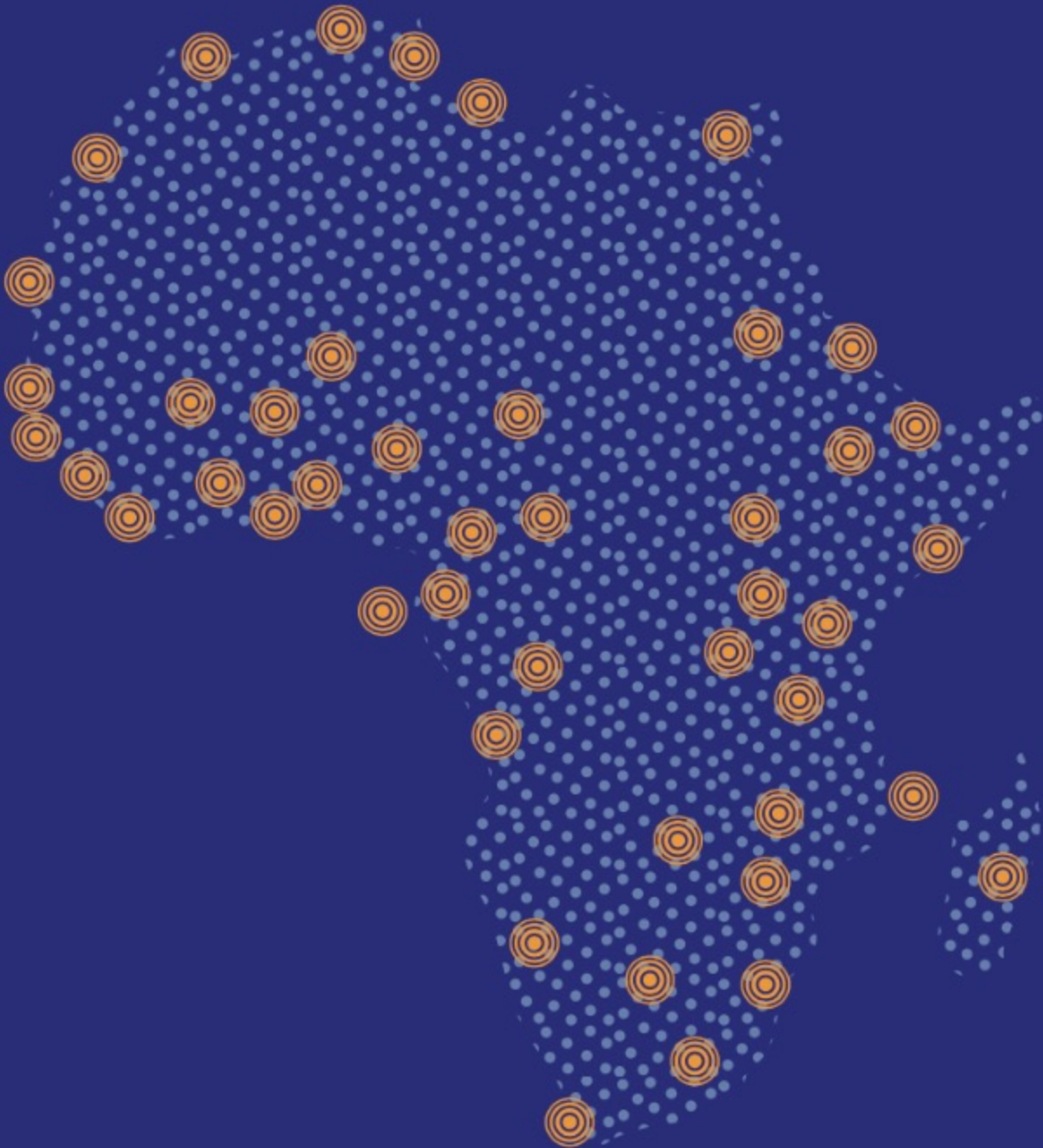


JOURNAL OF

African Real Estate Research

Volume 11 Issue 1



ISSN: 2304-8395



JARER

June 2026

i

TEAM AND
EDITORIAL
BOARD

v

EDITORIAL FOR
JARER VOL. 11
ISSUE 1, 2026

Abel Olaleye

1

THE IMPACT OF
SUSTAINABILITY
FEATURES ON TIME ON
MARKET OF
COMMERCIAL RENTAL
PROPERTY IN LAGOS,
NIGERIA

Ibrahim Egunleti, Ige Victor
Olutope, Akinbola Kazeem
Bolayemi, Raji Malik, Ngwoke
Nwora Valentine

21

EFFECT OF
INCLUSIVITY OF
ACCESS FACILITY
DESIGN ON SPACE
UTILISATION FOR
PERSONS WITH
DISABILITIES IN
MAKERERE
UNIVERSITY
RESIDENTIAL
HALLS

Moses Batanda Mubiru
Eunice Nahula

40

SHARING ECONOMY IN
THE REAL ESTATE
MARKET: THE RISING
DEMAND FOR
COWORKING OFFICE
SPACES IN LAGOS,
NIGERIA

Priscilla Oyebola Bello
Agboola Alirat Olayinka

60

INDIVIDUAL LEVEL
CHARACTERISTICS THAT
DRIVE AWARENESS OF
SUSTAINABILITY
FEATURES IN PROPERTY
VALUATION: THE
NIGERIAN EXPERIENCE

Adebola Adeyemo
Cyril Ajayi

101

DOES INCREMENTAL
HOUSING FINANCE
CONTRIBUTE TO
SUSTAINABILITY FOR
AFRICA’S GREEN
AFFORDABLE HOUSING?
A SCOPING LITERATURE
REVIEW

Jonathan Oladeji
Chioma Okoro

78

COMPARATIVE
PERFORMANCE OF
SELECTED MACHINE
LEARNING
ALGORITHMS IN
PREDICTING
RESIDENTIAL
PROPERTY PRICE
ACROSS SUB-
MARKETS IN LAGOS
METROPOLIS

Thomas Ashaolu
Amos Adewusi
Abiodun Oyelakin

121

