of 100 meters as stated by the Kogi State Town Planning Development Board (KSTPDB) was created along the river channels. As such, buildings that fell within these buffer zones were mapped and were in violation of stated development setback and as such susceptible to flood. The analysis therefore revealed that a total of 1,201 buildings were built in violation of stated development control standards. The violations and buildings at risk to flooding are represented in red color as seen in Figure 2 and 3.

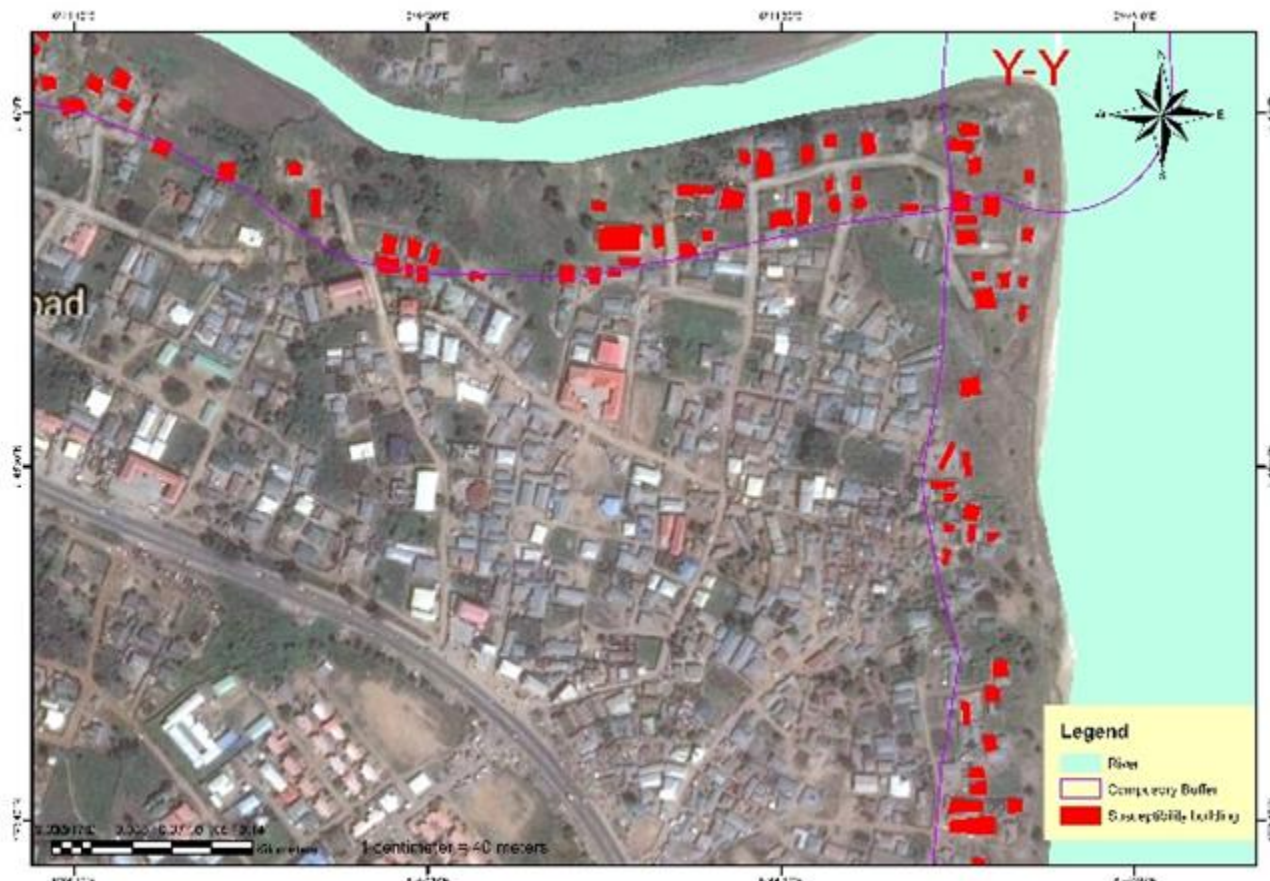


Figure 3 Y-Y section of the Susceptible/Contravening Buildings in Lokoja (Source: Authors' Field Survey)

The numerous number of buildings structures constructed in contravention of existing building regulations standards in the study area were attributable to laxity in enforcing development control measures by the town planning officers as well as the administrative bottlenecks involved in the building approval process by Kogi State Town Planning Development Board (KSTPDB). The board revealed that not more than 15% of submitted building plans were approved annually. This has forced developers to proceed with their building development irrespective of the apparent consequences of such actions (including susceptibility flooding).

