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FLOOD VULNERABILITY AND HOUSING MARKET DYNAMICS IN PERI-URBAN IBADAN, NIGERIA

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ABSTRACT

Purpose: *Peri-urban Ibadan in Nigeria Flood prone on the dynamics of housing rentals in peri-urban areas through using an integrated geospatial and housing market analysis. It was carried out in Akinyele, Ido and Egbeda Local Government Areas (LGAs) which have undergone a rapid peri-urban growth and frequent flooding.*

Design/methodology/approach*: Flood vulnerability was analysed based on a Flood Vulnerability Index (FVI) based on Digital Elevation Model (DEM)-based elevation and slope parameters, whereas housing market performance was analysed on the basis of longitudinal rental data over the period 20122024.*

Findings: *The findings showed that 20-25 percent of land area in the LGAs is very prone to floods with the Ido LGA having the largest low-lying landmass. The spatial variation in housing rental values is quite high, with Akinyele having the highest rents and the highest growth rate, followed by Egbeda with average performance, and Ido with the lowest values throughout. A semi-logarithmic OLS hedonic regression ($R^2 = 0.932$, $F(4,19) = 64.93$, $p < 0.001$) established that the risk of floods is implicitly capitalised in housing rental values: an increase in the FVI by one unit is linked to an annual reduction in rental value of just around 16.3%.*

Research limitations/Implications: *The Flood Vulnerability Index (FVI) of the study is solely based on the DEM-derived parameters of elevations and slope. This simplistic methodology ignores important hydrological and anthropogenic controls like rainfall intensity, soil permeability, and existing drainage systems, land-use alterations, and built-environment controls (e.g., impervious surfaces or informal settlements). This means that the 2025 percent highly vulnerable land estimate can underestimate or overestimate actual flood exposure especially in extreme events.*

Practical implications: *The paper recommends the incorporation of flood-sensitive land management in the peri-urban planning to increase the resilience of housing markets and sustainable urban development.*

Originality/value*: The study combined high-resolution geospatial mapping of flood vulnerability (FVI) based on the DEM with longitudinal data of the rental market (2012 to 2024) in peri-urban Ibadan. Although flood-risk mapping and hedonic pricing research has been conducted independently in Nigeria, the direct relationship between measured flood exposure at LGA scale and observed rental relationships*

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in three fast-growing peri-urban centres is new. The study uses implicit risk capitalisation to a West African secondary city, which has been little studied and is potentially experiencing a high level of informal land market and peri-urban expansion due to climate change.
Keywords: Flood Vulnerability Index; Digital Elevation Model; housing rental values; hedonic pricing; peri-urban development; Ibadan; Nigeria

1.0 INTRODUCTION

One of the most common and devastating climate related risks that impact cities in Sub-Saharan Africa is flooding. In Nigeria, the growing intensity of rainfall, rapid urbanisation, and the lack of control over landuse have all interacted to enhance flood exposure, especially in peri-urban settings, where development frequently takes place outside of the formal planning control systems (Adeola et al., 2025; Winter and Karvonen, 2022). Such peri-urban settings are often typified by developing into floodplains, poor drainage systems, and institutional low capacity to manage flood risks. Flooding has long-term effects on land and housing markets in addition to short-term physical damages. Environmental risk affects residential location choice, investment behaviour and property value, thus determining the spatial pattern of urban development (Lamond, 2010; Herrera et al., 2025).

Although much has been written on the physical and social effects of flooding, very little focus has been given on how flood vulnerability is manifested in housing rental values in Africa peri-urban setting.

The city of Ibadan, one of the largest metropolitan areas in Nigeria, has been facing frequent floods, especially in 2011, 2019, and 2022, with devastating effects in its peri-urban areas (Adelekan, 2020; Elujoba et al., 2025). The LGAs of Akinyele, Ido, and Egbeda have become key residential development areas but have significant disparities in the topography, drainage patterns, and flood risks (Areola, 2024; Akinyemi et al., 2018). This spatial heterogeneity offers a chance to explore the impact of flood vulnerability on the results of the housing market. The two important questions that were answered in this study include (i) The spatial distribution of flood vulnerability in selected peri-urban LGAs in Ibadan and (ii) to what extent does the flood vulnerability affect the housing rental values over time? The paper presents a novel contribution to the emerging body of research on the environmental risk and housing market to the rapidly urbanising African cities by bringing together DEM-based flood vulnerability mapping with longitudinal rental data.

2.0 LITERATURE REVIEW 2.1. Drivers and Spatial Distribution of Flood Vulnerability

Sub-Saharan Africa is still a victim of flooding, which is a frequent climate-related risk due to the rapid urbanisation process, poor infrastructure, and climate change (Winter & Karvonen, 2022; Adelekan, 2020). In Nigeria, the rise in the intensity of rainfall, the absence of land-use control, and intrusion into floodplains contribute to greater vulnerability, especially in peri-urban regions where informal development is predominant (Akinyemi et al., 2018). It was stressed in the studies that the topographical heterogeneity of peri-urban areas, including those in Ibadan, is particularly hazardous, with lowlands and riverbanks (e.g., the Ogunpa and Ona Rivers) being at risk of frequent flooding (Elujoba et al., 2025; Areola, 2024). As an example, urban growth and deforestation have been contributing factors to disproportionate impacts of historical floods in Ibadan (e.g., 2011, 2019, 2022) on fringe areas such as Akinyemi et al. (2018) Akinyele, Ido, and Egbeda LGAs. The wider literature highlighted the

