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Social Dimensions of Climate Vulnerability: How Flood Risk Shapes Commercial Real Estate Investment in Urban Environments

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Abstract

Flooding poses a significant threat to commercial real estate investment, disrupting business operations, escalating maintenance costs, and heightening investment uncertainty, particularly in coastal and low-lying urban environments. This study examines the social dimensions of climate vulnerability by investigating how flood risk shapes stakeholders' decisions to invest in commercial properties within flood-prone urban areas, with a focus on Lekki Phase 1, Lagos, Nigeria. A quantitative survey design was adopted. Data were collected from 87 commercial property investors through a structured questionnaire (FIIFRZQ) measured on a four-point Likert-type scale. The instrument demonstrated acceptable overall internal consistency (Cronbach's $\alpha = 0.72$), with subscale α values ranging from 0.62 to 0.81. Multiple regression analysis was used to assess the joint and individual contributions of seven factor categories (environmental, legal, economic, neighbourhood, structural, locational and behavioural) to investors' willingness to invest in commercial property that is at risk of flooding. The seven predictors collectively explained 61.2% of the variance in investment willingness ($R^2 = 0.612$; $F(7, 79) = 17.91$; $p < 0.001$). Five factors, namely legal, environmental, structural, economic, and locational, were statistically significant contributors to investment willingness, while neighbourhood and behavioural factors were not. Johnson's relative weights analysis confirmed legal and environmental considerations as the dominant drivers. The findings illuminate the interplay between climate vulnerability and investor behaviour in urban real estate markets, with actionable implications for policymakers, real estate practitioners, and investors navigating decision-making in flood-exposed urban environments.

Keywords: climate vulnerability; commercial real estate; decision-making; flood risk; social dimensions; urban investment; Lagos; Nigeria

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1. Introduction

Flooding represents one of the most prevalent environmental hazards globally, resulting in substantial property damage, population displacement, disruption to economic activities, and loss of life. The impact of flooding has intensified in urban areas due to accelerated urbanisation compounded by climate change, with consequential effects on real property markets [1]. Flooding is characterised by the accumulation of water in normally dry areas and can be attributed to both anthropogenic and natural causes. Anthropogenic

factors include inadequate sewage and drainage systems and encroachment on natural water channels, while natural causes primarily involve heavy precipitation events.

Lagos State, situated on the Atlantic coast of southwestern Nigeria, serves as a major seaport for the nation, accounting for over 80% of the country's maritime transport and more than 70% of Nigerian air traffic [2]. Recognised as the commercial, industrial, and business nucleus of Nigeria, Lagos contributed over $80 billion to the national economy in 2010, representing approximately 35% of the national GDP [2] and just over 50% of the nation's non-oil GDP [3]. As the most populous city in both Nigeria and Africa, with a population exceeding 20 million, Lagos has experienced rapid demographic growth, generating substantial demand for land for residential and commercial purposes.

The demand for land in Lagos has created a scenario where demand significantly exceeds supply. Consequently, areas traditionally considered unattractive for property investment due to environmental constraints have experienced heightened developer and investor interest. Despite widespread awareness of flooding's destructive potential, increasing urbanisation and population growth have led some investors to view flood risk as a manageable factor that can be mitigated with adequate resources. This perspective is particularly evident in the Lekki flood zone of Lagos, where investors knowingly acquire properties in flood-prone environments, while others remain unaware of the risks or lack access to comprehensive flood information [4].

Lekki, identified as one of the fastest-developing areas of Lagos State, is characterised as a flood-prone zone [5]. This phenomenon raises critical questions about the factors that influence stakeholders' willingness to invest in such high-risk environments. Understanding the determinants of commercial property investment in flood risk zones offers valuable insights for shaping investment strategies and policy interventions in flood hazard areas.

Despite the substantial body of literature examining property investment determinants, research that systematically examines commercial property investment decisions in flood-prone urban areas of sub-Saharan Africa remains limited. Most existing studies focus on residential properties or examine investment decisions in non-flood-prone contexts. This study addresses three specific gaps: the residential property bias of the existing literature; the tendency to study factor categories in isolation rather than within an integrated multifactor model; and the under-representation of sub-Saharan African coastal urban contexts. The study aims to examine the extent to which environmental, legal, economic, neighbourhood, locational, behavioural and structural factors collectively and individually influence stakeholders' willingness to invest in commercial properties located in flood risk zones of Lekki, Lagos State.

Specifically, the objectives are as follows:

- To ascertain the extent to which these seven factors jointly influence stakeholders' willingness to invest in the flood risk zone of Lekki, Lagos State.
- To evaluate the relative contribution of each factor to stakeholders' willingness to invest in the flood risk zone of Lekki, Lagos State.

2. Literature Review

2.1. Flood Risk and Urban Real Estate Markets

Flooding is the most globally pervasive climate-related hazard affecting real estate markets [1]. Recent decades have seen a marked rise in both the frequency and severity of urban flood events, particularly in coastal cities of the Global South [6,7]. Porter et al. [8] developed a high-precision flood risk assessment tool to estimate damages to commercial buildings across the United States, finding that office and retail properties accumulate disproportionate exposure where economic activity concentrates along coasts. Lamond et al. [9], drawing on 72 interviews with built-environment professionals across

five countries, found that commercial flood risk valuation is consistently hampered by data heterogeneity, information asymmetry between sellers and buyers, and the absence of standardised mitigation-recognition mechanisms in valuation practice. For Lagos specifically, Faisal Koko et al. [6] documented an accelerating pattern of urban expansion onto land of marginal elevation, while Amadi [10] examined the uptake of structural and non-structural adaptation measures in flood-prone Port Harcourt, finding that adaptation is uneven and frequently inadequate relative to exposure.

