Assessment of the Effectiveness of Development Control on Flood Management in Makurdi Town, Benue State, Nigeria

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Abstract- This study assessed the effectiveness of development control measures in managing flood risks in Makurdi Town, Benue State. The study specifically examined existing development control measures, their implementation and enforcement, their role in mitigating flood risks, and the challenges faced, while also suggesting measures for enhancing development control measures that would improve flood management outcomes. A survey research design was adopted, with data collected from residents, officials, and experts. This study employed Cochran's formula to determine a representative sample size of 384 residents in flood-prone areas, alongside 24 purposively selected officials and experts. Data collection involved structured questionnaires, direct observations, and focus group discussions. A stratified random sampling method was used for residents, while purposive sampling targeted key informants. Quantitative data were analysed using descriptive and inferential statistics, while qualitative responses underwent thematic analysis to assess development control measures in flood management. Findings revealed that zoning regulations were the most recognised development control measure (42.7%), while awareness of building codes was low (10.9%). Residential land use dominated flood-prone areas (46.9%), with 81 of 116 developments identified as contraventions, and only 61.2% of these were demolished. Correlation analysis showed a strong positive relationship (r = 0.88) between developments and demolitions, but a weaker correlation (r = 0.54) with undemolished structures, indicating enforcement limitations. Only 30.7% of respondents rated development control measures as effective, while 56.8% rated them ineffective or very ineffective. Most respondents (45.9%) believed flood incidents had not reduced, and mean scores for risk mitigation indicators ranged from 2.38 to 2.97,
reflecting general dissatisfaction. Key challenges included lack of clear guidelines (mean = 4.02), weak enforcement (mean = 3.75), and insufficient resources (mean = 4.12). Recommendations include strengthening enforcement, revising legal frameworks, enhancing community participation, increasing funding, and improving inter-agency collaboration. The study concludes that current development control mechanisms are inadequate and require strategic reform to effectively mitigate flood risks in Makurdi

Index Terms- Development Control; Flood Management; Enforcement; Zoning Regulations; and Makurdi Town

I. INTRODUCTION

In recent years, flooding has become a prevalent and pressing issue in many urban areas across the globe, particularly in regions prone to heavy rainfall and inadequate drainage systems (Adedoja, Popoola, Alaga, and Akindejoye-Adesioye, 2023; Manandhar, Cui, Wang and Shrestha, 2023). With the increasing imperviousness caused by rapid urbanization and the rising frequency and severity of extreme events caused by climate change, the hydrological status of the urban area has changed, resulting in frequent urban flood disasters that are often poorly managed (Manandhar, Cui, Wang and Shrestha, 2023). Nigeria, like many other developing countries, faces significant challenges in managing floods, which pose serious threats to human lives, infrastructure, and economic stability. Meanwhile, flood management efforts are skewed primarily toward relief and rehabilitation support for the victims, rather than a preventive approach (Ikyapa, Adnan, Terwase, Adamu, 2020), such as development control.

Development control in urban areas which refers to the management of the extent, pace, and nature of development within a given locality, is a critical component of managing urban environments, especially in mitigating flood risks (Smith and Clark, 2015). This process is overseen by local planning authorities or governmental bodies, and its main aim is to ensure that all development is sustainable, meets regulatory standards, and serves the public interest (Smith and Clark, 2015). It is often implemented through planning and zoning regulations, which are generally established to guide the development of cities in a sustainable manner, balancing environmental, social, and economic factors. According to Smith and Clark (2015), development control is governed by a framework of policies and regulations that dictate where and how construction can occur. These regulations are designed to steer development away from flood-prone areas, such as river floodplains or low-lying coastal regions. By restricting development in these areas, planning policies help reduce vulnerability to flooding. Hence, the effective development control not only helps in mitigating the immediate impacts of floods but also contributes to building long-term resilience against future events. As urban areas continue to grow, the role of development control in flood management becomes increasingly important, necessitating continuous adaptation and integration with other urban management practices.

Flood management is a critical aspect of urban planning and environmental conservation, aimed at minimizing the adverse impacts of flooding on human life, property, and ecosystems. Effective flood management encompasses a combination of structural and non-structural measures, each designed to address various aspects of flood prevention, mitigation, and response. Structural measures involve physical constructions designed to control floodwaters. These include dams, levees, floodwalls, and reservoirs. Dams and reservoirs play a significant role in flood management by regulating water flow and storing excess water during peak rainfall periods (Morris et al., 2012). In the same vein, levees and floodwalls are critical in protecting urban areas from riverine flooding. These structures act as barriers, preventing water from inundating populated areas. However, they must be adequately maintained to ensure their effectiveness; failure can result in catastrophic flooding (Pinter, 2005).

Besides, the structural measures, non-structural measures focus on policies, planning, and community involvement to manage flood risks. These include development control (land-use planning and floodplain zoning), early warning systems, and public education. Land-use planning is essential in preventing construction in high-risk flood areas. By restricting development in floodplains, cities can reduce the potential damage from floods (Tobin, 1995). Similarly, early warning systems are vital for providing timely alerts to communities about impending floods, enabling them to take preventive actions. These systems rely on advanced meteorological forecasting and river monitoring to predict flood events. For instance, the Flood Early Warning System (FEWS) in the Netherlands has been instrumental in reducing flood-related casualties and damage (Klijn et al., 2018). Floodplain zoning involves designating areas that are prone to flooding for specific uses that can withstand periodic inundation, such as parks and agricultural land. This approach not only mitigates damage but also preserves the natural functions of floodplains, which can absorb excess water and reduce the velocity of floodwaters (Smith & Ward, 1998).

Furthermore, public education and community engagement are also crucial. Educating the public about flood risks and response strategies can significantly enhance community resilience. Programmes that teach residents how to prepare for floods, create emergency kits, and develop evacuation plans are essential components of flood management (FEMA, 2020). An emerging approach in flood management is Integrated Flood Management (IFM), which emphasises a holistic approach that sustainably integrates land and water management. IFM seeks to balance the use of floodplains with flood risk reduction, ensuring that economic development and environmental protection go hand in hand. This approach involves a coordinated effort among various stakeholders, including governments, non-governmental organisations, and local communities (UNESCO, 2009). This means that effective flood management requires a multi-faceted approach that combines structural and non-structural measures.