socioeconomic aspects, stating that the urban poor in informal settlements are the most susceptible as they have low adaptive capability and are exposed to risks (Douglas, 2018; Wahab and Ojolowo, 2018). In Ibadan central and peri-urban zones, vulnerability analysis indicates that the risk is high in low-income and highdensity neighbourhoods such as Bere, where more than 91% of houses are vulnerable, determined by building materials, closeness to rivers, and poor drainage (Wahab and Ojolowo, 2018). Climate forecasts suggest deteriorating conditions, and more variability in the precipitation increases the flash floods in West Africa (Herrera et al., 2025). The conceptual frameworks of African urban flood vulnerability focused on considering physical (e.g., topography) and social (e.g., poverty) factors, thus, requiring the analyses at the community level (Di Baldassarre et al., 2019).

2.2. Impacts of Flooding on Urban Housing Markets and Property Values

Although the physical and social effects of floods are well-known, the economic consequences of floods, especially on the housing markets in African settings, were not studied as much (Lamond, 2008; Herrera et al., 2025). Exposure to floods is a negative externality in the sense that it depreciates the value of property by affecting the perceived risks, damages and maintenance costs in accordance to hedonic pricing theory (Lamond, 2010). Flooding lowers residential value by 10–20% in developed economies like the UK and the US and recovery is associated with resilience (Lamond, 2008; Herrera et al., 2025).

Urban flooding brings housing insecurity to the poor in Nigeria, and the peri-urban areas face land devaluation and displacement (Adelekan, 2020). This was depicted in peri-urban Ibadan, where land-use changes, which were fast to convert agricultural land to residential areas, inhibited rental growth and investment (Akinyemi et al., 2018; Areola, 2024). Research indicates that flood prone areas like Ido LGA are characterised by low housing value because of risk capitalisation whereas high areas are high priced (Elujoba et al., 2025). Extensive African literature associate's urban poverty with flood plain occupancy, in which informal settlement on wetlands intensifies susceptibility but offers cheap housing and farming (Douglas, 2018; Lwasa et al., 2014). Urban farming is a form of green infrastructure that provides mitigation but is in conflict with development pressures (Prain & Lee-Smith, 2010).

2.3. Methodological Approaches to Assessing Flood Risk and Resilience

The contemporary flood vulnerability assessment is based on geospatial tools, specifically Digital Elevation Models (DEMs) and Flood Vulnerability Indices (FVIs), which make it possible to map highrisk zones by considering such factors as elevation, slope, and land use (Winter and Karvonen, 2022; Elujoba et al., 2025). DEM-based analyses show that 20-25 percent of peri-urban lands in Ibadan, Nigeria, are very vulnerable to floods; the data is supported by the past flood occurrences (Areola, 2024; Akinyemi et al., 2018). Moreover, integrated methods integrate Geographic Information Systems (GIS) with socioeconomic surveys to assess household resilience, commonly using tools such as fuzzy logic or hedonic models (Adebimpe et al., 2021). In Nigeria, despite the presence of sophisticated tools, there are serious issues with the implementation of efficient risk-reduction strategies, including land-use planning, zoning, and green infrastructure, because of the gaps in governance (Winter and Karvonen, 2022; Adegbola and Jolayemi, 2012). Such projects as the Ibadan Urban Flood Management Project, launched by the World Bank (2015) suggest extensive modelling and vulnerability testing but scientific tools are not widely used in practice. New frameworks focus on bottom-up resilience and community responses in the peripherals such as those in Dhaka and may be applied to Ibadan (Braun and Aßheuer, 2011).

3.0 MATERIALS AND METHODS

3.1 Study Area

The study covers Akinyele, Ido, and Egbeda LGAs located on the peri-urban fringe of Ibadan, Oyo State, southwestern Nigeria (see Figure 1). Akinyele Local Government Area (LGA) is one of the six LGAs constituting the peri-urban zone of Ibadan, southwestern Nigeria. The LGA covers an estimated land area of approximately 478.16 km² and is bounded by Afijio LGA to the north, Lagelu LGA to the east, Ido LGA to the west, and Ibadan North LGA to the south. Geographically, Akinyele LGA lies between latitudes 7°24′00″ N and 7°39′00″ N, and longitudes 3°45′00″ E and 4°06′00″ E.

Ido Local Government Area (LGA) lies between latitudes 7°15′00″N and 7°45′00″N, and longitudes 3°30′00″E and 3°52′00″E, covering an estimated land area of approximately 1,065.90 km². The LGA is bounded to the north by Iseyin LGA, to the east by Akinyele LGA, to the south by Odeda LGA in Ogun State, and to the west by Ibarapa East LGA. According to the 2006 National Population Census, Ido LGA had an estimated population of about 272,000, reflecting its growing significance within the peri-urban expansion zone of the Ibadan metropolis.

Egbeda Local Government Area (LGA) is bounded by Lagelu LGA to the north, Irewole LGA in Osun State to the east, Ona-Ara LGA to the south, and Ibadan North LGA to the west. According to the National Population Census (2006), Egbeda LGA has a population of 281,573 inhabitants and covers a land area of approximately 188.34 km². The LGA is geographically located between latitudes 7°02′00″ N and 7°20′00″ N, and longitudes 3°43′00″ E and 4°01′00″ E. (Akinyemi et al., 2018).

