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Exploring The Nexus Between Vulnerability and Urban Planning Practices in Flood-Prone Neighbourhoods of Lokoja, Kogi State, Nigeria

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ABSTRACT

Flooding remains one of the most pervasive environmental hazards in Nigeria, with Lokoja urban area frequently experiencing this devastating event. This study investigates the relationship between vulnerability and urban planning practices in selected flood-prone neighbourhoods of Lokoja: Sarkin Noma/Galilee, Kabawa/Adankolo, Phase I/Old Poly Quarters, Gadumo, and Ganaja. Using a purposive sample of 250 respondents proportionally drawn from a population of 91,435. Questionnaires administration to households, built environment professionals and other stakeholders were employed to elicit data for the study. A composite vulnerability index (CVI) was constructed from exposure, sensitivity, and adaptive capacity indicators. Results reveal that vulnerability levels vary across neighbourhoods, with Ganaja and Gadumo showing higher CVI scores due to poor housing conditions, weak compliance with planning regulations, exposure, and socioeconomic pressures. Conversely, Phase I/Old Ploy Quarters recorded relatively lower vulnerability due to better infrastructure, terrain advantage, and enforcement of development control. Also, urban planning institutional capacity framework assessment revealed acute weaknesses in all criteria evaluations for organizational performance. The study concludes that weak institutional capacity and poor implementation of development control policies exacerbate vulnerability to flooding. Strengthening urban governance through capacity building of planning institutions, effective enforcement of land-use regulations, and community-based adaptation strategies are recommended to abate flood related issues in the neighbourhoods.

Keywords: Vulnerability, Development Control, Flooding, Neighbourhoods, Urban Planning

1.0 INTRODUCTION

Flooding has emerged as one of the most significant environmental challenges in urban Africa, and Nigeria in particular disproportionately affecting cities along major river basins (Adelekan, 2016; IPCC, 2022; Alfa & Suleiman, 2022). Vulnerability of settlements to flooding in Nigeria manifest in different dimensions that bears enormous negative consequences on liveability and livelihoods. Over the years, flooding has become a recurring phenomenon that has severely affected numerous people, with devastating consequences. The effects of floods have affected millions of people and caused fiscal losses amounting to billions of US dollars (NEMA, 2013). Floods are among the most destructive natural disasters, causing extensive damage to human lives, property, and the environment (Ibrahim *et al.*, 2024). Specifically, in 2012, the Niger-Benue trough spanning several states in Nigeria suffered flood-related damages to farms, houses, roads, and displaced millions of people with resultant

death toll of about 431 persons killed by flood water (Obeta, 2014). This is perhaps the worst flood hit on Nigeria settlements in more than 40 years with colossal losses that resulted in widespread displacement of households, food insecurity, mortality and economic losses mainly as a result of destruction of farmlands and urban infrastructure.

Studies have associated these flooding implications on the built environment largely to poor urban planning and climate change particularly in increased frequency and intensity of rainfall (ActionAid, 2006; Adeleye & Rustum, 2011; Obeta, 2014). Literature evidences have projected the planning agencies in Nigeria to exhibit utmost disregard to the application of development control measures in tackling impending flood disasters (Obabori, *et al*., 2007; Aluko, 2011; Lekwot *et al*., 2013) Previous studies have also advocated for policies on the proper land use management that offer protection to individual buildings on the flood plains especially to the riverine settlements (Albert *et al.,* 2019). Hassan *et al.* (2024) undwerscores the pivotal role of the application of land use planning standards and regulations as tools to control flood essentially through the use of open spaces to separate high risk development areas from other urban development areas. However, it is evident in Nigeria that rapid urbanization with concomitant multiple challenges has continued to take centre stage without effective urban planning practices. These challenges include acute housing shortages and proliferation of improperly constructed housing structures and informal settlements, poor environmental management and sanitation practices, inadequate critical infrastructure, rising crime rates, and flooding (Okorie, 2015; Kadi *et al*., 2012; Adeleye *et al*., 2019).