While structural measures provide immediate protection against flooding, non-structural measures offer sustainable, long-term solutions by integrating policy, planning, and community engagement. By adopting a comprehensive strategy that includes both types of measures, societies can better mitigate the impacts of floods, protecting lives, property, and the environment.

Several studies have shown that the alarming pace of rapid urbanization experienced in many developing countries, including Nigeria, is often accompanied by numerous challenges (Olotuah & Adesiji, 2005; Adetunji & Oyeleye, 2013; Lekwot, Kyom & Balasom, 2013; Oyeleye, 2013), especially in cities with less regard for urban planning. These challenges include severe housing shortages and proliferation of improperly constructed housing structures and informal settlements, poor environmental management and sanitation practices, dearth of critical infrastructures, rising crime rates, and flooding (Kadi, Halingali & Ravishankar, 2012; Okorie, 2015; Junaid, 2017). Of these problems, the incidence of flooding has become perennial in many cities in the developing countries where several lives and property worth several millions of US Dollars are lost annually in addition to the dislocation of several socioeconomic activities (Nelson, 2001; ActionAid, 2006; UN-Water, 2011).

In Nigeria, many of the state capitals and cities including Makurdi town, are perennially dealing with many of these problems, particularly the menace of poor drainage management and flooding (Potschin, 2009; Satterthwaite, Huq, Pelling, Reid & Romero Lankao, 2007), problems that seemed to have defiled many of the solutions adopted over the years (Nkwunonwo, 2016). Although urban flooding in Nigeria has been attributed to several causal factors, including climate change-induced heavy rainfall, indiscriminate waste dumping and erection of structures along floodplains are increasingly being cited as bigger challenges (Satterthwaite et al., 2007; Potschin, 2009; Odufuwa, Adedeji, Oladesu & Bongwa, 2012; Agbonkhese, Agbonkhese, Aka, Joe-Abaya, Ocholi & Adekunle, 2014). However, in July-September 2017 and 2022, Makurdi, urban neighbourhoods were wrecked by a devastating flood that destroyed properties and left residents homeless

(Onah, 2023). Consequently, some building experts and urban planners contended that the perennial flooding experienced in most Nigerian cities was due to man-made and can directly be linked to the poor application of development control measures in these settlements (Bwala, Oladosu & Nghalmi, 2016; Onwubiko, 2017). This underscores the fact that the effectiveness of development control plays a significant role in flood management by regulating land use and ensuring that construction practices do not exacerbate flood risks (White, 2008). This implies that effective development control can mitigate flooding by enforcing zoning laws, promoting sustainable drainage systems, and preserving natural floodplains, which absorb excess water (Jha, Bloch, and Lamond, 2012). Conversely, inadequate control can lead to increased impermeable surfaces and poorly planned urbanization, which heightens flood risk and severity. Studies indicate that integrating stringent development control measures with comprehensive flood management strategies significantly reduces flood impacts (White, 2008; Jha, Bloch, and Lamond, 2012).

In Benue State Nigeria, the town of Makurdi in Benue State has been significantly impacted by recurrent flooding events, which have devastating socio-economic and environmental consequences. The town's vulnerability to floods is exacerbated by its geographical location along the Benue River and the rapid urbanization that lacks effective planning and development controls (Ali, et al, 2022). Effective development control mechanisms can significantly reduce the risk of flooding by ensuring that urban expansion adheres to established planning guidelines, incorporating flood management measures such as adequate drainage systems, floodplain zoning, and building codes that consider flood risks (Adelekan, 2010; ActionAid, 2006; UN-Habitat, 2014; Yaro, and Tanko, 2019). Sadly, there are limited or no empirical studies in this area, focusing on how effective development control is in Makurdi town and its role in flood management. This study therefore aims to assess the effectiveness of development control on flood management in Makurdi town. It seeks to identify the existing development control measures, evaluate their implementation, and determine their impact on mitigating flood risks. The study will also explore the challenges faced in enforcing development control and

propose recommendations for enhancing flood management strategies in Makurdi. This is very important because understanding the interplay between urban planning and flood management is crucial for formulating policies that safeguard lives and property, promote sustainable development, and enhance the resilience of urban communities to climate-related hazards.

II. MATERIAL AND METHODS

Study Area

Makurdi is the capital of Benue State and doubles as the Headquarters of Makurdi Local Government Area. It is located at the bank of River Benue in the plain of Benue trough of middle belt region of Nigeria. The area is found between latitude 7° 43' 50" N and longitude 8° 32' 10" E with a mean elevation of 92 meter above sea level (Figure 1). Makurdi experiences a tropical wet and dry savannah climate (Aw) with a mean annual temperature of 28°C, ranging from 26°C in December to 31°C in March, and a mean annual rainfall of 1190mm, peaking at 262mm in September. The relative humidity varies seasonally, reaching up to 92% during the rainy season (April to October) and dropping to 43% in January during the dry season (November to March). The vegetation is predominantly savannah, consisting of trees and grasses, though urbanization has reduced natural vegetation, which persists mainly on the town's outskirts.

Geologically, Makurdi is characterized by cretaceous sediment with false-bedded sandstones, up to 900m thick, and soils classified as hydromorphic along the river and red ferrasols elsewhere, with acidic, well-drained sandy loam to clay loam textures. The city lies in the low-relief River Benue plain, with elevations rising from 12m at the riverbank to 153m northward and 216m southward, drained primarily by the Benue River and its tributaries. Economic activities in Makurdi center on agriculture (rice, yam, cassava), fishing, and commerce, with subsistence farming and market gardening prevalent, particularly along the riverbank. The town, a nucleated settlement with a population of 319,797, has grown from a small river port, featuring urban districts, commercial centers, industries (relocated to an industrial layout in 1985), and increasing vehicular traffic.
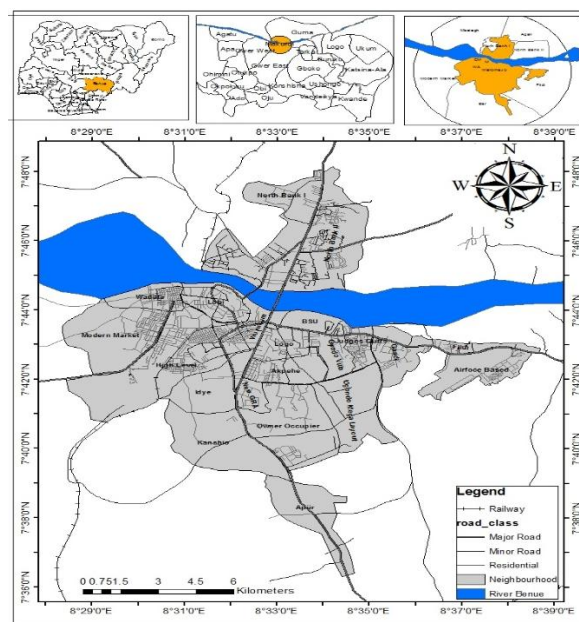

Figure 1: Makurdi Town
Source: Department of Geography, Rev. Fr. Moses Orshio Adasu University GIS Lab (2024).