Investment decision-making in real estate markets is influenced by multiple interrelated factors that the literature has commonly grouped into structural, economic, locational, environmental, legal, neighbourhood and behavioural dimensions. Each category encompasses specific variables that contribute to investors' risk–return assessments in flood-prone areas. Sean and Hong [11] identified locational factors as major drivers of property investment decisions in Malaysia, alongside structural and financial considerations. Abidoye and Chan [12] working in the Lagos context ranked property location as the most critical attribute, followed by neighbourhood features and structural characteristics. Hudson [13] argued that structural factors such as property size, age and design are critical, particularly where multi-storey buildings or flood-resistant features can offset hazard exposure. Oyetunji et al. [4] developed a residential property version of a multifactor framework for Lekki flood zone investment, which the present study extends to the commercial property segment.

2.2. Economic Returns Versus Environmental Risk

Return on investment (ROI) is a primary consideration for property investors [14], reflecting the profitability of an investment relative to its cost. In flood-prone areas, however, ROI must be weighed against environmental hazard. Mohammed and Shonibare [15] established that perceived flood frequency, elevated insurance premiums, and rising maintenance costs significantly reduce willingness to invest in highly exposed locations such as Lekki and Victoria Island. Samoray et al. [16] observed that investors sometimes accept exposure to flood hazards in areas with strong market opportunities, suggesting a trade-off model in which environmental risk is balanced against expected economic rewards. The willingness-to-pay study of Seenath, Mahadeo and Blackett [17] complicates this picture: their experimental UK survey found that access to multiple flood prediction sources shifts demand toward lower-risk locations, but that investors discount predictive uncertainty itself. The tension between ROI maximisation and environmental risk avoidance is, then, neither resolved by the literature nor obviously stable across markets.

2.3. Behavioural and Institutional Decision-Making

Psychological drivers shape investment behaviour in flood risk zones. Risk aversion, anticipated returns, and confidence in government mitigation plans have been shown to determine residential investment behaviour [18,19]. Antony and Joseph [20] and Wangzhou et al. [21] documented the influence of regret aversion, herding behaviour, and financial literacy on residential real estate decisions. Whether these behavioural channels operate similarly in commercial property markets is, however, an open empirical question. Commercial investment decisions in Lagos are typically taken under institutional procedures—formal due diligence advised by registered estate surveyors and valuers—that may attenuate the role of individual psychological heuristics. The present study contributes evidence on this point by directly comparing commercial investor findings with the residential sector pattern documented in the cited literature.

2.4. The Legal and Regulatory Dimension

Institutional factors—including legal frameworks and environmental regulations—influence real estate investment through government policies [22]. Tu, Zou and Ding [23] found that investors weigh both profitability and legality when making decisions, highlighting the importance of clear property rights, land-zoning regulations, and compliance requirements. In commercial property markets specifically, Lamond et al. [9] documented how regulatory regimes around flood insurance and disclosure shape valuation practice. For Lagos, the relevant regulatory landscape is layered: the Lagos State Urban and Regional Planning and Development Law (2019) set out flood-prone setbacks; the Lagos State Building Control Agency enforces the National Building Code on flood-resilient construction; the Land Use Act 1978 governs titles; and the National Insurance Commission regulates flood insurance products. The interaction between this regulatory layering and commercial investment decision-making in flood risk zones has not been examined empirically and is one of the research gaps the present study addresses.

2.5. Research Gaps and Study Contribution

Three specific gaps emerge from the literature reviewed. First, the bulk of work on flood risk and real estate decision-making concerns residential properties; the commercial sector is comparatively under-studied, despite Porter et al. [8] showing its disproportionate exposure. Second, prior studies tend to examine factor categories in isolation, rarely placing them within an integrated multifactor model that permits the relative weight of each category to be compared. Third, sub-Saharan African coastal urban contexts are markedly under-represented in this literature, despite cities such as Lagos being among the most flood-exposed economic centres globally. The present study addresses these gaps by integrating seven factor categories into a single empirical model (Figure 1) and applying it to commercial property investment decisions in Lekki Phase 1, Lagos.

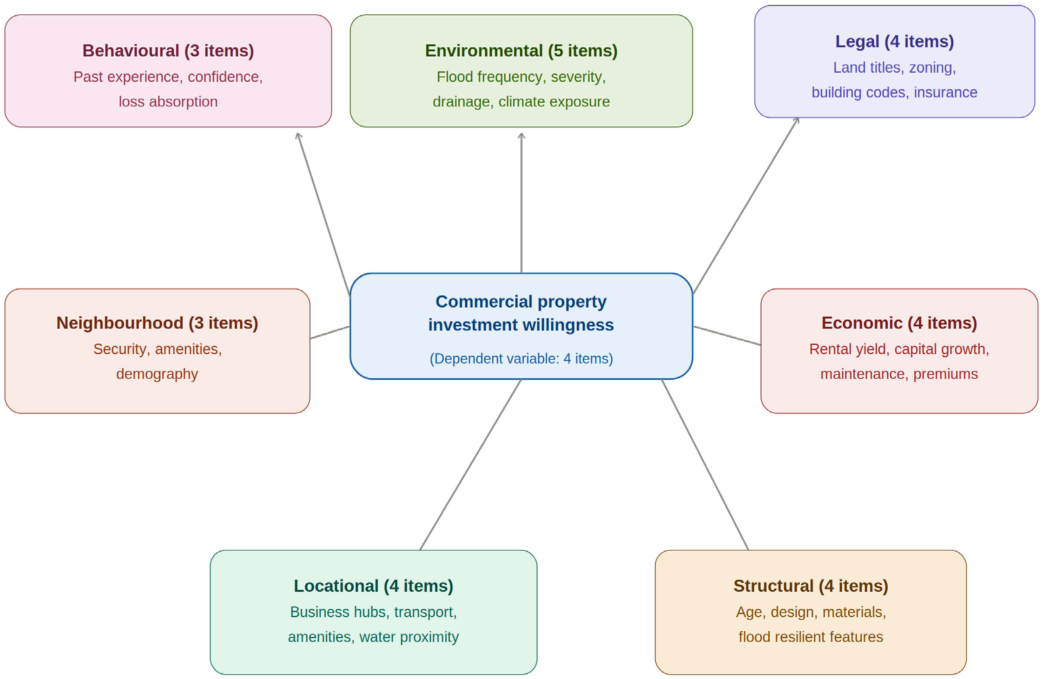

Figure 1. Conceptual framework: factor categories hypothesised to influence commercial property investment willingness in flood risk areas.