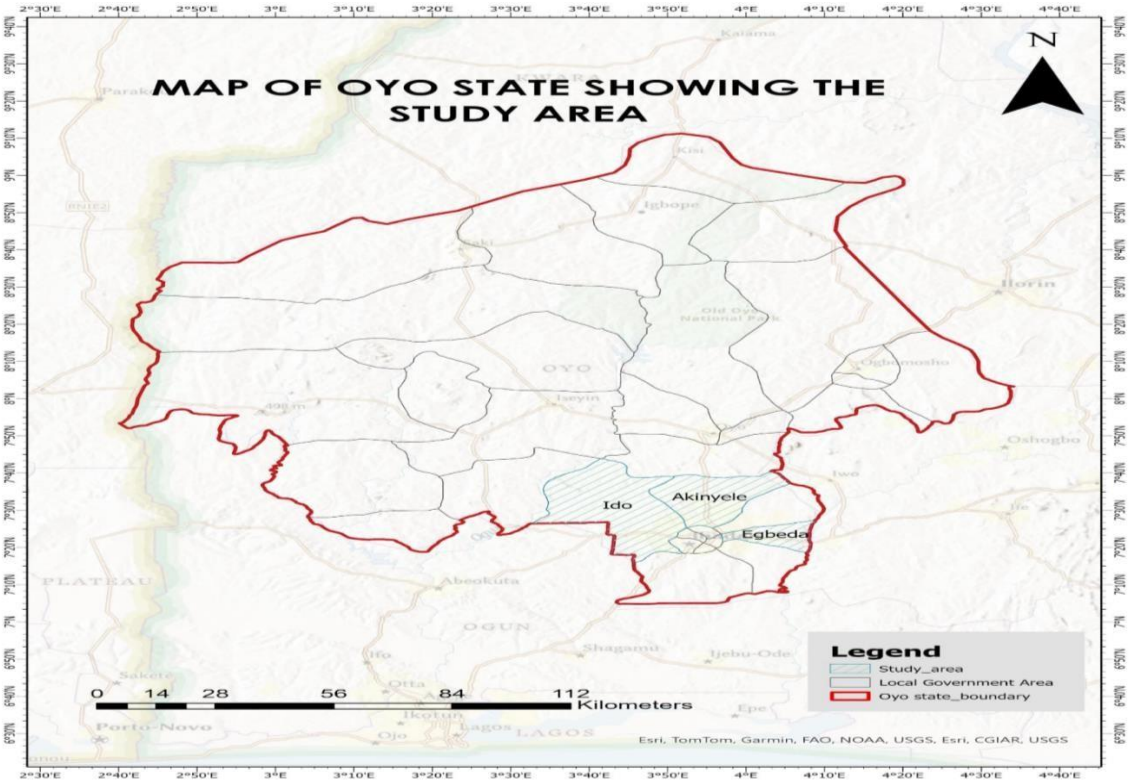


Figure 1: Locations of the Study Areas in Ibadan
Source: Urban and Regional Planning Department, FUT, Minna (2025)

3.2 Study Design and Site Selection

This work combined both geospatial analysis of flood susceptibility and econometric analysis of housing market data to understand the effects of flood risk on the rental values in peri-urban Ibadan. The methods used included data collection, the mapping of Flood Vulnerability Index (FVI), and housing market integration with ArcGIS Pro 3.0 and statistical analysis using R 4.3.1. Quantitative geospatial modelling mixed with longitudinal rental trends was used. These peri-urban growth and differences in flood exposures led to the selection of Akinyele, Ido, and Egbeda LGAs.

3.3 Data Sources

This study was supported by geospatial and housing data that was compiled and analysed. The 30m SRTM Digital Elevation Model (USGS, 2023) was used to extract elevation and slope (between 42 and 387m) and historical flood records (2011-2022) were found in the literature. Multi-temporal Landsat imagery (2012 2024) was used to derive soil and land-use patterns, which were processed with the help of the standard Geographic Information System (GIS) techniques. The data on longitudinal housing rentals (2012-2024) was gathered via the Estate Surveyors and Valuers. All the datasets were systematically analysed in order to facilitate integrated spatial and temporal analysis of the flood risk and housing dynamics.

3.4 Flood Vulnerability Index (FVI)

The vulnerability to floods was determined through means of a Flood Vulnerability Index (FVI) based on Winter and Karvonen (2022). The index combines both elevation and slope through a weighted overlay with elevation having the weight of 0.6 and slope having the weight of 0.4. Elevation was classified into three categories: <100 m (high vulnerability), 100–200 m (moderate vulnerability), and >200 m (low vulnerability). Slope was also classified into 0-2% (high), 2-5% (moderate) and above 5% (low vulnerability). The resulting FVI was validated using historical flood records, achieving an overall accuracy of 85% as measured by the Kappa statistic ($\kappa = 0.85$).