Other than natural forces of flooding, aided by climate change induced heavy rainfall, anthropogenic factors of poor sanitary practices of indiscriminate waste dumping and building constructions on wetlands and flood plains creates obstacles for free flow of flood waters (Agbonkhese *et al*., 2014). This has led to increasing household-level vulnerability (Pathak *et al*., 2020) that requires a multifaceted approach for the creation of a resilient community (Otaro, 2025).

A cursory study of the land development practices reveals several contraventions to extant legal provisions and planning regulations that have over the years culminated into periodic flood disaster in the built-up areas of Lokoja urban area. As a riparian settlement located at the confluence of the Niger and Benue rivers, the settlement is highly susceptible to recurrent flooding, with a far-reaching implication for human security, urban infrastructure, and livelihoods (Ajibade *et al*., 2013). The city has experienced severe floods, notably in the year 2012, 2018, and 2022 displacing thousands of residents and disrupting socio-economic activities (NEMA, 2022). Despite multiple interventions, the settlement's flooding situation has persisted over the years with its associated negative consequences aggravated by low perception of coping abilities, resulting in low precautionary measures (Ben-Enukora *et al*., 2025). Studies conducted by Buba *et al.*, 2021 revealed that communities affected are hardly involved in flood research and decision-making and implementation implying a top-bottom approach to flood management.

In spite of the recurrent flood disasters, the settlement continues to expand into floodplains with minimal adherence to planning regulations. Weak enforcement of development control, combined with poverty and

inadequate institutional coordination exacerbates vulnerability. This aligns with the position of the NDP (National Development Plan 2021-205) that weak institutional capacity to manage environmental disasters and disaster management issues is a challenge to deal with climate change related issues in Nigeria. Despite this understanding, no literature evidence has explicitly examined how urban planning practices or lack thereof mediates vulnerability across different neighbourhoods in Lokoja. An inference from this development creates a study vacuum that requires an assessment of the institutional framework empowered by the law to among other responsibilities grant approval for all land development in Kogi state.

This study therefore explores the relationship between vulnerability and urban planning efforts in selected flood-prone neighbourhoods of Lokoja as perceived by residents, built environment professionals, and other stakeholders. By focusing on localized vulnerability assessments, it provides empirical insights into how institutional capacity, socioeconomic conditions, and urban planning intersect in shaping disaster risks.

The specific objectives are to assess the vulnerability levels of selected flood-prone neighbourhoods in Lokoja; examine the capacity of urban planning institutions' framework in influencing vulnerability outcomes; and identifying institutional factors constraining effective development control. The study also put to test the hypothesis that there is no significant relationship between flood vulnerability and urban planning practices in Lokoja.

2.0 Literature Review:

Vulnerabilities of lives and livelihood to climate-related environmental processes are essentially the result of inadequate and unsustainable urban planning practices associated with complex natural settings and societal structures (ActionAid, 2006; Adeleye & Rustum, 2011; Obeta, 2014). Vulnerability to climate change varies significantly from settlement to settlement and even within settlements. The location, urban structure, dominant building type, socio-economic characteristics and institutional capacity are key factors that affect vulnerability and adaptive capacity of a settlement in the urban areas (Storch & Eckert 2009; NISER, 2010). Also, the degree of susceptibility of communities to flood among communities is dependent on the factors that predominate within the community (Ajodo & Olawepo, 2021). Determining the vulnerability of such communities is important for enhancing resilience and facilitating effective disaster preparedness (Islam *et al.*, 2024).

Over the years in Nigeria, urban and regional planning agencies considered physical planning in a narrow and environmentally neutral way. As a result, there is usually a limited attention given to environmental issues in urban growth management process. Focus of physical planning efforts is placed on the physical layout of human settlements where most often permits to developers are issued indiscriminately without a strong ethical and legal basis. Evidences abound that the problems of flooding in many Nigerian urban environments are somewhat traceable to poor development control practices and environmental inconsiderateness (Obeta, 2014). Since physical planning is often perceived by local town planners in terms of ad hoc physical solutions to human settlement problems, it has tended to heighten the problem it is supposed to mitigate. In view of this, the Nigerian urban areas exhibit many of the features associated with urban decay which makes them some of the most

vulnerable cities in the world as demonstrated by the frequent negative impacts of environmental emergencies and extreme weather events (Izeogu, 1986; NISER, 2010; Olorunfemi & Raheem, 2013). Control of development is the statutory responsibility of professional town planners operating in physical planning agencies at the three tiers of government in order to ensure compliance with the approved planning schemes (Ola, 2011). Usually, standards and regulations are prepared along with planning schemes to guide orderly development of land and enforced by control departments in the planning agencies (Ahmed & Dinye, 2011; Lekwot *et al.*, 2013).