Methods

The study population in Makurdi Town includes residents, Benue State Urban Development Board officials, and urban planning and flood management experts, though the exact population size is unknown due to inadequate records. The sample size for residents was calculated using Cochran's (1963, 1975) formula, designed for unknown population sizes, yielding approximately 384 individuals. The formula used a 95% confidence level (Z = 2.58), 15% estimated proportion (p = 0.15), and 5% precision level (e = 0.05), resulting in 383.47, rounded to 384. Out of 384 copies of questionnaire distributed to residents in flood-affected areas, 377 were properly completed and returned for analysis. For government officials and experts, purposive sampling was employed to select 24 key informants, with six from each of three categories: government officials from relevant ministries (Ministry of Environment and Water Resources, Urban Development Board, State Emergency Management Agency), academics, and professionals. The sampling procedure involved stratifying Makurdi into neighborhoods, randomly selecting households from each stratum for resident surveys, and purposively identifying officials and experts based on their roles and expertise. Data were collected through structured questionnaires, direct

observation, and focus group discussions (FGDs). Questionnaires, containing both closed and open-ended questions, gathered residents' awareness, perceptions, and experiences regarding development control and flood management. Direct observation in flood-prone areas documented the physical state of drainage systems, building codes, and land use practices, providing empirical evidence. FGDs with community leaders, residents, experts, and officials offered deeper insights into collective experiences and perspectives on flood management and development controls.

Quantitative data from questionnaire were analyzed using descriptive statistics (frequencies, percentages, averages, and graphs) and inferential statistics, specifically Pearson's product-moment correlation, to assess relationships between variables and the effectiveness of development control measures. Qualitative data from observations and FGDs were analyzed using thematic analysis, coding data to identify key themes and patterns. This analysis highlighted implementation, enforcement, and challenges of development control measures. The combined use of quantitative and qualitative methods ensured a comprehensive understanding of the issues.

III.   RESULTS AND DISCUSSION

Socio-Demographic Characteristics of Respondents
Table 1 presents the results of the socio-demographic characteristics of respondents. These critical characteristics shape perceptions, awareness, and interactions with development control measures and flood risks. The sex distribution in Table 1 shows that 63.9% of respondents were male, while 36.1% were female. This indicates that male respondents dominate the surveyed population, possibly reflecting male-headed households or higher male engagement in public decision-making processes.

Table 1: Socio-Demographic Characteristics of Respondents

Variable	Frequency	Percentage
Sex		
Male	241	63.9
Female	136	36.1
Age Group/Range		
18 – 40 years	179	47.5
41 – 63 years	172	45.6
64 – 86 years	26	6.9
Marital Status		
Single	122	32.4
Married	210	55.7
Divorced/separated	27	7.2
Widow	18	4.8
Educational Qualification		
None	18	4.8
First School Leaving Certificate	44	11.6
Senior Secondary School Certificate	113	30.0
Diploma/ (NCE)	129	34.2
Graduate/Postgraduate Degree	73	19.4
Main Occupation		
Civil Service	105	27.9
Farming	199	52.8
Fishing	12	3.2
Artisans/petty trading	47	12.5
Others (okada - Moto cycling)	14	3.7
Average household Annual income		
₦50,000.00 - ₦250,000.00	178	47.2
₦250,001.00 - ₦550,000.00	60	15.9
₦550,001.00 - ₦750,000.00	60	15.9
₦750,001.00 - ₦1,000,000.00	79	21.0

Source: Field Survey, 2025; N = 377

The demographic profile of Makurdi Town's study population, as presented in Table 1, reveals that 47.5% of respondents are aged 18–40 and 45.6% are 41–63, indicating a predominantly economically active group influencing development activities and flood management decisions, while only 6.9% are aged 64–86. Marital status shows 55.7% are married, suggesting a strong family-oriented population invested in housing stability and aware of flood-related safety issues, with 32.4% single, 7.2% divorced or separated, and 4.8% widowed. Educationally, 34.2% hold Diplomas or NCE, 30.0% have Senior Secondary School Certificates, 19.4% are graduates or postgraduates, 11.6% have First School Leaving Certificates, and 4.8% lack formal education, indicating a relatively educated population capable of understanding flood risk mitigation strategies. Occupationally, 52.8% are farmers, 27.9% civil servants, 12.5% artisans or petty traders, 3.2% fishers, and 3.7% in other jobs like motorcycle riding, with

farmers particularly vulnerable to floods and reliant on effective development controls. Income distribution shows 47.2% earn ₦50,000–₦250,000 annually, 15.9% earn ₦250,001–₦550,000, another 15.9% earn ₦550,001–₦750,000, and 21.0% earn ₦750,001–₦1,000,000, highlighting that nearly half are low-income earners, limiting their ability to invest in flood-resilient housing. This demographic and socioeconomic structure shapes the community's engagement with development control policies critical for flood management. Awareness and compliance with these policies are influenced by education and income, affecting the overall effectiveness of flood risk reduction efforts in Makurdi.

Existing Development Control Measures in Makurdi Town

Table 2 shows that 42.7% of respondents in Makurdi town identified zoning regulations as a key development control measure, making it the most widely recognised approach. Only 10.9% were aware of building codes, suggesting limited public knowledge about structural standards that could reduce flood risks. Land use policies (19.9%) and environmental impact assessments (19.1%) were moderately recognised, indicating some awareness of broader planning tools but still falling short compared to zoning.