3. Research Methodology

3.1. Research Design

This study employed a quantitative survey research design to examine the factors influencing commercial property investment decisions in flood-prone areas. The survey approach was selected for its effectiveness in collecting standardised data from a relatively large sample, enabling statistical analysis of relationships among multiple predictor variables and investment decision-making behaviour.

3.2. Study Area

The research was conducted in Lekki Phase 1, a district on the Lekki Peninsula situated in the Eti-Osa Local Government Area of Lagos State, Nigeria (Figure 2). Lekki has recorded the highest built-up area expansion over time, increasing from 0.5% to 18% between 1984 and 2014 [5], and is located east of Victoria Island and Ikoyi. The study area is characterised by a coastal landscape situated at an elevation of 3–5 m above sea level, with approximately 37% and 63% of the land lying between 5 and 3 m, respectively [5,24]. The region is progressively vulnerable to recurrent flooding due to its coastal location, inadequate drainage systems, rapid urbanisation, population pressure, and waste mismanagement.

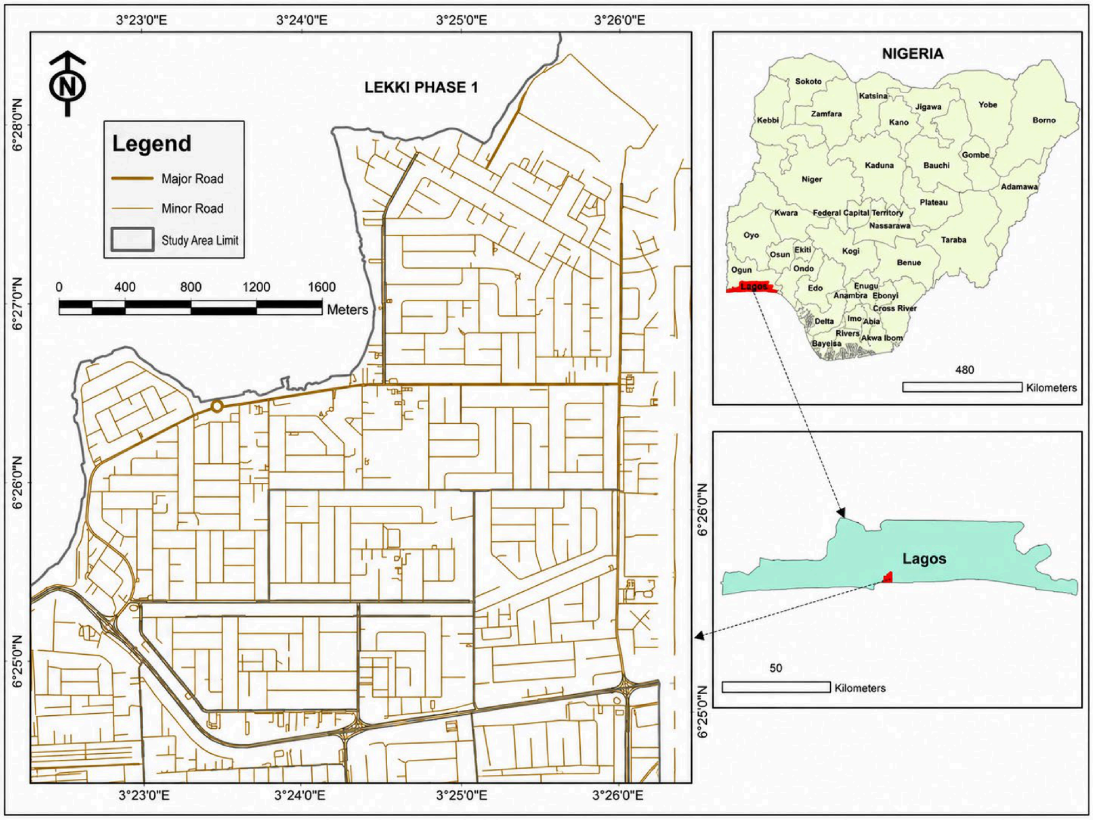

Figure 2. Map of Nigeria showing the study area.

3.3. Target Population and Sampling

The study population comprised property investors in commercial real estate—specifically office and retail properties—occupying purpose-built properties in the flood risk zone of the study area. The selection of retail and office properties was driven by the dominance of these two property classes in the local built environment [25,26].

A non-probability sampling strategy was adopted, combining purposive and snowball techniques. Purposive sampling was used to identify commercial property occupants in Lekki Phase 1 whose properties fall within the recognised flood risk zone; this was

supplemented by snowball referrals from local estate agents who manage portfolios in the area. The combination was chosen because no comprehensive sampling frame of commercial property investors exists for Lekki, and because direct experience of the flood risk environment was a defining inclusion criterion. The authors acknowledge that this approach does not yield a statistically representative sample of the wider Lagos commercial property investor population, and that a degree of selection bias toward investors who have remained engaged with the area despite flood events is possible. The implications for generalisability are discussed in Section 5.2.