The Digital Elevation Model (DEM) analysis reveals that the elevation of Lokoja ranges from 404 above sea level to -47 below mean sea level (Figure 4). The neglect of development control regulations contributed to the rise of buildings development on marginal land portions and flood-prone areas. Figure 5 shows a section of the susceptibility map of Lokoja. The areas of the study, considered vulnerable to flooding were thus classified into three based on their relative proximity to the river channels. These are low flood risk areas, moderate flood risk areas and high flood risk areas. Low flood risk areas are less than 2% susceptible to flood, while the moderate flood risk and high flood risk areas are 35% - 65% and more than 65% susceptible to flood respectively.

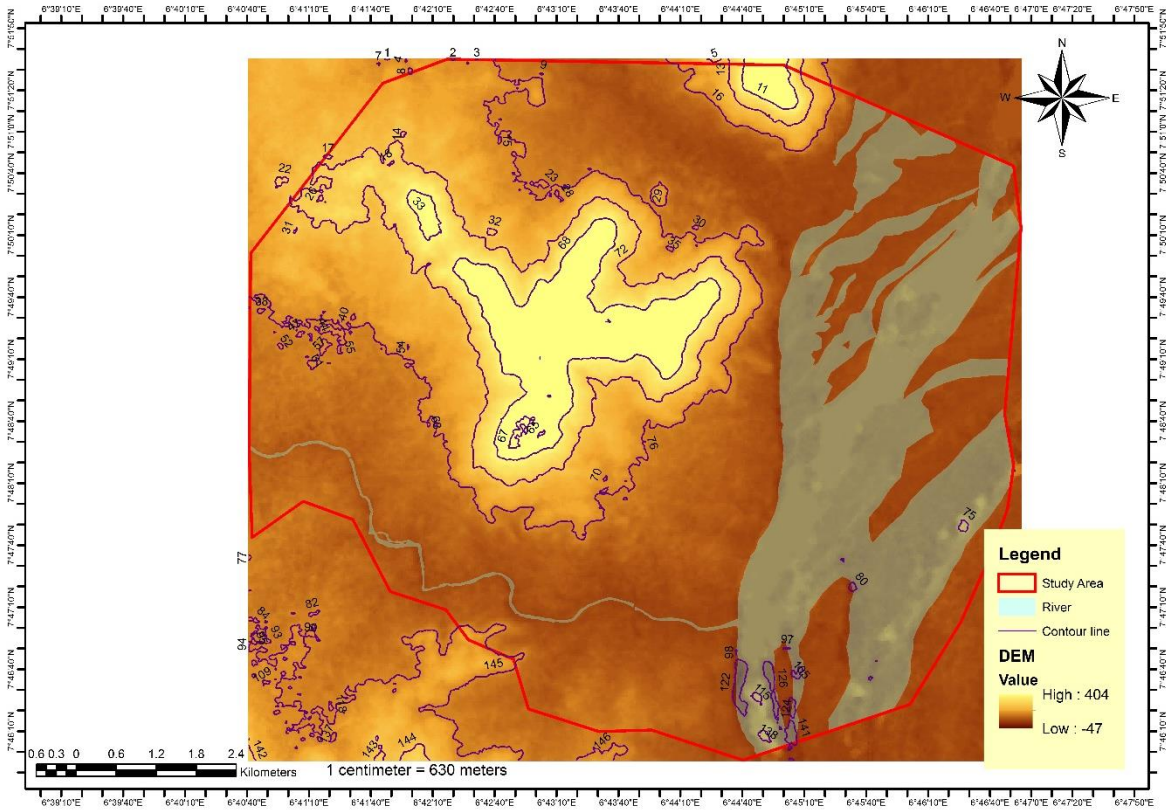


Figure 4 DEM and contour map of Lokoja (Source: Authors' Field Survey)