Table 2: Development Control Measures Known to Respondents in Makurdi Town

Development Control Measures	Frequency	Percentage
Zoning regulations	161	42.7
Building codes	41	10.9
Land use policies	75	19.9
Environmental impact assessments	72	19.1
Others	28	7.4
Total	377	100.0

Source: Field Survey, 2025

The small proportion (7.4%) listed under "Others" points to a gap in public understanding of alternative or innovative flood management controls. These findings suggest that while zoning regulations are prominent, there is limited community engagement or knowledge regarding the full range of development control measures essential for effective flood management. The dominance of zoning awareness may reflect local authorities' focus on land demarcation rather than enforcing building standards or integrating environmental assessments. This highlights a potential weakness in Makurdi's flood management strategy, where the partial application of development controls undermines comprehensive flood risk reduction. Therefore, the effectiveness of development control on flood management in Makurdi appears constrained by uneven implementation and public understanding of the available regulatory tools. The findings of the current study on development control measures in Makurdi town, highlighting zoning regulations as the most recognised (42.7%), while building codes (10.9%) and environmental impact assessments (19.1%) received significantly less awareness, align with several previous empirical studies. Adelekan (2010) found that in Lagos, zoning was more familiar than building codes, with poor regulatory enforcement contributing to flood vulnerability, much like in Makurdi. Similarly, Oduwaye (2015) observed that land use policies exist across Nigerian cities but are poorly enforced, with limited public participation, a condition echoed by the moderate awareness of land use policies (19.9%) in Makurdi. Abaje, Ati, and Iguisi (2015) directly linked Makurdi's flood risks to inadequate planning and poor public infrastructure, reinforcing the present study's conclusion that development controls are unevenly implemented. Jeb and Aggarwal (2008), in their study of River Kaduna, emphasised the importance of land use planning in flood mitigation, consistent with Makurdi respondents' higher awareness of zoning controls. Meanwhile, Eziyi (2012) showed that in Onitsha, poor public understanding and weak enforcement of planning laws undermined urban management, a trend mirrored in Makurdi's low public knowledge of building codes and other regulatory tools. However, variations emerged: while Adelekan (2010) noted a stronger community-led adaptation response in Lagos than in Makurdi, and Eziyi (2012) reported more acute informal settlement expansion in Onitsha, these contextual differences do not diminish the overall pattern, across Nigerian cities, development controls are recognised unevenly, with zoning being the most familiar and comprehensive flood management hindered by poor implementation and weak public engagement.

The Focus Group Discussion (FGD) identified zoning regulations as the principal instrument of development control in Makurdi Town, implemented primarily through the issuance of three statutory notices. The first is the Stop-Work Notice (also referred to as a Stop-Order Notice), which serves as an initial warning to developers whose construction activities contravene zoning regulations. This notice grants a 7-day grace period during which the developer is expected to cease work or bring the project into compliance. Traditionally, the second stage is the issuance of an Abatement Notice, which spans a 21-day period and formally communicates that the structure in question has been marked for removal unless corrective measures are taken. Finally, a Demolition Notice is issued at the expiration of the abatement period, granting a further 30-day window for voluntary compliance before enforced demolition by the authorities. However, the FGD revealed that in practice, this three-stage process is often not followed rigorously. Instead, the intermediate Abatement Notice is frequently bypassed, and a Demolition Notice called Abatement-Demolition Notice is issued directly after the expiration of the initial Stop-Work Notice. As a result, the entire enforcement timeline has effectively been compressed into a single 30-day period from the first notice to potential demolition.

Level of Effectiveness of the Implementation and Enforcement of Existing Development Control Measures

Data on the level of effectiveness of the implementation and enforcement of development control measures were obtained through questionnaire. The results were collated and present in Figure 2.
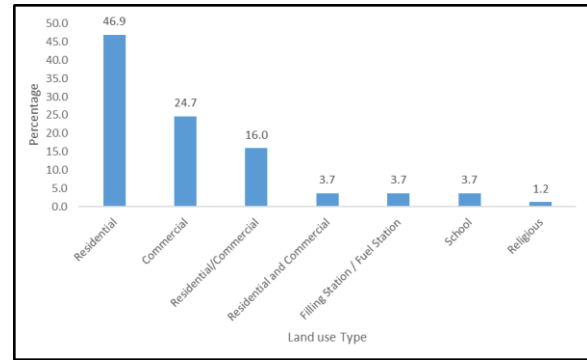

Figure 2: Land Use Type in the Flood-Prone Area

The result presented in Figure 2 reveals the distribution of land use types in flood-prone neighbourhoods of Makurdi as documented by the Benue State Urban Development Board (2024). The result shows that the predominant land use is residential, accounting for 38 of the 81 cases, representing 46.9% of the total. This indicates that nearly half of the structures or developments in these flood-prone areas are primarily used for housing. Commercial land use follows, with 20 occurrences making up 24.7%, showing that business-related developments are also significantly exposed to flood risks. Mixed land uses, namely Residential/Commercial and Residential and Commercial, collectively contribute 16.0% and 3.7% respectively. This implies that a noteworthy number of properties serve dual purposes, increasing the complexity of managing flood risks due to higher occupancy and economic stakes. Furthermore, the presence of critical facilities such as Filling/Fuel Stations (3.7%) and Schools (3.7%) within these vulnerable zones raises concerns over safety and continuity of essential services during flood events. Religious institutions are the least represented, with just one instance (1.2%), suggesting limited exposure or possibly better siting considerations. The dominance of residential land use in these areas calls for targeted flood mitigation and land-use planning to protect lives and property. Commercial and dual-use buildings also need attention due to the economic implications of flood damage. The presence of fuel stations in flood-prone areas is particularly hazardous and underscores the need for stricter enforcement of zoning regulations.

Educational facilities being located in these zones suggest the potential disruption of learning during flood events, affecting vulnerable populations like children. Furthermore, the data reflect a lack of adequate spatial planning or poor compliance with environmental risk assessments in development control. This reinforces the need for more proactive floodplain management policies. Overall, the findings demonstrate the urgency of integrating disaster risk reduction strategies into urban planning in Makurdi.