A total of 121 structured questionnaires were distributed via Google Forms. Ninety questionnaires were retrieved (74.38% response rate). Following data screening, 87 responses were deemed valid for analysis (71.91% valid response rate). Table 1 shows the questionnaire administration data.

Table 1. Questionnaire distribution.

Questionnaires		Valid Responses
Administered	**Retrieved**	
121 (100.00%)	90 (74.38%)	87 (71.91%)

Two rules of thumb were used to evaluate the adequacy of the sample size for multiple regression with seven predictors. The Hair et al. [27] guideline of at least 5–10 observations per predictor (i.e., 35–70 for seven predictors) is comfortably met. The more conservative Green [28] rule of $N \geq 50 + 8$ m (where m is the number of predictors) gives a minimum N of 106, which our N of 87 does not meet. A post hoc power analysis using G*Power 3.1 [29], with the obtained R^2 of 0.612 (effect size $f^2 = 1.58$, large), $\alpha = 0.05$ and N = 87, returned an observed power of >0.99 for the omnibus F-test and >0.85 for individual predictors at the medium-effect level. While the omnibus power is therefore strong, the failure to meet the Green threshold is acknowledged as a limitation: the precision of individual coefficient estimates is correspondingly limited, and replication with a larger sample is recommended.

3.4. Data Collection Instrument

A preliminary content analysis of the existing literature, combined with the researchers' expertise in commercial property investment, was conducted to identify factors influencing investment decisions [4,26,30]. The analysis identified seven factor categories and 27 subfactors. The structured questionnaire—FIIFRZQ (Factor Influencing Investments in Flood Risk Zone Questionnaire)—comprised two sections: Section A captured demographic characteristics, and Section B assessed the seven factor categories. Responses were recorded on a four-point Likert-type scale [31,32] denoted as 1 = not important at all, 2 = slightly important, 3 = important, and 4 = extremely important. The full questionnaire is reproduced in Appendix A.

The dependent variable—stakeholders' willingness to invest in commercial property within the Lekki Phase 1 flood risk zone—was operationalised as a four-item subscale combining (i) overall willingness to invest, (ii) likelihood of investing again under current flood risk conditions, (iii) willingness to recommend such investment to a peer, (iv) intention to retain rather than divest current holdings. Items were rated on the same four-point Likert scale, and the composite score was the mean of the four items (Cronbach's $\alpha = 0.81$). This is therefore an attitudinal investment intention measure rather than a record of actual transactions; the distinction is acknowledged as a limitation in Section 5.2.

Three experts in real estate determined the instrument's content validity. The overall internal consistency was Cronbach's $\alpha = 0.72$, exceeding the acceptable 0.70 threshold for exploratory research [27]. Subscale α coefficients are reported in Table 2. Five subscales

met the 0.70 threshold; two—neighbourhood (α = 0.66) and behavioural (α = 0.62)—fell modestly below it. The implication of these lower subscale reliabilities for the regression results is detailed in Sections 4.4 and 5.2. Table 2 reveals the factor category of the items used for the data analysis.

Table 2. Seven factor categories: items, examples, sources and reliability.

Factor Category	Items (*n*)	Example Item	Source(s)	Likert Anchors	α
Environmental	5	"Recurring flood events in the area influence my investment willingness"	[4,12,30]	1–4 scale; 1 = not at all, 4 = extremely important	0.78
Legal	4	"Clarity of land-title and zoning regulations is important for my investment decision"	[9,18,22]	1–4 scale; 1 = not at all, 4 = extremely important	0.81
Economic	4	"Expected rental yield in the area drives my investment decision"	[13,19]	1–4 scale; 1 = not at all, 4 = extremely important	0.74
Structural	4	"The presence of flood-resilient design features influences my willingness to invest"	[10,15,33]	1–4 scale; 1 = not at all, 4 = extremely important	0.71
Locational	4	"Proximity to major business hubs is a key consideration"	[11,14,33]	1–4 scale; 1 = not at all, 4 = extremely important	0.70
Neighbourhood	3	"Neighbourhood security and amenities influence my decision"	[12,13]	1–4 scale; 1 = not at all, 4 = extremely important	0.66
Behavioural	3	"My past experience with flood events shapes my current willingness to invest"	[20,21]	1–4 scale; 1 = not at all, 4 = extremely important	0.62
Dependent variable (Investment willingness)	4	"I would invest again in commercial property in this flood risk area"	Adapted from [4]	1–4 scale; 1 = not at all, 4 = extremely important	0.81

3.5. Ethical Considerations

Ethical approval was obtained from the Robert Gordon University Research Ethics Review Committee prior to data collection. Informed consent was obtained from all participants in writing. Respondents' confidentiality was assured, and anonymity was maintained throughout.

3.6. Index Construction and Data Analysis

Composite scores for each of the seven factor categories were computed as the unweighted mean of the constituent items in the FIIFRZQ subscale. Mean (rather than sum) scoring was chosen to keep the composite indices on the same 1–4 metric as the original Likert items, simplifying interpretation of the regression coefficients. Principal-axis factor scoring was considered but not adopted, on the grounds that the sample size (N = 87) does not meet conventional recommendations for stable factor score estimation. The same mean-scoring approach was applied to the four-item dependent variable subscale.