Literature evidences have projected the planning agencies in Nigeria to exhibit utmost disregard to the application of development control measures in tackling impending flood disasters; (Aluko, 2011; Lekwot *et al*., 2013). The scenario portrayed neglects in plan preparation and implementation, effective implementation of land use zoning, effective control on contraventions to planning standards, regulations and building codes. This has led to difficulties in checking developments and conservation of flood plains.

The interplay between urban vulnerability and development control is well-documented in global urban studies, but is especially pertinent to African cities prone to climatic hazards. Vulnerability is conceptualized as a function of exposure, sensitivity, and adaptive capacity, with urban poverty, planning deficits, and weak governance repeatedly identified as amplifiers of disaster risk (Turner *et al*., 2003; Pelling, 2011). Urban vulnerability is shaped by exposure to hazards, sensitivity of socio-economic systems, and adaptive capacity of households and institutions (Turner *et al*., 2003).

Development control practices defined as the regulatory mechanisms for guiding land use, building codes, and urban growth are central to shaping vulnerability outcomes (Olokesusi, 2011). This is because it incorporates land-use planning, compliance monitoring, and enforcement that determine the spatial configuration of risk in cities (Birkmann *et al*., 2016). However, weak enforcement, informal settlements, and rapid urbanization undermine the effectiveness of development control in Nigerian cities (Akinmoladun & Adejumo, 2011).

Floods, in particular, are recognized as the most common and destructive natural disasters in Nigeria (Adelekan, 2016), with informality and unregulated expansion into flood-prone areas posing persistent challenges (Douglas *et al.*, 2008). Studies have shown that improved land-use governance and localized enforcement contribute to fewer losses and stronger community resilience (Olokesusi, 2011). Yet, institutional failures, resource constraints, political interference, and public apathy hamper effective implementation (Akinmoladun & Adejumo, 2011).

Efforts to build resilience hinge on integrating local knowledge, community participation, and robust policy frameworks (Ajibade *et al*., 2013). Literature underscores the need for risk mapping, adaptive infrastructure, and multi-level institutional collaboration (IPCC, 2022). Despite abundant evidence favouring proactive development control, on-ground realities in many Nigerian cities are marked by weak governance, corruption, and insufficient technical capacity, revealing a critical disjuncture between policy and practice. This study thus situates itself within this literature, focusing on the empirical realities of Lokoja's evolving urban landscape to offer context-sensitive recommendations.

3.0 Methodology

3.1 Study Area

Lokoja, the capital of Kogi State in Nigeria lies at the confluence of the Niger and Benue rivers. The settlement is located at latitude 7, 8000 (747'60.000"N) and 6, 7333 (643'59.988"E) within the lower Niger-Benue trough. It has an estimated landmass of 63.82 sq. km. The creation of Kogi state on 27th August 1991 with Lokoja as the capital brought an influx of population to the area due to its status as an administrative headquarters (Adeoye, 2012). According to 1991 census, Lokoja had the population of about 77,516 people, which increased to 195,261 in 2006 (NPC, 2006). The increase in human population brought rapid development, which modified land use pattern in the area. The impact of urbanization on flood resilience in the city is visible in encroachment on vulnerable areas of unplanned developments especially on floodplains, wetlands and riverbanks (HBS, 2026). Lokoja urban area comprises Lokoja metropolis and several small size localities within the 16-kilometre radius of Lokoja metropolis. The master plan proposed an area that is bounded by an imaginary circle having a 16-kilometre radius from the General Post Office (its focal point).

3.2 Data Collection Method

Data were collected through two sets of questionnaires administered to 204 household in 6 flood prone neighbourhoods/communities and 25 key informants drawn from the built environment professionals in the Town Planning and Development Board, Bureau of Lands, and other stakeholders (urban planners and allied professionals, technical officers, community leaders and disaster managers).