The result of the development control contraventions in the study area, presented in Table 3, reveals various infractions, each with differing levels of frequency and prevalence. From Table 3, drainage blockage is the most common form of contravention, which accounts for 35.8% of all recorded cases. This is followed closely by land disputes (19.8%), which signify conflicts over land use and environmental mismanagement. Non-compliance with building regulations, including lack of adherence to planning instructions and standards, contributes to 13.6% of the total. Other significant contraventions include road encroachment and issues related to building design, such as lack of setbacks or improper building plans, which together make up approximately 16%. A smaller but notable share of contraventions (6.2%) includes building construction without obtaining the necessary approval from regulatory bodies. In the same vein, cases categorised as "others," including structural alterations and distressed buildings, contribute 8.6% to the total number of infractions. Overall, the data show that contraventions stem from both administrative and technical violations, reflecting inadequacies in development monitoring and enforcement processes.

Table 3: Development Control Contravention Frequency by Type

Contravention Type	Frequency	Percentage
Dispute	16	19.8
Blocking of the Water Channel	29	35.8
Road Encroachment	7	8.6
Non-compliant to safety	11	13.6
No Setback / Improper Plan	6	7.4
Building without Approval	5	6.2
Others (Alteration, distressed)	7	8.6
Total	81	100.0

Source: Benue State Urban Development Board, Makurdi, 2024

When these contraventions are examined across different land use types (Table 4), residential areas are observed to be the most affected, accounting for over half (52.4%) of all violations. This suggests that the residential sector may lack adequate regulatory supervision or be prone to rapid and unplanned growth. Commercial areas account for 24.4% of the contraventions, while mixed residential/commercial properties constitute 14.6%. These figures imply that commercial activities, whether stand-alone or integrated with residential use, also present significant challenges to development control enforcement. Meanwhile, institutional and special-use properties, such as schools (4.9%), religious buildings (1.2%), and filling stations (2.4%), record much lower incidences. The lower frequency of infractions in these categories may reflect stricter oversight, fewer developments, or better compliance due to their public-facing nature. Nevertheless, even a few infractions in these categories can pose substantial risks given their sensitive land use functions and the potential for public safety concerns.

Table 4: Development Control Contraventions by Land Use Type

Land Use Type	No. of Contraventions	Percentage
Residential	43	52.4
Commercial	20	24.4
Residential/Commercial	12	14.6
School	4	4.9
Religious	1	1.2
Filling Station/Fuel	2	2.4

Source: Extracted from Benue State Urban Development Board, Makurdi, 2024 Database

The summary statistics in Table 5 provide a broader view of enforcement outcomes within the study area. Out of the total 116 developments observed, 81 were

identified as contraventions, representing a contravention rate of nearly 70%. Out of these 81 violations, only 71 cases have been subjected to demolition, yielding a demolition effectiveness rate of 61.2%. This indicates that while a majority of contravening structures have been addressed, a significant proportion (38.8%) remain standing, undermining the deterrent effect of enforcement actions. The 45 developments yet to be demolished continue to pose risks to orderly urban development and may encourage further non-compliance. These statistics suggest that although the development control authority has made notable progress in enforcing regulations, there remain gaps in operational capacity or institutional will to fully address all infractions. The persistence of undemolished contraventions could also be attributed to political interference, legal injunctions, or logistical challenges in accessing certain properties.

Table 5: Summary Statistics of the Dataset of 81 Records of Development Control Contraventions.

Metric	Value
Total Number of Developments	116
Total Number of Demolitions	71
Total Number Yet to be Demolished	45
Total Contraventions Identified	81
Demolition Effectiveness Rate (%)	61.2%

Source: Extracted from Benue State Urban Development Board, Makurdi, 2024 Database

Further analysis using Pearson correlation coefficients reveals a strong positive relationship ($r = 0.88$) between the total number of developments and the number of demolitions. This suggests that as more developments occur, the likelihood of encountering and enforcing against contraventions increases significantly. Similarly, a moderate correlation ($r = 0.54$) between developments and structures yet to be demolished indicates that enforcement is somewhat lagging behind the pace of development. This scenario underscores the need for proactive regulatory frameworks that anticipate and mitigate violations before they escalate. The results collectively suggest a pressing need to strengthen institutional mechanisms, improve monitoring systems, and enhance public awareness about the consequences of contravening development regulations. Effective urban governance in Makurdi depends not only on enforcement but also on participatory planning, timely approval processes, and sustained political commitment.

Perception on Whether Recent Developments in Makurdi Town Appear to Violate Existing Development Control Measures

The results of residents' perceptions regarding whether recent developments in Makurdi town appear to violate existing development control measures are presented in Table 6. The findings reveal that 48.5% reported that recent developments in Makurdi Town seem to violate existing development control measures, while 27.1% disagreed, and 24.4% were unsure. This suggests that nearly half of the surveyed population perceives a significant gap between planning regulations and actual development practices, raising concerns for urban flood management. Examples from field observation and supported by the existing literature include constructions on floodplains, the erection of buildings on drainage setbacks, and the conversion of natural water retention areas into residential or commercial plots, as documented by Ologunorisa (2004) and Eguavoen (2013), who reported how such practices intensify urban flooding risks. These violations often stem from weak enforcement by planning authorities and political interference, as further noted by Olajuyigbe et al. (2012). In the context of the study, these findings indicate that development control mechanisms in Makurdi are not fully effective in mitigating flood risks, as unregulated constructions block natural drainage channels and increase surface runoff. Moreover, the 24.4% who were unsure reflect a possible gap in community understanding of what constitutes a violation, underscoring the need for better public education on development regulations.

Table 6: Developments in Makurdi Town that Appear to Violate Existing Development Control Measures

Response	Frequency	Percentage
Yes	183	48.5
No	102	27.1
Not sure	92	24.4
Total	377	100.0

Source: Field Survey, 2025

Several empirical studies have evaluated the effectiveness of development control measures in urban areas vulnerable to environmental hazards.

Ogunleye et al. (2020), in their study of Akure, Nigeria, found that over 60% of developments in flood-prone areas were residential structures, which aligns with the current study's finding that residential use (46.9%) predominates in Makurdi's vulnerable neighbourhoods. Similarly, Aluko (2017) reported that most development control contraventions in Lagos occurred in residential and commercial zones due to weak enforcement, consistent with the Makurdi study's 70% contravention rate, predominantly in these land-use categories. Adegun and Taiwo (2018) also identified drainage blockage and unauthorized building as key issues undermining urban planning, mirroring the current study where drainage blockage (21.0%) and unapproved developments (6.2%) were notable infractions. These studies agree that the prevalence of residential use and administrative laxity in enforcement are recurring challenges in Nigerian urban centers.