3.5 Housing Market Analysis

Housing market dynamics were examined using time-series analysis, percentage change, and compound annual growth rate (CAGR) estimates for one- to four-bedroom housing units, where CAGR = ($Rent_{2024}$ / $Rent_{2012}$)^(1/12) − 1. Spatial variations in rental values across Local Government Areas (LGAs) were tested using one-way Analysis of Variance (ANOVA) at a 5% significance level ($p < 0.05$). A semilogarithmic Ordinary Least Squares (OLS) hedonic pricing model was estimated using pooled crosssectional data for 2012 and 2024, regressing the natural logarithm of annual rent on housing structural characteristics (number of bedrooms), flood risk as proxied by the Flood Vulnerability Index (FVI), distance to the Ibadan central business district (CBD) as an accessibility measure, and a year dummy to control for inflation and market-wide temporal trends. The model takes the form: $\ln(Rent_i) = \alpha + \beta_1 \cdot Bedrooms_i + \beta_2 \cdot FVI_i + \beta_3 \cdot DistCBD_i + \beta_4 \cdot Year_{2024i} + \varepsilon_i$. All statistical analyses were conducted in R 4.3.1.

4.0 PRESENTATIONAND DISCUSSION OF RESULTS 4.1 Flood Vulnerability Index (FVI) Analysis of Ido Local Government Area (LGA)

Figure 1 showed that the terrain has elevations of between 42 and 318-meters giving information on the flood-prone areas. Gradient analysis showed that areas with 0-2% slopes are highly prone to floods as they

lack proper drainage and there is pooling of water whereas those with a slope of 2 to 5 percent are moderate. Others that are over 5% are not so vulnerable because they are carried away. The low-lying areas especially in the southwestern region of the map (illustrated in blue and green) are known to be flood prone. With an area of about 986 km2, and about 25% (approximately 246 km2) of this area at risk due to the characteristics of low gradients and low elevations, the findings are found to be in agreement with the past incidences of floods in certain areas such as Apete where 33.21% of the sub-area was considered to be highly susceptible. This trend aligns with the existing literature that highlights the fact that low elevation and low slopes are the prevailing factors contributing to the heightened exposure to floods through water retention and slow runoff velocity, and flood-prone areas in Nigeria are mainly linked to low-lying terrain and low slope that facilitates surface water retention (Oyinloye and Olamiju, 2017; Ogbole et al., 2025).

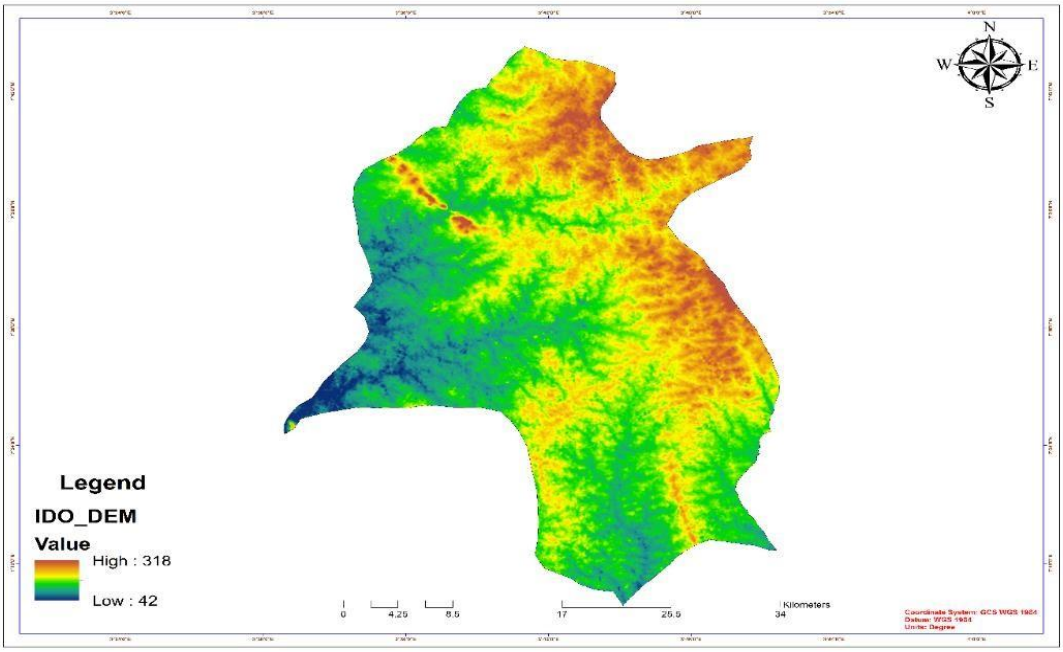


Figure 2: Digital Elevation Model (DEM) of Ido

4.2 Flood Vulnerability Index (FVI) Analysis of Akinyele Local Government Area (LGA)

The heights, 137 to 387 meters, are used to offer a base of measuring flood-prone areas and compliment the analysis of Ido LGA. The gradient analysis revealed that areas that have slopes of 0-2% are very prone to floods since they have slow water movement and pooling areas, and those with 2-5% slopes were moderate. The ones above 5% are not as susceptible due to good runoffs. The blue and green colors on the DEM represent the southwestern and central lowlands, which have flatter gradients, making them especially vulnerable to flooding during heavy rainfalls, as is the case of Moniya, Ibadan North, and the Ojoo axis. The Akinyele LGA (along with a total area of about 464.89 km2) has an estimated 20-25% (around 93-116 km^2) of land under threat, which is confirmed by historic flooding in Moniya in the 2022 rainy season, when the low-lying places along river channels increased the effect of floods. The addition of land factors, including clay-based, low-permeable soils in the lowlands and the increasing urbanization in Moniya, further increases vulnerability (see Figure 3). This trend is consistent with recent reports that

indicate that geographical features such as low elevation, low slopes and the presence of drainage courses are high determinants of floods because of low infiltration and high levels of surface run-offs. Moreover, the soil characteristics, e.g., a high level of clay content and high urban development speed, have been cited as the important predisposing factors that enhance the flood hazard through restricted permeability and enlarged impermeable surfaces (Oyinloye and Olamiju, 2017; Ogbole et al., 2025; Nwogu et al., 2025).