3.3 Sampling Frame

The household study covers five major flood-prone neighbourhoods/communities and their population distribution as shown in Table 3.1

Table 3. 1: Sampling Frame per Neighbourhood

S/NO.	Neighbourhoods/communities	Population
1.	Sarkin Noma/Galilee	14,217
2.	Kabawa/Adankolo	29,682
3.	Phase I/Old Ploy Quarters	8,093
4.	Gadumo	21,692
5.	Ganaja	17,751
6.	Total	91,435

Source: National Population Commission, 2006

3.4 Sample Size and Distribution

The household questionnaires were administered to household heads that were living, and/or were undertaking economic activities along the riparian buffer of 150m within the last two decades and have experiences of the hazards. Snowball method was used to reach out to people who had relocated, and the simple random method (lottery system) was used to select those living along the riverbank (Deperso, 2018). The sample size was derived based on Yamane's (1967) formula: n = N/(1+N(e2) ..... (1)

Where n = sample size, N= number of households, and e2= margin of error. The sample size was calculated at a confidence interval of 95% with a margin of error (e) = 0.07 (Adjei-Mensah and Kusimi, 2019):

$n = 91,435/(1+91,435(0.07^2)$

n = 204.

Table 3.2: Population of settlements and sample distribution

Settlements	No. of Households	Sample unit
Sarkin Noma/Galilee	14,217	32
Kabawa/Adankolo	29,682	66
Phase I/Old Ploy Quarters	8,093	18
Gadumo	21,692	48
Ganaja	17,751	40
Total	91,435	204

Source: Adapted from the National Population Commission, 2016

Though a sample size of 203.62 was obtained from the computation, it was rounded up to 204. Proportional distribution formula was used to determine the sampling unit for each community in relation with the household numbers of each settlement (Adjei-Mensah & Kusimi, 2019): $S= pH/TH \times n$ ..... (2)

Where S = sampling unit, pH= number of community households, TH= Total number of households and n= sample size (see Table 3.2).

3.5 Data Analysis

An assessment of the vulnerability levels of selected flood-prone neighbourhoods was carried out by processing the data into frequencies and percentages and presented as tables and charts.

The study adopted both descriptive and inferential statistics.

The household questionnaires were analysed by computing the Composite Vulnerability Index (CVI) from three dimensions:

i. Exposure (flood frequency, proximity to rivers)
ii. Sensitivity (housing quality, socio-economic status)
iii. Adaptive Capacity (awareness, institutional support, coping strategies)

CVI was derived as:

CVI = Exposure + Sensitivity - Adaptive Capacity/2

Results were presented using descriptive statistics and graphical visualization.

The data from the collected from professionals and other stakeholders adopted both descriptive and inferential statistics. The descriptive statistics was utilized with a five points' Likert scale questions using mean and standard deviation. The inferential statistic used is simple linear regression which examines the relationship between urban

vulnerability and urban planning practices through the use of statistical package for social sciences (SPSS) version 27.

4.0 Results and Discussions

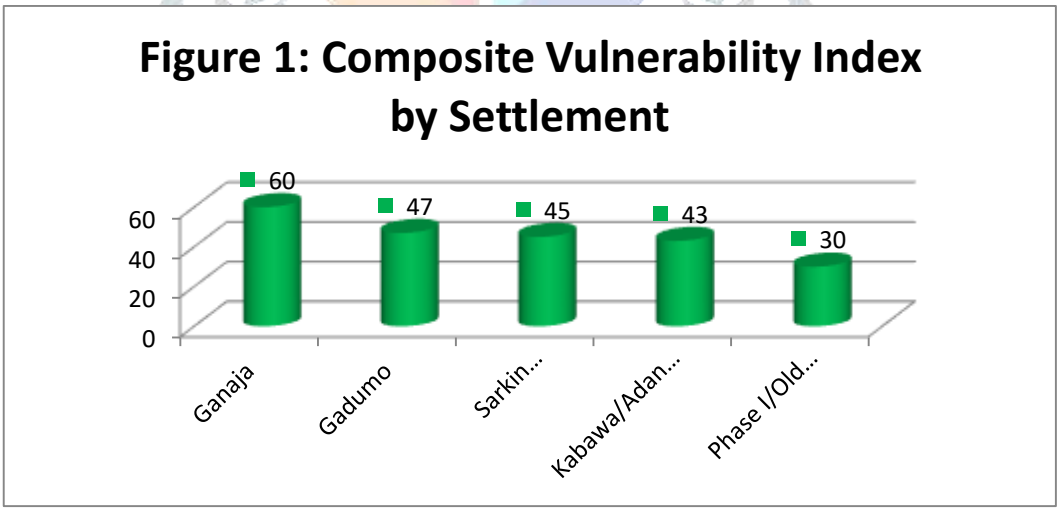
6.1 Flood Vulnerability Level across Neighbourhoods