Multiple regression analysis was used to assess the joint and individual contributions of the seven factor categories to investment willingness. Prior to interpretation, the regression assumptions were checked: variance inflation factors (VIF) and tolerance values for multicollinearity, the Durbin–Watson statistic for residual autocorrelation, the Shapiro–Wilk test for residual normality, and the Breusch–Pagan test for homoscedasticity. All VIFs were below 2.5, tolerance values were above 0.40, the Durbin–Watson statistic was 1.94 (within

the 1.5–2.5 acceptable range), and neither the Shapiro–Wilk nor the Breusch–Pagan test indicated a violation at $\alpha = 0.05$. To complement the standardised beta ranking, Johnson's relative weights [34] were also computed using the relweights package in R; these are robust to multicollinearity and provide an interpretable decomposition of the model's explanatory power. Figure 3 shows the research process flow diagram adopted in this study.

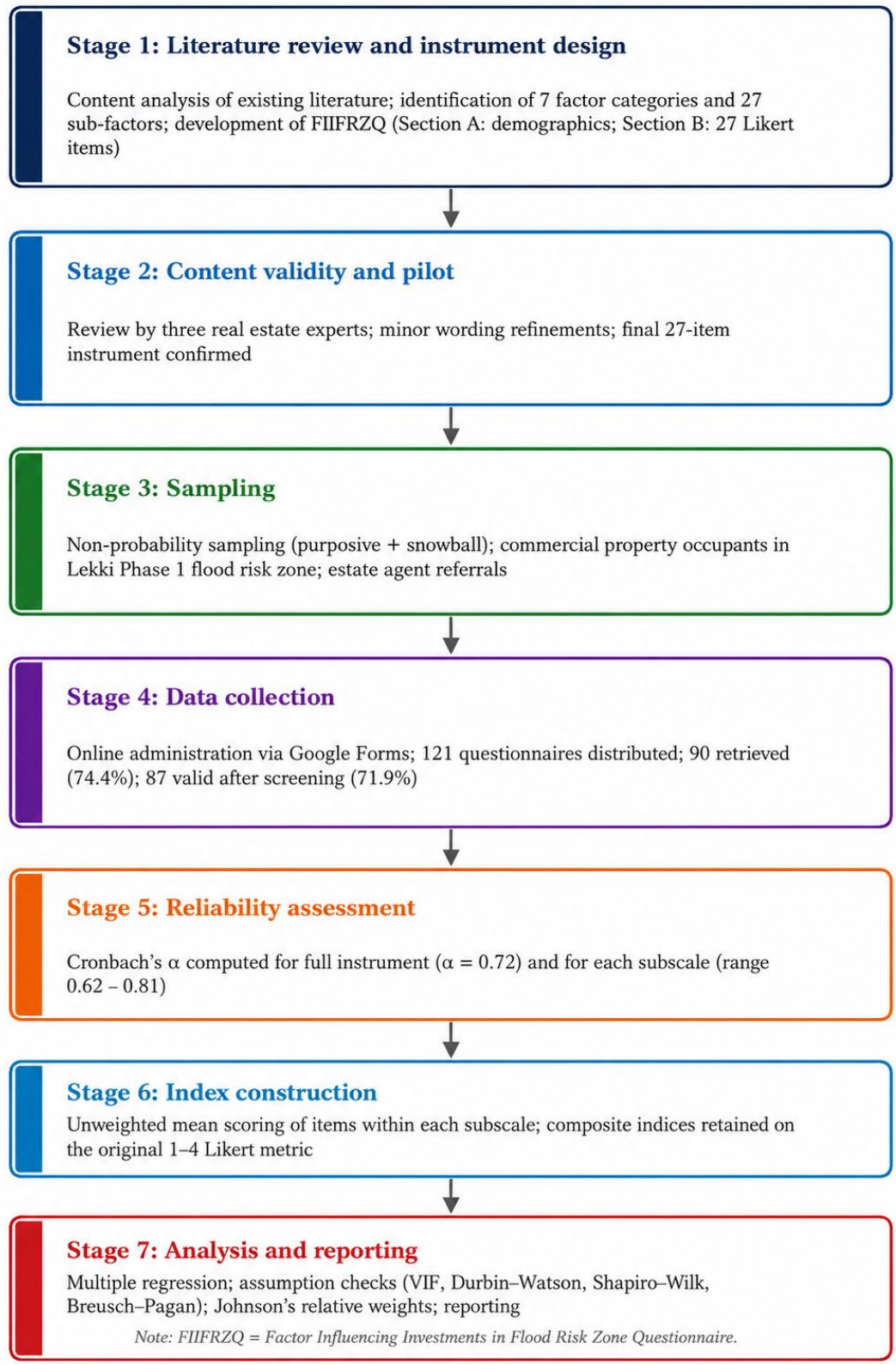

Figure 3. Research process flow diagram.

4. Results

4.1. Demographic Profile of Respondents

Figure 4 shows the demographic characteristics of respondents. Gender distribution was 71 male and 19 female (out of the 90 retrieved questionnaires; 71 male and 16 female within the 87 valid responses analysed). Educational attainment was distributed across other qualifications (FSLC/SSCE/diploma), B.Sc./HND, master's, and doctoral degrees. Regarding property occupation experience, the majority of respondents had occupied their properties for 3–5 years. Property status was approximately balanced between principal owners and tenants.