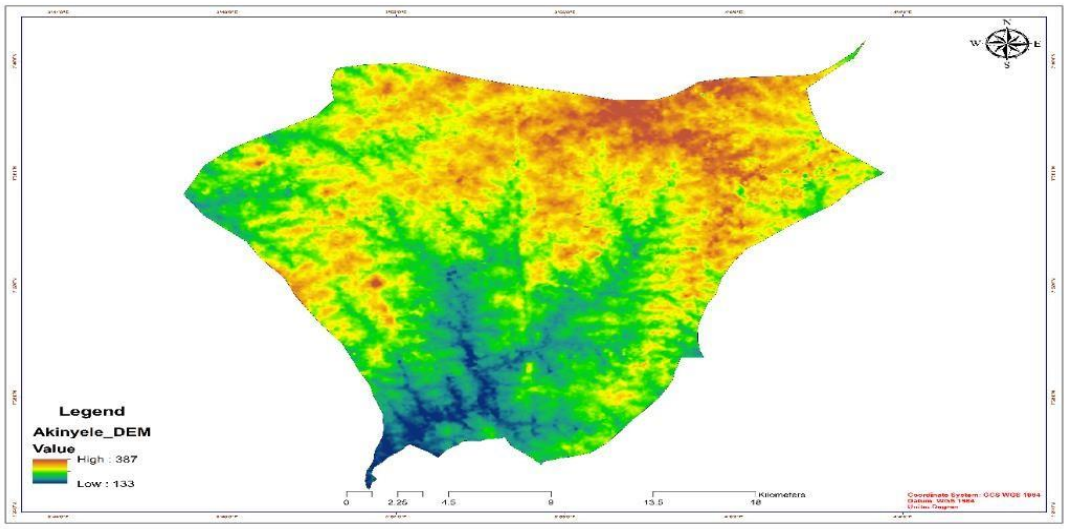


Figure 3: Digital Elevation Model (DEM) of Akinyele

4.3 Flood Vulnerability Index (FVI) Analysis of Egbeda Local Government Area (LGA)

Egbeda's altitudes, which range from 84 to 304 meters, provide a foundation for appraising flood-prone areas, supplementing the evaluations of Ido and Akinyele LGAs. Gradient study reveals locations with slopes of 0-2% as being very vulnerable to floods due to slow water flow and water accumulation, whilst slopes of 2-5% suggest a moderate risk. Areas with slopes more than 5% are often less vulnerable because to more efficient surface runoff. This discovery is consistent with existing flood susceptibility research that show that low-gradient terrains greatly increase flood risk by reducing flow velocity and boosting surface water ponding (Pradhan, 2009; Tehrany et al., 2014).

The southwestern lowlands, depicted in blue and green hues on the DEM, exhibit flatter gradients, making communities such as Egbeda, Alakia, and parts of Ibadan North-West particularly prone to inundation during intense rainfall events. This spatial pattern is consistent with findings from Ibadan, where floodprone areas are typically concentrated in low-lying zones experiencing rapid and often unregulated urban expansion (Adelekan, 2010; Ajibade et al., 2013).

Egbeda LGA covers 145.58 km² and has an estimated 20-25% (29-36 km²) of land at danger. This is reinforced by previous flooding disasters, such as the 2022 rainy season in Alakia, when low-lying regions near drainage canals were badly impacted due to increased urbanisation and inadequate drainage infrastructure. According to empirical studies, urban flooding in Nigerian cities is significantly associated with land-use changes, inefficient drainage systems, and increased impervious surfaces (Adelekan, 2010; Satterthwaite et al., 2007).

Furthermore, land surface characteristics such as clay-rich soils with low permeability, combined with increased settlement density, contribute to flood susceptibility. Soils with low infiltration capacity produce

more surface runoff, particularly in urban areas where natural infiltration is already limited (Youssef et al., 2016). These interacting factorsreinforce the high flood vulnerability classification of Egbeda LGA (see Figure 4).