The CVI scores revealed significant variations among neighbourhoods (see Table 3.3). Ganaja exhibited the highest vulnerability (60%), followed by Gadumo (47%). Phase I/Old Poly Quarters recorded the lowest (30%), reflecting better planning enforcement.

Table 3.3: Composite Vulnerability Index

Settlement	Population	Sample	Exposure (%)	Sensitivity (%)	Adaptive Capacity (%)	CVI (%)
Sarkin Noma/Galilee	14,217	32	70	60	40	45
Kabawa/Adankolo	29,682	66	65	55	35	43
Phase I/Old Poly Quarters	8,093	18	55	50	45	30
Gadumo	21,692	48	60	65	30	47
Ganaja	17,751	40	75	70	25	60

Source: Field Survey, 2025



Source: Field Survey, 2025

Findings indicate that vulnerability is not uniform but mediated by the strength of development control practices. Settlements with relatively better enforcement of regulations (Phase I/Old Ploy Quarters) recorded lower vulnerability, consistent with studies linking governance quality to resilience (Birkmann et al., 2016). Conversely, Ganaja and Gadumo's high vulnerability aligns with the literature on informal urban expansion in flood-prone areas (Douglas et al., 2008).

Institutional weaknesses, resource constraints, and socioeconomic pressures reduce compliance with development control measures of urban planning institutions. This reinforces arguments that vulnerability in African cities is largely governance-driven (Pelling, 2011).

6.2: Urban Planning Institutional Capacity Framework Assessment

Models developed as key indicators for organizational performance measurement such as financial perspective, internal processes perspective, customer perspective, and learning and growth perspective (Haddadi and Yaghoobi, 2014) have been tested to determine the capacity of planning institutions to deliver services and also specifically developing planning strategies against flood disaster as shown in Table 4.1.

Table: 4.1 Descriptive Statistics of Urban Planning Institutions Capacity Framework Assessment in Influencing Flood Vulnerability Outcomes in Lokoja.

S.no	Capacity Assessment Framework	Very Weak (1)	Weak (2)	Neutral (3)	Strong (4)	Very Strong (5)	Mean	Standard Deviation
1.	Institutional and Governance Capacity	14 (14)	6 (12)	0 (0)	2 (8)	3 (15)	1.96	0.41
2.	Human Resource Capacity	11 (11)	8 (16)	3 (9)	2 (8)	1 (5)	1.96	0.21
3.	Financial and Resource Capacity	17 (17)	6 (12)	0 (0)	1 (4)	1 (5)	1.52	0.12
4.	Technical and Infrastructure Capacity	10 (0)	7 (14)	2 (6)	4 (16)	2 (10)	2.24	0.19
5.	Planning and Regulatory Functionality	9 (9)	6 (12)	3 (9)	6 (24)	1 (5)	2.36	0.51
6.	Service Delivery Performance	7 (7)	9 (18)	1 (3)	6 (24)	2 (10)	2.48	0.42
7.	Data Monitoring and Evaluation Capacity	11 (11)	8 (16)	2 (6)	2 (8)	2 (10)	2.04	1.11
8.	Stakeholder and Community Engagement	7 (7)	9 (18)	3 (9)	4 (16)	2 (10)	2.40	0.32
9.	Innovation and Change Management	12 (12)	8 (16)	2 (6)	2 (8)	1 (5)	1.88	0.76
10.	Planning Strategies against flood Disaster	15 (15)	5 (10)	0 (0)	2 (8)	3 (15)	1.92	0.12