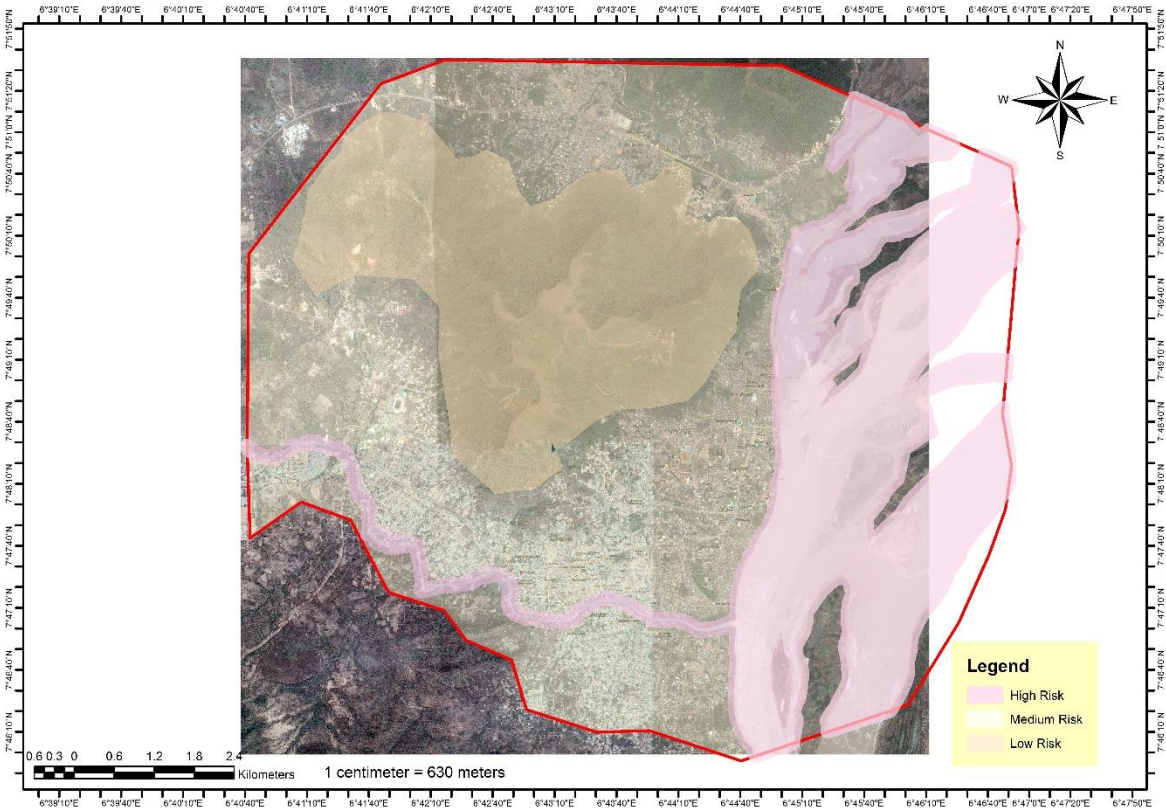


Figure 5 Vulnerability Map of Lokoja (Source: Authors' Field Survey)

Flood Susceptibility Factors in Lokoja

The identified flood susceptibility factors as identified in the study area includes; poor drainage system, cultural beliefs, indiscriminate waste disposal methods on waterways, building on marginal land portions and building along the river banks. Table 2 reveals that 49.8% of the respondents were of the view that building along river banks was a strong factor of flood susceptibility; On the other hand, 22.8% of the respondents revealed that poor drainage system is also an influencing factor. 23.5% of the respondents were of the view that flood susceptibility in the area was also influenced by building on marginal lands which confirms the findings of (Salami, 2018). Salami (2018), stated that many of the victims of the 2017 flooding in Lokoja were residents who lived in houses built along the river banks

Table 2 Factors Influencing Flood Susceptibility in Lokoja

Responds	Respondent	Percentage (%)
Poor Drainage System	65	22.8
Cultural Beliefs	2	0.7
Indiscriminate Waste disposal on water ways	9	3.2
Building on Marginal Lands	67	23.5
Building along River banks	142	49.8
Total	285	100

Source: Authors' Field work

4. CONCLUSION AND RECOMMENDATION

With the results of flood susceptibility assessment in the study area, it would be important to intensify development control measures on marginal lands and flood plains. Also, concerned ministries and agencies should be proactive in flood control and management in areas with high and medium flood risk. This would at least increase the adaptive capacity of such areas against future flood events. As such the study therefore recommends the following:

- Buildings built in contravention of development control laws should be marked and demolished as stipulated by the Town Planning Law of 1999. This Act will serve as a wakeup call to the public on the need to strictly adhere to development control measure.
- Regular inspection exercises to development sites by the town planning officials and planners should be cautioned on the dangers of all forms of indiscipline.
- Kogi State Sanitation Board (KSSB) should sensitize the residents of Lokoja on the dangers of indiscriminate solid waste disposal especially on waterways. As it would go a long way in reducing flood susceptibility in the study area, also across the State.

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