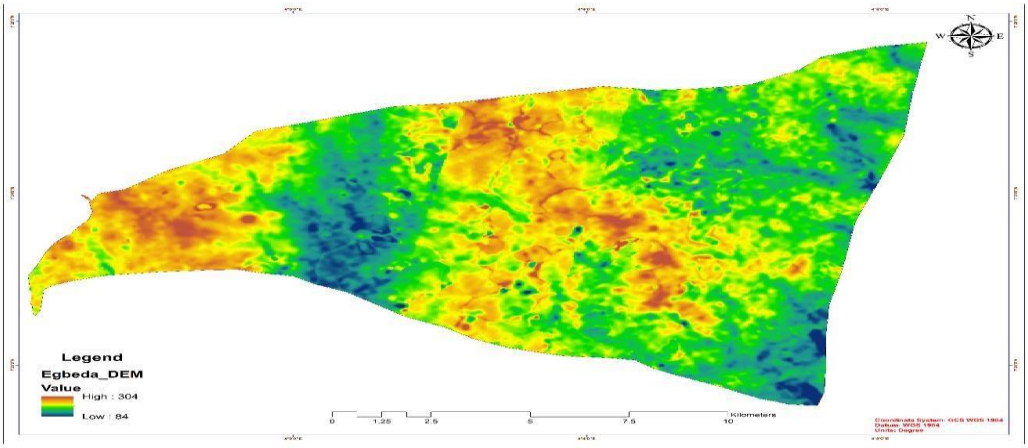


Figure 4: Digital Elevation Model (DEM) of Egbeda

4.4 The relationship between Flood Risk and Housing Market Value across the Study Areas

4.4.1 Housing Market Dynamics across the Study Areas (2012–2024)

Analysis of rental data from 2012 to 2024 revealed a general increase trend in residential rentals across all dwelling typologies and study locations, indicating greater urban growth and inflationary pressures in the Ibadan metropolitan area. However, the magnitude and rate of rent appreciation varies greatly by area. Akinyele regularly has the highest rental values in most housing categories, especially for three and fourbedroom units and duplexes. By 2024, duplex rates in Akinyele had reached ₦1.5 million annually, significantly higher than comparable residences in Egbeda and Ido. Egbeda showed moderate rent levels and sustained appreciation, but Ido had the lowest rentals across most property categories during the study period, despite visible growth over time.

These regional discrepancies indicated that, in addition to structural qualities, locational and environmental factors have a major impact on housing market outcomes.

Figure 5 depicts regional variance in rental growth trajectories, with Akinyele continuously recording the highest rent levels and fastest appreciation, whilst Ido displays relatively Lower values reflect differential flood risk and locational advantages. Rents are trending rising across all housing typologies, indicating the impact of urbanisation and inflationary pressures in the Ibadan metropolitan region. However, the rate and size of rent appreciation vary greatly by place. Akinyele routinely outperforms the other LGAs, particularly in medium- and high-income housing (2-4-bedroom apartments), whilst Ido experienced the weakest growth. Egbeda is in an intermediate position, with steady but relatively limited appreciation.