Source: Research survey, 2025

The Perspectives of the professionals and relevant stakeholders in the built environment indicates weaknesses in all the criteria for the assessment of the urban planning institutions in their capacities to carryout statutory

responsibilities in the state. This is revealed in the mean value and standard deviation for all assessment items in Table 4.1. This includes prevention and abatement of vulnerabilities of lives and livelihood to climate-related environmental processes such as flooding in the built-up areas lending credence to ActionAid, 2006; Adeleye & Rustum, 2011; Obeta, 2014 assertions.

Statement of Hypothesis

In line with extant literature posit that associates inadequate and unsustainable urban planning practices with climate-related environmental processes such as flood vulnerability, a null hypothesis has been put forward and tested for validation.

H_1: There is no significant relationship between flood vulnerability and urban planning practices in Lokoja, Kogi State.

Table 4.2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.867[a]	.752	.751	.648923	.642

The model summary table reports the strength of relationship between the independent and dependent variables. The result of R stood at 0.867 indicating a strong positive relationship between the dependent variable urban planning practices and the explanatory variable flood vulnerability. The coefficient of multiple determinations R^2 measures the percentage of the total change in the dependent variable that can be explained by the independent or explanatory variable. The result indicates a R^2 of .752 showing that 75% of the variances in urban planning practices is explained by the urban vulnerability while the remaining 25% (i.e. 100 – 75) of the variations could be explained by other variables not considered in this model.

The adjusted R-square compensates for the model complexity to provide a fairer comparison of model performance. The result is supported by the value of the adjusted R which is to the tune of 75% showing that if the entire population is used, the result will deviate by 0.1% (i.e. 75.2 – 75.1), with the linear regression model, the error of the estimate is considerably low at 0.648923. The result of Durbin Watson test shows .642, an indication that there is no auto correlation.

Table: 4.3 Anova

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	543.012	1	543.012	121.321	.000[b]
	Residual	142.531	24	.314		
	Total	685.543	25			

a. Dependent Variable: Urban planning practices

b. Predictors: (constant), Flood vulnerability

The ANOVA table confirms the results of model summary, analysis of the result revealed that F = 121.321 which is significant at (0.000) < 0.05. Hence, since the P-value < 0.05 (critical value), the null hypothesis that there is no significant relationship between flood vulnerability and urban planning practices as explained in the institutional capacity to deliver services in Lokoja, Kogi State is rejected.

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5.0 Conclusion

This study highlights the critical relationship between urban planning practices and vulnerability in Lokoja's flood-prone settlements. Effective enforcement of planning regulations, strengthening institutional capacity, and integrating community-based adaptation are essential. The policy implications of the study will require carrying out the following measures:

i. strengthening institutional resources for physical planning agencies.

ii. strict enforcement of land-use regulations, especially in floodplains.

iii. community engagement and awareness campaigns on safe housing development practices.

iv. incorporating flood risk assessments into urban planning frameworks.

By addressing both governance and community dimensions, Lokoja can build resilience to future floods. A limiting factor to understanding the extent of compliance to planning standards and regulations in the neighbourhoods led to relying on perspective views of built environment professionals and stakeholders for inferences. The inability to explore the records of development control mechanisms to ascertain the extent of certification and development control approvals of buildings along the flood plain corridors, due to poor record keeping by the planning agencies is an encumbrance to this effort. Further studies may adopt measures to determine the extent of contraventions and violations to planning standards and regulations in flood prone areas of the city.

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7.0 References

ActionAid (2006) Unjust waters Climate change, flooding and the protection of poor urban communities: experiences from six African cities. www.actionaid.org

ActionAid (2006. Climate change, urban flooding and the rights of the urban poor in Africa: Key findings from six African cities. *A report of ActionAid International*, October.

Adelekan, I. O. (2016). Urban dynamics and vulnerability to climate change in African cities. *Current Opinion in Environmental Sustainability*, 20, 241–248.