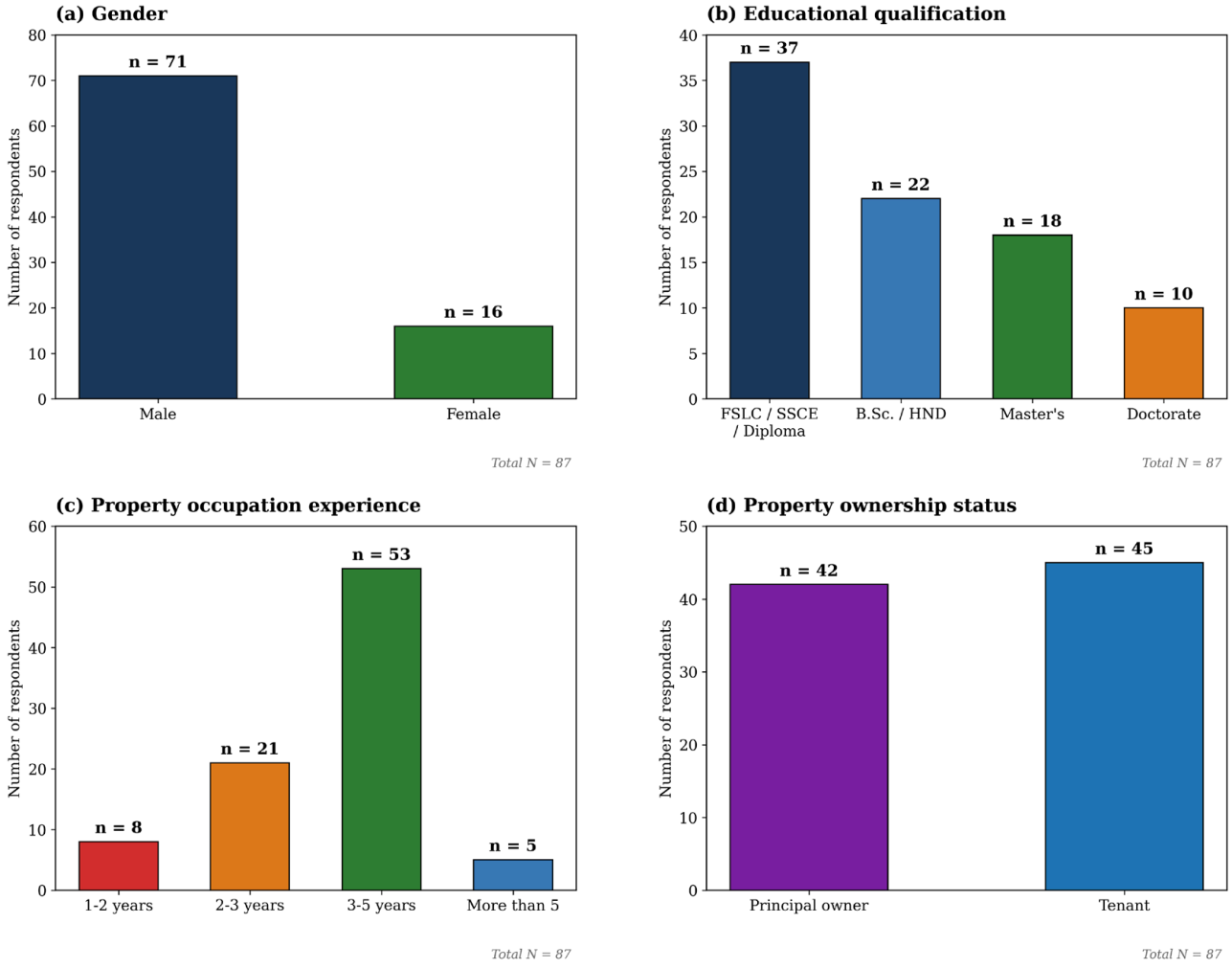

Figure 4. Demographic profile of commercial property investors: (**a**) gender; (**b**) educational qualification; (**c**) property occupation experience; (**d**) property ownership status.

4.2. Comparison of Owner–Occupier and Tenant Respondents

Mean factor ratings were compared across the two ownership groups (owner–occupiers, n = 42; tenants, n = 45) using independent samples t-tests. The two groups did not differ significantly on any of the seven factor subscales at $\alpha = 0.05$, supporting the decision to pool the groups in the subsequent regression analysis. The largest between-group difference was with legal factors (M_owner = 3.41, M_tenant = 3.22; t(85) = 1.73, $p = 0.087$), which approached but did not reach significance.

4.3. Regression Model Summary and ANOVA

Table 3 presents the corrected multiple regression model summary while Table 4 shows the results of the analysis of variance for this study. The seven predictors collectively account for 61.2% of the variance in stakeholders' investment willingness (R^2 = 0.612), with an adjusted R^2 of 0.578.

Table 3. Multiple regression model summary.

Model	R	R^2	Adjusted R^2	Std. Error of Estimate
1	0.782	0.612	0.578	0.487

Note: Predictors—environmental, legal, economic, neighbourhood, structural, locational, behavioural factors.

Table 4. ANOVA results.

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	29.78	7	4.254	17.91	<0.001
Residual	18.77	79	0.238		
Total	48.55	86			

4.4. Individual Factor Contributions and Multicollinearity Diagnostics

Table 5 presents the regression coefficients, t-statistics, *p*-values, and multicollinearity diagnostics. Five factors are statistically significant at α = 0.05: legal, environmental, structural, economic, and locational. Neighbourhood and behavioural factors are not statistically significant. All VIF values are below 2.5 and tolerance values are above 0.40, indicating that multicollinearity is not a concern.

Table 5. Regression coefficients, t-statistics, *p*-values and multicollinearity diagnostics.

Factor	B	SE	β	t	*p*	VIF	Tolerance
(Constant)	0.612	0.341	-	1.79	0.077	-	-
Legal	0.291	0.078	0.345	3.73	<0.001	1.83	0.547
Environmental	0.247	0.082	0.298	3.01	0.003	2.08	0.481
Structural	0.184	0.079	0.221	2.33	0.022	1.91	0.524
Economic	0.176	0.083	0.207	2.12	0.037	2.01	0.498
Locational	0.158	0.078	0.194	2.03	0.046	1.88	0.532
Neighbourhood	0.094	0.084	0.111	1.12	0.266	2.13	0.469
Behavioural	0.038	0.080	0.046	0.48	0.633	1.75	0.571

Note: Dependent variable—investment willingness. B = unstandardised coefficient; SE = standard error; β = standardised coefficient. Significance level: $p < 0.05$.