Conversely, Ajibade and McBean (2019), in their analysis of flood risk and land-use planning in Lagos, noted that only about 40% of contravening structures were demolished, which contrasts with the 61.2% demolition effectiveness rate reported in Makurdi. This variation may reflect differences in institutional capacity or political will across states. Furthermore, Ukoje and Kanu (2021), studying Abuja's peri-urban settlements, reported stronger compliance among institutional and public-use land categories, in line with the current study's findings where schools, religious buildings, and fuel stations exhibited fewer violations. However, while Agunbiade et al. (2019) argued that low compliance resulted mainly from a lack of awareness among the populace, the Makurdi study emphasizes enforcement gaps and political interference as more critical drivers. This divergence suggests that both community education and institutional strengthening are necessary, but their relative importance may vary contextually.

Finally, Ede et al. (2022) found a weak correlation between urban growth and enforcement in Port Harcourt, differing from the strong ($r = 0.88$) and moderate ($r = 0.54$) correlations reported in Makurdi. This indicates that, unlike Port Harcourt, development control in Makurdi is somewhat reactive, responding as growth increases but still unable to keep pace. The current study's integration of perception data (48.5% confirm widespread violations) also aligns with Olajuyigbe et al. (2012), who linked poor planning practices with public distrust in regulatory agencies. Thus, the study contributes to existing literature by combining statistical evidence with public opinion to provide a comprehensive understanding of enforcement challenges. In summary, the consistency across studies reinforces the urgent need for integrated urban governance and proactive risk-sensitive land-use planning in Nigeria's flood-prone cities.

Residents' Perception of the Effectiveness of Development Control Measures

This section examines how residents perceive the effectiveness of development control measures in managing flood risks in Makurdi town, offering insight into public view towards planning enforcement. The findings reveal that only 30.7% of respondents consider the measures effective, suggesting limited satisfaction with their implementation and impact. In contrast, a significant 56.8% of residents view the measures as ineffective, indicating widespread dissatisfaction and a general perception that development control efforts have failed to adequately address the challenges of flooding in the area (Table 7).

Table 7: Effectiveness of Development Control Measures

Level of Effectiveness	Frequency	Percentage
Very effective	68	18.0
Effective	48	12.7
Neutral	47	12.5
Ineffective	145	38.5
Very ineffective	69	18.3
Total	377	100.0

Source: Field Survey, 2025

Linking this to the research topic, the data suggests that weak or poorly implemented development control is a major challenge undermining effective flood management in Makurdi. The high percentage of negative responses signals gaps in urban planning, building regulation enforcement, and drainage system maintenance. Therefore, improving the effectiveness of development control is essential for reducing the town's vulnerability to frequent and damaging floods. The results in Table 8 reveal how residents perceive the implementation and enforcement of development

control in Makurdi Town, which directly affects its effectiveness in managing flood risks. The results notably indicate that 45.1% of respondents strongly agreed they are aware of development control measures, producing a relatively high mean score of 3.7 and a negative skewness (-0.748), suggesting that most responses leaned toward agreement. However, when asked if the regulations are clear and easy to understand, only 2.7% strongly agreed, with a low mean of 2.45 and a positive skew (0.394), indicating more disagreement or uncertainty. Similarly, the accessibility of information had only 17.5% strongly agreeing, with a mean of 2.9, reflecting moderate uncertainty or disagreement among residents. These figures suggest that while awareness is relatively high, the clarity and accessibility of development control information are limited, which weakens public understanding and compliance, a critical concern in the context of flood management, where clear communication is essential for effective land use and building control.

The enforcement-related responses further expose weaknesses in Makurdi's development control system. Only 12.2% strongly agreed that authorities effectively enforce regulations, with a low mean of 2.4 and a skewness of 0.825, showing a majority leaning toward disagreement. Similarly, consistency in enforcement across different areas had just 5% strongly agreeing, the lowest across all statements, and the mean dropped further to 2.21, reflecting residents' perceptions of uneven enforcement. Fairness in enforcement showed only 7.4% strong agreement and a mean of 2.29, reinforcing the perception of biased or selective application of rules. For flood management, this suggests that even when regulations exist, inconsistent and unfair enforcement undermines trust and reduces compliance, allowing risky practices such

as building in flood-prone areas to continue unchecked, thereby heightening flood vulnerability.

When looking at the effectiveness of penalties and community involvement, the data shows similar concerning trends. Only 12.5% strongly agreed that penalties deter non-compliance, with a mean of 2.57, and community involvement had just 8.5% strong agreement, with a mean of 2.47. These figures indicate weak deterrence and limited community engagement in the development control process. In the context of the study, effective flood management requires both strong enforcement mechanisms and active community participation to ensure land use decisions reflect local needs and reduce exposure to flood hazards. Without effective penalties, developers may ignore restrictions, and without involving the community, local knowledge about flood-prone zones or drainage challenges remains untapped.

Furthermore, the overall satisfaction levels were low, with only 7.7% strongly agreeing and a mean score of 2.26, suggesting general dissatisfaction with how development control is implemented in Makurdi. Similarly, the perception of positive impact on urban development was split, with just 19.9% strongly agreeing but an average mean of 2.91, indicating mixed feelings. Residents' and developers' actual compliance was rated even lower, with only 2.4% strong agreement and a mean of 2.12, one of the lowest in the table. These trends imply that despite some level of awareness, the weak enforcement, poor clarity, and limited public engagement compromise the effectiveness of development control measures. In a flood-prone urban environment like Makurdi, this limits the capacity of development control to shape safer, more resilient urban growth, making it harder to manage and mitigate flood risks effectively.