Adeleye, A.J. and Rustum, R. (2011) Flooding and Influence of Urban Planning in Lagos Nigeria. *Journal of Urban Design and Planning*, 164, pp 175-187. http://dx.doi.org/10.1680/udap.1000014

Adeleye, B., Popoola, A., Sanni, L., Zitta, N. & Ayangbile, O. (2019) Poor development control as flood vulnerability factor in Suleja, Nigeria. *Town and Regional planning*, no.74, pp. 23-35.

Adeoye, N.O. (2012) Spatio-Temporal Analysis of Land Use/Cover Change of Lokoja -A Confluence Town. *Journal of Geography and Geology 4(4)*. DOI: 10.5539/jgg.v4n4p40

Adjei-Mensah, K. & Kusimi, J. M. (2019). Dwindling water supply and its socioeconomic impact in Sekyere Kumawu District in Ashanti Region of Ghana: *public opinion on the role of climate change*. GeoJournal, 1-18.

Ahmed, A. & Dinye, R.D. 2011. Urbanization and the challenges of development controls in Ghana: A case study of Wa Township. *Journal of Sustainable Development in Africa*, 13(7), pp. 210-235.

Ajibade, I., McBean, G., & Bezner-Kerr, R. (2013). Urban flooding in Lagos, Nigeria: *Patterns of vulnerability and resilience among women.* Global Environmental Change, 23(6), pp 1714–1725.

Akinmoladun, F.O. & Adejumo, O.T. (2011). Urban agriculture in metropolitan Lagos: An inventory of potential land. *Journal of Geography and Regional Planning*, 4(1), 9–19.

Albert M.F, Olatinwo B.O, Olayemi O. O, Alalade T.A. Agbolade O.O. & Ayuba H.K. (2019) Assessment of Flood Vulnerability in Katsina–Ala, Benue State, *Nigeria. Advances in Multidisciplinary Research Journal*, 5(3) pp 99–110. Article DOI: dx.doi.org/10.22624/AIMS/V5N3P10

Alfa, M.A. & Suleiman, M.Y. (2022) Flood Vulnerability Assessment in the Gbako River Basin, Niger State, Nigeria. *African Scholar Journal of Built Env. & Geological Research*, 26(4, 101-108.

Aluko, O. (2011) Development control in Lagos State: An assessment of public compliance to space standards for urban development. *African Research Review*, 5(5), pp. 167-184. https://doi. org/10.4314/afrrev. v5i5.14 [Accessed: 18 September 2024].

Ben-Enukora, C.A., Okorie N., Ecem A.A., & Eze, I. (2025) Flood risk communication, perception and precautionary behaviours among residents in flood-prone state in North-central, Nigeria. *International Journal of Disaster Risk Reduction.* 128.

Buba F.N., Ojinnaka O.C., Ndukwu R.I., Agbaje G. I., & Orofin Z.O. (2024) Assessment of flood vulnerability in some communities in Lokoja, Kogi State, Nigeria, using Participatory Geographic Information Systems. *International Journal of Disaster Risk Reduction,* 55

Deperso, G. (2018). Using Simple Random Sampling to study larger population. Investopedia.com/ask/answer/what are the advantages of using simple random sampling. Retrieved 12/08/2020.

Douglas, I., Alam, K., Maghenda, M., McDonnell, Y., McLean, L., & Campbell, J. (2008). Unjust waters: Climate change, flooding and the urban poor in Africa. Environment and Urbanization, 20(1), 187–205.

Haddadi F. & Yaghoobi T. (2014) Key indicators for organizational performance measurement. *Management Science Letters.* homepage: www.GrowingScience.com/msl

Hassan W. I., Joseph I., & Abubakar S. (2024). Assessment of Effect of Flooding and Flood Risk Reduction Strategies in Urban Centres. *Journal of Built Environment and Geological Research*, 4(4). https://africanscholarpub.com/ajbegr/article/view/231

HBS (Heinrich Boll Stiftung) (2026) Flood Resilience and Affordability-Building Guidelines for Kogi State

Ibrahim M., Huo A., Ullah W. & Ullah S., (2024) Flood vulnerability assessment in the flood prone area of Khyber Pakhtunkhwa, Pakistan.