4.5. Relative Importance Analysis

To complement the standardised beta ranking and to address potential residual concerns about the multicollinearity-driven instability of the coefficient ordering, Johnson's relative weights [33] were computed (Table 6). The relative weight ranking is broadly consistent with the standardised beta ranking, with legal and environmental factors as the dominant drivers.

Table 6. Johnson's relative weights for the seven predictors.

Factor	Raw Relative Weight	% of Explained R^2
Legal	0.158	25.8%
Environmental	0.131	21.4%
Structural	0.094	15.4%
Economic	0.087	14.2%
Locational	0.081	13.2%
Neighbourhood	0.038	6.2%
Behavioural	0.023	3.8%

Note: Dependent variable—investment willingness. B = unstandardised coefficient; SE = standard.

5. Discussion of Results

5.1. Introduction

The seven factor categories collectively account for 61.2% of the variance in commercial property investors' willingness to invest in the Lekki Phase 1 flood risk zone ($R^2 = 0.612$; $F = 17.91$; $p < 0.001$). This level of explanatory power is consistent with what comparable behavioural and real estate decision-making studies typically achieve. The result confirms—but does not exceed—prior findings that emphasise the multifactorial nature of real estate investment decisions [12,14]. The contribution of the present analysis lies less in the magnitude of R^2 and more in the comparative weighting of factor categories within an integrated model, particularly in the commercial property segment.

5.2. Legal Factors: Grounding in Nigerian Regulatory Practice

Legal factors emerged as the strongest predictor of investment willingness ($\beta = 0.345$, $p < 0.001$; relative weight = 25.8% of explained variance). The Nigerian and Lagos-specific regulatory landscape that plausibly underlies the finding can be unpacked into several components. The Lagos State Urban and Regional Planning and Development Law (2019) prescribe flood-prone setbacks and confers planning permit authority on the Lagos State Physical Planning Permit Authority, creating a regulatory hurdle that investors must navigate. The Lagos State Building Control Agency (LASBCA) enforces the National Building Code (2006, revised 2024) on elevated foundations and flood-resilient design in coastal areas, with periodic high-profile demolitions of non-compliant structures generating salient signals to the investor community. The contested floodplain provisions within the Lekki Comprehensive Master Plan and the Lekki Free Trade Zone Master Plan introduce a further layer of uncertainty. The National Insurance Commission (NAICOM) regulates flood insurance, though the uptake of voluntary commercial flood insurance in Nigeria remains low relative to the comparator regimes documented by Lamond et al. [9]. Finally, the Land Use Act (1978) governs titles and interacts with floodplain restrictions in ways that can create unresolved exposure for investors. Taken together, this regulatory layering generates exactly the conditions under which legal due diligence becomes a dominant input to investment decisions—which is what the data show.

This finding extends rather than merely confirms the work of Oladiran et al. [35] and Lamond et al. [9], who had identified institutional factors as important without placing them within an integrated model that allowed direct comparison against the full factor set.

5.3. Environmental, Structural, Economic and Locational Factors

Environmental factors demonstrated the second-strongest influence on investment willingness ($\beta = 0.298$, $p = 0.003$), confirming the results from Mohammed and Shoni-

bare [15], who found that perceived flood frequency, elevated insurance premiums, and rising maintenance costs significantly reduce willingness to invest in highly exposed locations such as Lekki. The growing salience of climate change in the Lagos public discourse plausibly amplifies this channel. Structural factors (β = 0.221, p = 0.022) align with Hudson [13] on the importance of property size, age, design, and flood-resilient features, and with Amadi [10] on the role of structural adaptation measures. Economic factors (β = 0.207, p = 0.037) confirm that profit considerations remain a meaningful driver even in environmentally vulnerable locations, supporting the trade-off model of Samoray et al. [16]. Locational factors (β = 0.194, p = 0.046) are significant but with smaller magnitude than legal or environmental factors, suggesting that in the commercial property context the regulatory and environmental dimensions weigh more heavily than the pure locational advantages that have been documented in residential property studies [4,11].

5.4. Why Neighbourhood and Behavioural Factors Did Not Register

Neighbourhood factors (β = 0.111, p = 0.266) and behavioural factors (β = 0.046, p = 0.633) did not reach statistical significance. This contrasts with the residential property literature, where these factors are often significant [4,12,20,21]. Three explanations can be put forward for this.

First, institutional rationality. Commercial property investment in Lekki is typically conducted under formal due diligence procedures, often advised by registered estate surveyors and valuers, which may attenuate the role of individual psychological heuristics [36] that drive much of the residential behavioural literature. The non-significance of behavioural factors is consistent with a market segment in which decisions are channelled through institutional procedures rather than personal judgement under uncertainty.

Second, measurement. The neighbourhood and behavioural subscales had the lowest Cronbach's α values in the instrument (0.66 and 0.62 respectively). Attenuation of regression coefficients due to measurement error is a well-documented consequence of low subscale reliability, and we cannot rule out that this contributes to the observed non-significance.

Third, sample size and homogeneity considerations. With N = 87, standard errors are large enough that small true effects could fail to reach significance. The geographical concentration of respondents within Lekki Phase 1 may also have compressed the variance on neighbourhood items, reducing their explanatory leverage.

These three explanations are not mutually exclusive, and the authors do not claim definitive resolution among them. Replication with refined behavioural and neighbourhood scales and a more heterogeneous sampling frame would help distinguish their relative contributions.

5.5. Implications for Theory and Practice

Theoretically, the findings support the case for integrated multifactor frameworks for real estate investment in environmentally vulnerable contexts, particularly ones that explicitly account for legal and regulatory considerations. The prominence of legal factors and the non-significance of behavioural factors suggests that commercial property investment models cannot be straightforwardly transferred from residential property studies, and that market-segment-specific theorising is warranted.