Table 8: Effectiveness of the implementation and enforcement of Development Control in Makurdi Town

Statements	Frequency					Percentage					Descriptive Statistics				
	1	2	3	4	5	1	2	3	4	5	N	Mean	Std. Dev	Skewness	Kurtosis
Awareness of Development Control	55	39	40	73	170	14.6	10.3	10.6	19.4	45.1	377	3.7	1.483	-0.748	-0.933

Measures: I am aware of the existing development control measures in Makurdi Town.														
Clarity of Regulations: The development control regulations in Makurdi Town are clear and easy to understand	85	142	57	83	10	22.5	37.7	15.1	22.0	2.7	377	2.45	1.141	0.394	-0.96
Accessibility of Information: Information about development control measures is easily accessible to the public.	66	122	38	85	66	17.5	32.4	10.1	22.5	17.5	377	2.9	1.395	0.176	-1.348
Enforcement of Regulations: The authorities effectively enforce development control regulations in Makurdi Town.	101	149	50	31	46	26.8	39.5	13.3	8.2	12.2	377	2.4	1.293	0.825	-0.406
Consistency in Enforcement: There is consistency in enforcing	141	115	41	61	19	37.4	30.5	10.9	16.2	5.0	377	2.21	1.247	0.749	-0.634

development control measures across different areas of Makurdi Town.														
Fairness of Enforcement: The enforcement of development control measures is fair and unbiased	128	118	51	52	28	34.0	31.3	13.5	13.8	7.4	377	2.29	1.27	0.718	-0.62
Effectiveness of Penalties: The penalties for violating development control measures are effective in deterring non-compliance	114	89	65	62	47	30.2	23.6	17.2	16.4	12.5	377	2.57	1.39	0.395	-1.143
Community Involvement: The community is adequately involved in the development control process	104	122	55	64	32	27.6	32.4	14.6	17.0	8.5	377	2.47	1.284	0.533	-0.878
Residents and developers comply with the development control measures in	123	142	65	38	9	32.6	37.7	17.2	10.1	2.4	377	2.12	1.051	0.781	-0.089

Makurdi Town														
Impact on Urban Development: The development control measures have a positive effect on urban development in Makurdi Town	77	99	57	69	75	20.4	26.3	15.1	18.3	19.9	377	2.91	1.434	0.148	-1.348
Overall Satisfaction: I am satisfied with the current implementation and enforcement of development control measures in Makurdi Town.	132	122	47	47	29	35.0	32.4	12.5	12.5	7.7	377	2.26	1.265	0.797	-0.477

Source: Field Survey, 2025; *Note: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree*

Contribution of Development Control Measures to Mitigating Flood Risks

The implementation of development control measures is generally perceived as having a significant potential to reduce the frequency and impact of flood incidents, however, the Makurdi town does not align with this ascertion. The result in Table 10 presents respondents' views on the contribution of development control measures to reducing flood incidents in Makurdi Town. The result indicates that only 27.1% strongly agreed that development control measures have significantly helped in reducing flooding. An additional 10.9% agreed with this assertion, bringing total agreement to just 38%. Meanwhile, 16.2% of respondents remained neutral, indicating a level of uncertainty or indifference toward the effectiveness of these measures. Notably, a significant proportion of respondents (37.1%), disagreed with the statement, suggesting that they perceive little impact from development control policies. Another 8.8% strongly disagreed, further increasing the total level of disagreement to 45.9%. This means that more people in Makurdi believe development control efforts have not substantially reduced flood risks. The relatively high percentage of disagreement may reflect weak enforcement, poor planning regulations, or non-compliance with development control standards. Overall, the data shows that development control in its current form may not be achieving its full potential in mitigating flood incidents in the town.

Table 10: Contribution of Implementation of development control measures to reducing flood incidents in Makurdi Town

Response	Frequency	Percentage
Strongly agree	102	27.1
Agree	41	10.9
Neutral	61	16.2
Disagree	140	37.1
Strongly disagree	33	8.8
Total	377	100.0

Source: Field Survey, 2025

The analysis of Table 11 reveals that development control measures in Makurdi Town have had mixed and generally modest effects on reducing flood risk and improving community resilience. The results revealed that the mean scores for all 12 assessed statements range between 2.38 and 2.97 on a five-point scale, indicating widespread scepticism or indifference among respondents. For instance, the statement "Development control measures have significantly reduced the risk of floods impacting livelihoods" had a mean of 2.82, with a majority (51.8%) expressing disagreement. Similarly, the lowest rated item, "Local businesses have experienced fewer disruptions due to floods", scored a mean of 2.38, reflecting significant dissatisfaction. The positive skewness values in most items imply that responses are skewed towards disagreement, and the negative kurtosis across all responses indicates a flattened distribution, meaning opinions are varied and lack consensus.

From a socio-economic standpoint, the result shows that respondents are unconvinced about the role of flood mitigation in enhancing economic stability and quality of life. Statements assessing improvements in economic conditions, such as "Flood mitigation efforts have improved the overall economic stability of residents" (mean = 2.54) and "Flood risk mitigation has positively impacted economic activities in the town" (mean = 2.49), show low agreement levels. This trend also extends to the perceived benefits to businesses, where confidence in flood preparedness among business owners (mean = 2.81) remains low, despite a slight improvement in agreement from some quarters (19.6% strongly agreed). These perceptions indicate the persistent vulnerability of livelihoods and local businesses to flood events, suggesting a weak link between policy implementation and economic resilience.

In terms of infrastructure, respondents expressed scepticism regarding improvements to structural integrity and public resilience. The perceived benefit to commercial and residential buildings yielded slightly better results, with mean scores of 2.76 in both cases. However, 48.2% and 50.6% of respondents still expressed disagreement or neutrality. Views on public infrastructure were more critical, particularly on resilience enhancements (mean = 2.53) and preparedness (mean = 2.73). Although some optimism was seen in the reduction of damage to critical infrastructure (mean = 2.97), the large spread of responses and high standard deviation (1.376) signify divided opinions. These findings imply that the physical implementation of development controls may be inadequate or inconsistently applied across different urban sectors.

Overall, the findings demonstrate a lack of strong public confidence in the effectiveness of development control measures in addressing flood risks in Makurdi. The persistent low mean scores, high standard deviations, and predominantly negative skewness reveal a wide divergence in public perception and a general sense of dissatisfaction.