Intergovernmental Panel on Climate Change IPCC. (2022). Climate change 2022: Impacts, adaptation, and vulnerability. Cambridge University Press. https:// www.ipcc.ch/report/ar6/wg2/

Islam, M.B, Rana, I.A., Waseem, H.B., Sultana, T. Murray-Tuite, P. &Mahfuz M. (2024) Assessing the vulnerability of selected coastal informal settlements to floods in the Old Brahmaputra River floodplain, Bangladesh *Urban Climate* 56:102078 DOI:10.1016/j.uclim.2024.102078 [Accessed: 23 September 2024].

Izeogu, C.V., 1986: Physical Planning in Nigeria: The Challenge of the Eighties, *Journal of the Nigerian Institute of Town Planners,* 6-7: 47-59.

Kadi, A.S., Halingali, B.I. & Ravishankar, P. 2012. Problems of urbanization in developing countries: A case study in India. *International Journal of Science and Nature*, 3(1), pp. 93-104.

Lekwot, V.E., Kyom, B.C. & Balasom, M.K. 2013. The nature, scope and dimensions of development control, tools and machineries in urban planning in Nigeria. International *Journal of Innovative Environmental Studies Research*, 1(1), pp. 48-54.

National Population Commission (NPC), (2006). Priority tables. [online]. Available at: <population.gov.ng> [Accessed: 5 November 2017].

NEMA (Nigerian Emergency Management Agency) (2013) Report on flood disasters in Nigeria. Abuja: Government Press.

NEMA (2022). Flood Situation Report, *National Emergency Management Agency*, Abuja.

NDP (National Development Plan) 2021-2025 Volume I. Federal Ministry of Finance, Budget and National Planning.

NISER (Nigerian Institute of Social and Economic Research) (2010) Socio-Economic Impact of Climate Change in Nigeria, NISER, Ibadan.

Obabori, A. O., Obiuwevbi, D. A. & Olomu, J.I. (2007) Development Control, an Important Regulator of Settlement Growth: A Case Study of Ekpoma, Nigeria. *Journal of Human Ecology*, 21(4), pp. 285-291.

Obeta M.C. (2014) Institutional approach to flood disaster management in Nigeria: need for a preparedness plan. *British Journal of Applied Science and Technology*. 4,4575-4590, https://api.semanticscholar.org/CorpusID:131538352

Okorie, G. 2015. Urbanization problems in developing countries. [online]. Available at: <https:/www. linkedin.com/pulse/ urbanization-problems-in-developing-countries> [Accesed: 28 December 2025].

Olokesusi, F. (2011). *Flooding and Flood Management in Nigeria*. NISER Monograph Series, Ibadan.
Olorunfemi F., & Raheem U. (2013) Floods and Rainstorms Impacts, Responses and Coping among Households in Ilorin, Kwara State. *Journal of Educational and Social Research* 3(4).
Pathak, S., Panta, H.K., Bhandari, T. & Paudel K.P. (2020) Flood vulnerability and its influencing factors. *Nat Hazards* 104, 2175–2196. https://doi.org/10.1007/s11069-020-04267-3[Accessed: 24 September 2024].
Otaro, O.T. (2025) Analysis of Lokoja waterfront Communities towards Resilience and Sustainable Development. *Journal of Ceramics and Environmental Design* 12 (2).
Pelling, M. (2011). Adaptation to Climate Change: *From Resilience to Transformation*. Routledge.
Storch, H. & Eckert, R. (2007) GIS-based Urban Sustainability Assessment. In: Kappas,
Storch, H., Downes; N. and Moon, K. (2009) Climate Change and the Resilience of Megacities in South-East Asia, Creating Risk-Based Climate Change Information for Ho Chi Mihn City's Settlements. Environmental Science, Geography.
Yamane, T. (1967): *Elementary sampling theory*. First Edition, Published by Prentice Hall, USA.
Turner, B. L., Kasperson, R.E., Matson, P.A., McCarthy, J.J., Corell, R.W., Christensen, L., & Schiller, A. (2003). *A Framework for Vulnerability Analysis in Sustainability Science*. Proceedings of the National Academy of Sciences, 100(14), 8074-8079. https://doi.org/10.1073/pnas.1231335100