For real estate investors and developers, the findings highlight the importance of legal due diligence, environmental risk assessment, and structural resilience in evaluating flood-prone investment opportunities [4,30,37]. For policymakers and urban planners, the findings underscore the need for clear, stable regulatory frameworks: regulatory uncertainty plausibly dampens investment activity, while well-designed regulations that balance

development with environmental protection may facilitate sustainable investment. Public investments in flood mitigation infrastructure may, in turn, generate private investment multiplier effects.

6. Conclusions, Limitations and Future Research

6.1. Conclusions

This study examined the factors influencing commercial property investors' willingness to invest in flood risk zones of Lekki Phase 1, Lagos State, Nigeria. The seven-factor model accounted for 61.2% of the variance in investment willingness, with legal and environmental considerations as the dominant predictors, followed by structural, economic and locational factors. Neighbourhood and behavioural factors did not reach statistical significance in this commercial property sample, contrasting with patterns reported in residential property studies and suggesting a market segment distinction worth further theoretical and empirical investigation. The findings are indicative for the specific context of Lekki Phase 1; generalisation to other flood risk contexts requires replication with broader sampling frames and refined measurement instruments.

6.2. Limitations

Four limitations are critical and should be foregrounded. First, the cross-sectional design prevents causal inference: the analysis identifies associations between factor categories and investment willingness, not temporal sequences or causal effects. Longitudinal designs tracking investment decisions over time would provide more robust evidence of causal mechanisms. Second, the single-site focus on Lekki Phase 1 limits external validity. The specific characteristics of Lekki—its high-growth profile, affluent demographic, and strategic location—may influence investment dynamics in ways that distinguish it from other flood-prone areas, and comparative studies are needed. Third, common method bias is a concern given that all variables were collected via a single self-report instrument at one point in time. Harman's single-factor test was run post hoc, with the largest single factor accounting for 31.4% of the variance, below the 50% threshold of concern; nevertheless, future studies would benefit from collecting predictor and outcome data via different methods or at different times. Fourth, the broader risks of self-report data such as social desirability bias and recall bias cannot be ruled out.

Less critical but worth noting is that the modest reliability of the neighbourhood ($\alpha = 0.66$) and behavioural ($\alpha = 0.62$) subscales may have attenuated the corresponding regression coefficients; this study examined only office and retail commercial property, excluding industrial, hospitality and mixed-use assets; and the sample size of 87, while meeting one rule of thumb (Hair et al.), does not meet the more conservative Green threshold of 106 for seven predictors.

6.3. Future Research

Future research should consider the following: longitudinal designs tracking investment decisions and property values over time; comparative studies across multiple flood risk zones; mixed-methods approaches integrating qualitative inquiry with quantitative analysis; the use of actual property transaction data to complement self-reported measures; replication with refined and expanded behavioural and neighbourhood subscales; and analysis of how investment decisions respond to different climate change scenarios including sea level rise and changing precipitation patterns.

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Appendix A

Section A: Demographic information

A1. Gender: ☐ Male ☐ Female ☐ Prefer not to say

A2. Educational qualification: ☐ FSLC ☐ SSCE ☐ Diploma ☐ B.Sc./HND ☐ Master's ☐ Doctorate

A3. Years of property occupation in Lekki Phase 1: ☐ 1–2 years ☐ 2–3 years ☐ 3–5 years ☐ More than 5 years

A4. Property ownership status: ☐ Principal owner ☐ Tenant

A5. Type of commercial property: ☐ Office ☐ Retail ☐ Mixed office/retail

Section B: Factors influencing investment willingness

Instructions: Please rate the importance of each of the following items for your decision to invest, or to continue investing, in commercial property in the Lekki Phase 1 flood-risk zone. Use the following scale: 1 = Not important at all; 2 = Slightly important; 3 = Important; 4 = Extremely important.

Environmental factors

E1. Recurring flood events in the area
E2. Severity of past flood events in the area
E3. Adequacy of drainage infrastructure
E4. Vulnerability of the property to future climate-change-related flooding
E5. Quality of the surrounding ecological environment

Legal factors

L1. Clarity of land-title and zoning regulations
L2. Existence and enforcement of building codes for flood-prone areas
L3. Availability and regulation of commercial flood insurance
L4. Stability of government policy on floodplain development

Economic factors

EC1. Expected rental yield in the area
EC2. Anticipated capital appreciation of the property
EC3. Cost of flood-related maintenance and repairs

EC4. Cost and availability of flood-insurance premiums

Structural factors

S1. Age and condition of the building
S2. Presence of flood-resilient design features (elevated foundations, barriers, etc.)
S3. Building materials used (water-resistant materials, etc.)
S4. Size and configuration of the property

Locational factors

LC1. Proximity to major business hubs and central business districts
LC2. Accessibility via major roads and transport links
LC3. Proximity to commercial amenities (banks, services, etc.)
LC4. Distance from known flood-prone water bodies

Neighbourhood factors

N1. Neighbourhood security and crime levels
N2. Neighbourhood amenities and services
N3. Demographic profile of the surrounding area

Behavioural factors

B1. My personal past experience with flood events at this or similar properties
B2. Confidence in government and authority response to flooding
B3. Perceived ability to absorb potential flood-related losses

Dependent variable: Investment willingness

DV1. My overall willingness to invest in commercial property in this flood-risk area is high
DV2. I would invest again in commercial property in this flood-risk area under current conditions
DV3. I would recommend a peer to invest in commercial property in this flood-risk area
DV4. I intend to retain rather than divest my current commercial-property holdings in this flood-risk area

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