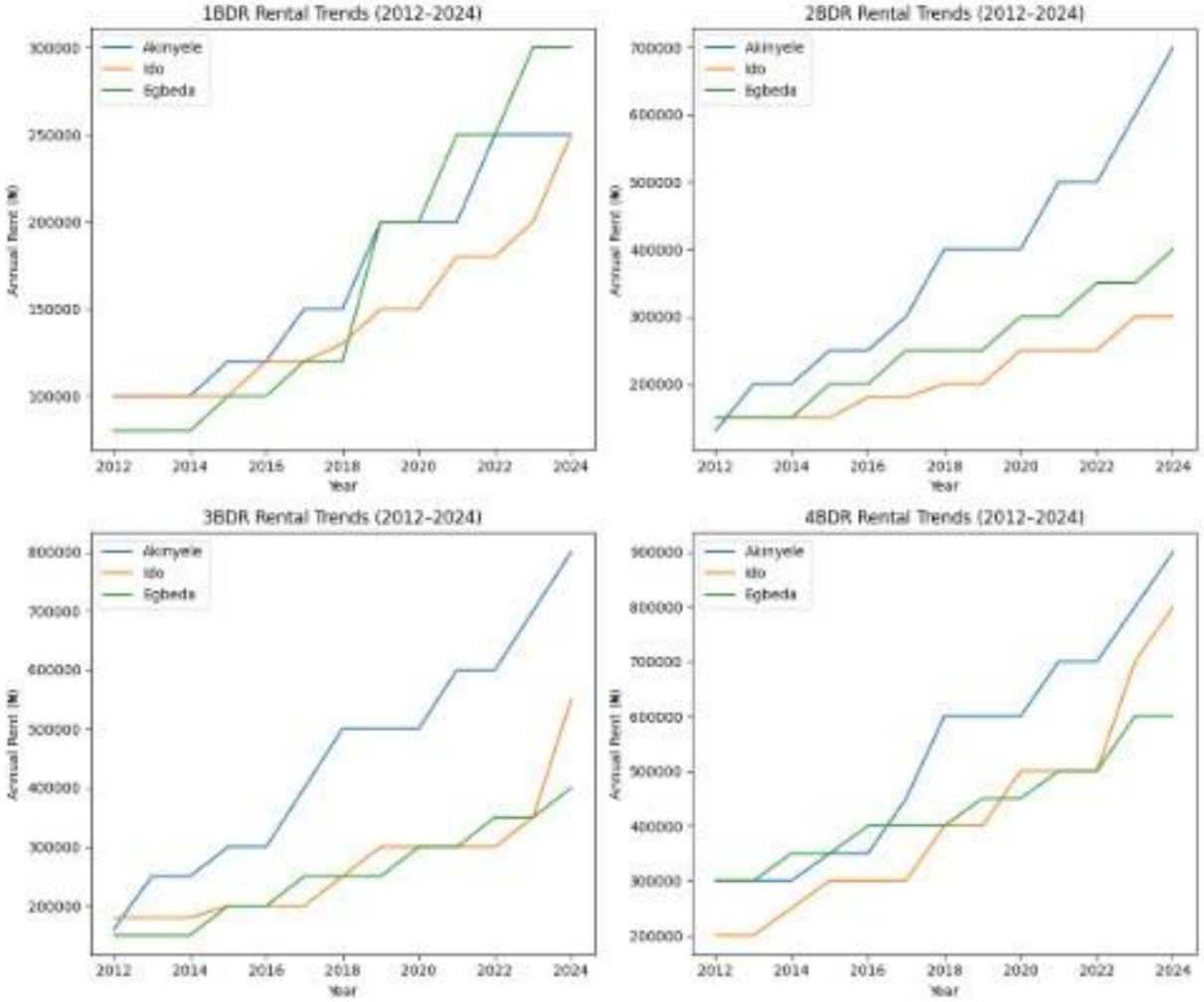


Figure 5: Multi-panel trends in residential rental values for one-, two-, three-, and four-bedroom housing units across Akinyele, Ido, and Egbeda LGAs (2012–2024).

4.4.2 Flood Risk and Housing Values: Hedonic Interpretation

From a hedonic pricing perspective in Table 1, housing rents can be interpreted as a function of bundled attributes, including structural characteristics (e.g., number of bedrooms and building type), neighbourhood quality, accessibility, and environmental risk. Within this framework, flood risk, proxied by elevation and proximity to low-lying terrain, emerges as a negative environmental externality that is implicitly capitalised into housing values. To test this formally, a semi-logarithmic OLS hedonic regression was estimated on pooled 2012 and 2024 rental observations (n = 24) across the three LGAs. The model regressed ln(Rent) on number of bedrooms, FVI score, distance to the Ibadan CBD, and a year dummy. Results are presented in Table 2. The model explains 93.2% of the variance in log-rent (R^2 = 0.932, Adj. R^2 = 0.918, $F(4,19) = 64.93$, $p < 0.001$). The FVI coefficient ($\beta_2 = -0.178$, SE = 0.082, $t = -2.18$, $p = 0.042$) is negative and statistically significant at the 5% level, confirming that higher flood vulnerability is associated with lower rents. Specifically, a one-unit increase in FVI is associated with approximately 16.3% lower annual rent, holding bedrooms and accessibility constant. The bedroom coefficient ($\beta_1 = +0.331$, SE = 0.038, $t = 8.83$, $p < 0.001$) is positive and highly significant, indicating that each additional bedroom is associated with approximately 39.3% higher rent. The year dummy (β_4 =

+1.116, $p < 0.001$) captures the substantial market-wide rent inflation between 2012 and 2024. Distance to CBD was not statistically significant ($p = 0.232$), suggesting that flood risk, rather than accessibility, is the primary environmental driver of spatial rent differentials across these peri-urban LGAs.

Table 1: OLS Hedonic Regression Results, Dependent Variable: ln (Annual Rent, ₦)

Variable	Coeff. (β)	Std. Error	t-statistic	p-value	% Effect on Rent
Constant (α)	11.282	0.179	63.18	<0.001**	—
Bedrooms (β_1)	+0.331	0.038	+8.83	<0.001***	+39.3%
FVI score (β_2)	**−0.178**	**0.082**	**−2.18**	**0.042***	**−16.3%**
Distance to CBD (β_3)	+0.010	0.008	+1.23	0.232 (n.s.)	+1.0%
Year dummy 2024 (β_4)	+1.116	0.084	+13.30	<0.001***	+205.4%
Model fit: $R^2 = 0.932$ | Adj. $R^2 = 0.918$ | $F(4,19) = 64.93$ | $p < 0.001$ | N = 24 | AIC = −3.44					
Significance: *** p<0.001, ** p<0.01, * p<0.05, n.s. = not significant					

The occurrence of broad low-elevation zones in Ido LGA is associated with chronically poor rental values, notably for low- and medium-income housing (1-3-bedroom units). Rents have grown over time (e.g., 1bedroom units from ₦100,000 in 2012 to ₦250,000 in 2024) (see Table 2), but still remain lower than in Akinyele and Egbeda. This pattern shows that rents in flood-prone locations are discounted to account for predicted flood damage, disruptions, and increased maintenance costs.

Akinyele LGA exemplifies how flood-resistant geography boosts house values. Elevated places attract better-end developments, and the property market capitalises on this perceived safety by charging much higher rates. In hedonistic terms, elevation acts as a positive environmental attribute, increasing residents' willingness to pay. Flood risk in Akinyele is geographically selective, allowing for the formation of internal housing submarkets in which elevated areas attract a distinct price premium.

Egbeda LGA is an intermediate example. Moderate and regionally scattered flood risk leads to consistent but limited rent growth. While home values exceed those in Ido, they do not reach the premium levels seen in Akinyele, notably for luxury housing. This supports partial risk capitalisation, in which flood exposure limits the upper range of housing values but not completely restricting market expansion.