The result of the Focus Group Discussion revealed that the impact of development control on flood mitigation in Makurdi Town appears minimal, as findings reveal a negligible correlation between such efforts and a reduction in flood risk. Panelists assessed these measures as only "partially effective" or even "insignificant" in addressing the challenges posed by seasonal flooding. This underscores a significant implementation gap, suggesting the disconnect between the theoretical potential of development control as a flood management strategy and its practical effectiveness on the ground.

Table 11: Impact of Development Control Measures on Flood Risk

Stateme nts	Frequency					Percentage					Descriptive Statistics				
	1	2	3	4	5	1	2	3	4	5	N	Mean	Std. Devi ation	Skew ness	Kurt osis
Development control measures have significa ntly reduced the risk of floods impactin g livelihoo ds.	76	119	54	81	47	20.2	31.6	14.3	21.5	12.5	377	2.82	1.375	0.201	-1.265
Flood mitigatio n efforts have improve d the overall economi c stability of residents .	79	151	29	101	17	21.0	40.1	7.7	26.8	4.5	377	2.54	1.216	0.388	-1.117
The impleme ntation of flood control measures has enhance d the quality of life for the communi ty.	96	122	78	45	36	25.5	32.4	20.7	11.9	9.5	377	2.48	1.255	0.575	-0.66

The structural integrity of buildings has improved due to flood control measures.	72	139	68	64	34	19.1	36.9	18.0	17.0	9.0	377	2.6	1.227	0.471	-0.803
Flood risks to residential properties have decreased as a result of development control measures.	83	108	46	95	45	22.0	28.6	12.2	25.2	11.9	377	2.76	1.359	0.191	-1.289
Commercial buildings are better protected from floods due to the implemented development control measures.	77	77	98	111	14	20.4	20.4	26.0	29.4	3.7	377	2.76	1.188	-0.126	-1.152
Public infrastructure (e.g.,	121	76	51	92	37	32.1	20.2	13.5	24.4	9.8	377	2.53	1.418	0.509	-1.022

roads, bridges) has become more resilient to flooding due to development controls.															
Development control measures have reduced the frequency of flood-related damage to critical infrastructure.	5 8	1 1 7	4 9	8 3	7 0	15.4	31.0	13.0	22.0	18.6	3 7 7	2.9 7	1.376	0.122	- 1.32 1
The overall infrastructure in Makurdi Town is better prepared to handle floods due to these measures.	6 8	1 2 1	7 3	8 2	3 3	18.0	32.1	19.4	21.8	8.8	3 7 7	2.7 3	1.267	0.302	- 1.01
Local businesses have experienced fewer	1 2 5	1 2 7	9	8 9	2 7	33.2	33.7	2.4	23.6	7.2	3 7 7	2.3 8	1.344	0.587	- 1.08

disruptions due to floods thanks to development control measures.															
Flood risk mitigation has positively impacted the economic activities in the town.	63	129	61	91	33	16.7	34.2	16.2	24.1	8.8	377	2.49	0.973	0.182	-0.539
Development control measures have increased business owners' confidence in flood preparedness.	65	143	44	51	74	17.2	37.9	11.7	13.5	19.6	377	2.81	1.396	0.408	-1.204

Source: Field Survey, 2025; *Note: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.*

The findings of the current study align and contrast in various ways with previous empirical studies on the effectiveness of development control measures in mitigating flood risk. For instance, Okoyeh et al. (2020) in their study of Onitsha, Nigeria, found that while development control policies were present, their weak enforcement led to continued vulnerability to flood risks—a point consistent with the current study's findings in Makurdi where 45.9% of respondents expressed disagreement about the efficacy of such measures. Similarly, Oyatayo and Adeniran (2021) observed in Ibadan that residents lacked confidence in development control agencies, with low compliance and poor oversight weakening flood mitigation efforts, reflecting the scepticism and low mean scores reported in Makurdi. A study by Nkwunonwo et al. (2020) also supports these observations, stating that urban planning systems in Nigerian cities rarely translate to tangible improvements in flood resilience due to poor implementation.

Conversely, some studies highlight more positive outcomes, which contrast with the Makurdi case. For example, Olorunfemi et al. (2019) documented notable improvements in flood control in Lagos following stricter enforcement of urban development regulations, with over 60% of respondents acknowledging enhanced infrastructure resilience. This is in contrast with Makurdi's more divided public perception and lower mean values (2.53 for infrastructure resilience). Likewise, Bello and Arowosegbe (2018) in Abeokuta reported that areas where development control was coupled with community awareness programmes experienced reduced flood incidents and increased public trust—an approach that appears lacking in Makurdi, where only 38% of respondents believe development control has been effective.

Overall, while there is consensus among several studies (Okoyeh et al., 2020; Oyatayo & Adeniran, 2021; Nkwunonwo et al., 2020) on the limited effectiveness of development control in mitigating urban flood risk due to institutional weaknesses and poor enforcement, variations emerge where active policy enforcement and public engagement exist. The divergence between findings from Lagos and Abeokuta versus Makurdi underscores the importance of not just having development control policies in place but ensuring they are properly implemented, monitored, and supported by community involvement. The findings from Makurdi, therefore, reflect broader national challenges in urban flood risk governance while also highlighting unique local governance gaps.

CONCLUSION AND RECOMMENDATIONS

Based on the findings, the study concludes that development control measures in Makurdi Town are currently ineffective in significantly mitigating flood risks due to weak enforcement, inadequate legal frameworks, and limited community engagement. Although zoning regulations are moderately recognised, low awareness of building codes and poor enforcement have led to widespread violations, especially in residential areas, with a high rate of unaddressed contraventions. The majority of respondents rated the enforcement of development control as poor or very poor, reflecting institutional weaknesses and enforcement inconsistencies.

Furthermore, only a few residents considered existing measures effective, while the majority disagreed that they had reduced flood impacts, indicating public scepticism.

To enhance flood risk management in Makurdi Town, local authorities should strengthen enforcement of development control regulations through increased monitoring, penalties, and demolition of illegal structures, while revising legal frameworks to include clear guidelines, building codes, and flood risk maps. Adequate funding, trained personnel, and digital monitoring systems should be prioritized, alongside fostering inter-agency collaboration and centralized data sharing for coordinated, data-driven urban planning. Community involvement through participatory planning, town hall meetings, and targeted public awareness campaigns via media, schools, and religious institutions will promote compliance and educate residents on sustainable urban practices and flood risk reduction.

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