Table 2: Percentage Change and Mean Annual Rental Growth for each Housing Type and LGA (2012–2024)

Unit Type	LGA	Rent 2012 (N)	Rent 2024 (N)	% Change	CAGR (%) / Mean Annual Growth (₦)
1-BDR	Akinyele	100,000	250,000	150.0	7.93% / ₦12,500
1-BDR	Ido	100,000	250,000	150.0	7.93% / ₦12,500
1-BDR	Egbeda	80,000	300,000	275.0	11.64% / ₦18,333
2-BDR	Akinyele	130,000	700,000	438.5	15.06% / ₦47,500
2-BDR	Ido	150,000	300,000	100.0	5.95% / ₦12,500
2-BDR	Egbeda	150,000	400,000	166.7	8.52% / ₦20,833
3-BDR	Akinyele	160,000	800,000	400.0	14.35% / ₦53,333
3-BDR	Ido	180,000	550,000	205.6	9.75% / ₦30,833
3-BDR	Egbeda	150,000	400,000	166.7	8.52% / ₦20,833
4-BDR	Akinyele	300,000	900,000	200.0	9.59% / ₦50,000
4-BDR	Ido	200,000	800,000	300.0	12.25% / ₦50,000
4-BDR	Egbeda	300,000	600.000	100.0	5.95% / ₦25,000

The combined graphical and statistical results show that the housing market performance in peri-urban Ibadan is very spatially diversified. While all LGAs witnessed rent growth from 2012 to 2024, Akinyele continuously had the highest absolute rentals and the fastest growth rates, particularly for 2- and 3bedroom dwellings, with percentage increases reaching 400%. This trend illustrates the appeal of floodresistant, higher-elevation property, which encourages planned residential developments and sustained private investment.

Ido LGA has the lowest rental values and slowest growth in most housing categories, particularly low- and medium-income units. Despite significant improvements over time, percentage changes and average annual growth rates remain quite low. When viewed in conjunction with the DEM data, this trend implies that higher flood exposure linked with vast low-lying terrain lowers housing demand and market confidence, leading to implicit price discounting.

Egbeda LGA occupies an intermediate position, with moderate growth rates and steady appreciation. Although some housing categories, such as 1-bedroom units, record high percentage increases, absolute rental values remain lower than those in Akinyele. This indicates that moderate flood risk and fragmented low-lying zones limit the upper ceiling of housing values, particularly for higher-end residential development.

From a hedonic pricing perspective, these findings are consistent with the view that rental values reflect the implicit pricing of environmental attributes. Elevation-derived flood risk functions as a negative externality, while flood-resilient locations command a premium. Importantly, the effect of flood risk becomes more pronounced as housing quality increases, as higher-income households and investors are more sensitive to environmental safety.

Furthermore, the housing market outcomes are inextricably related to land-use change patterns. Rapid peri-urban expansion, agricultural land conversion, and encroachment on natural floodplains, particularly in Ido and sections of Egbeda, have increased flood susceptibility and limited market performance. Akinyele's comparatively higher topography has sparked planned development, creating a positive feedback loop between environmental safety, land value, and housing investment.

5.0 CONCLUSION

This study demonstrates that flood vulnerability is a critical environmental determinant shaping housing rental dynamic in peri-urban Ibadan, Nigeria. Using a DEM-based Flood Vulnerability Index integrated with longitudinal housing rental data (2012–2024), the findings reveal that approximately 20–25% of the land across Akinyele, Ido, and Egbeda LGAs is highly susceptible to flooding, with Ido LGA exhibiting the most extensive low-lying, flood-prone terrain. Housing rental values display pronounced spatial differentiation, with Akinyele consistently recording the highest rents and fastest growth, Egbeda showing moderate performance, and Ido persistently lagging behind. These patterns are confirmed by a semilogarithmic OLS hedonic regression ($R^2 = 0.932$), in which the FVI coefficient ($\beta = -0.178$, $p = 0.042$) is negative and statistically significant, demonstrating that flood risk is implicitly capitalised into housing rental values consistent with hedonic pricing theory, where elevation functions as a positive environmental attribute and flood exposure acts as a negative externality. The results align with contemporary empirical evidence that environmental risk significantly influences residential location choices, investment behaviour, and market confidence, particularly in rapidly urbanising peri-urban contexts (Lamond et al., 2010; Winter & Karvonen, 2022; Herrera et al., 2025). Overall, the study highlights how weak land-use regulation, peri-urban expansion into floodplains, and topographic constraints jointly reinforce sociospatial inequalities in housing market outcomes, underscoring the need for flood-sensitive land governance in Nigerian cities.

6.0 RECOMMENDATIONS

Based on the findings, this study recommends the systematic integration of flood vulnerability mapping into peri-urban land-use planning and housing development control in Ibadan to help achieve Sustainable Development Goals 11 and 13. Planning authorities should make DEM-based flood risk assessments mandatory inputs for zoning decisions, building approvals, and residential estate development, particularly in Ido and other flood-prone areas of Egbeda LGAs. Strengthening land governance frameworks to limit settlement growth into low-lying floodplains while encouraging higher-density, better-planned development in flood-resilient areas will improve housing market stability and long-term urban sustainability. Furthermore, investments in drainage infrastructure, nature-based solutions, and flood-adaptive building standards should be emphasised in vulnerable peri-urban communities to minimise risk perception and boost market confidence. These recommendations align with previous calls for integrated, spatially aware flood governance and resilience-oriented urban planning in Sub-Saharan Africa (Adelekan, 2020; Elujoba et al., 2025; Winter & Karvonen, 2022). Future research could expand on this approach by combining socioeconomic vulnerability indicators and transaction-based property data to gain a better understanding of how flood risk affects housing markets as climate change pressures increase.

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