UNDERSTANDING
FINANCING AND
DECISION-MAKING OF
SMALL-SCALE
PROPERTY
DEVELOPERS: THE CASE
OF SOUTH AFRICA

Carsten Lausberg
François Viruly
Björn-Martin Kurzrock
Dayni Sanderson
Max Hammer

EDITOR-IN-CHIEF**Prof. Abel Olaleye***Obafemi Awolowo University,
Ile Ife, Nigeria***ASSOCIATE EDITOR****Assoc. Prof. Aly Karam***University of Witwatersrand,
Johannesburg, South Africa***EDITORIAL BOARD****Dr Rotimi Abidoye***University of New South
Wales, Australia***Assoc. Prof. Kwame Addae-
Dapaah***University College London,
United Kingdom***Assoc. Prof. Kola Akinsomi***University of the
Witwatersrand, Johannesburg,
South Africa***Dr Abdul-Rasheed Amidu***University of Auckland, New
Zealand***Dr Steven C. Bourassa***University of Washington,
United States of America***Dr Daniel Dabara***Oxford Brookes University,
United Kingdom***Assoc. Prof. (Emerita)
Karen Gibler***Georgia State University,
United States of America***Prof. Robert Home***Anglia Ruskin University, UK***Prof. Thies Lindenthal***University of Cambridge,
United Kingdom***Prof. Vida Maliene***Liverpool John Moores
University, United Kingdom
and Vytautas Magnus
University, Lithuania***Assoc. Prof. Kathy Michell***University of Cape Town,
South Africa***Prof. Many Mooya***University of Cape Town,
South Africa*

EDITORIAL BOARD

Agnes Mwasumbi

Ardhi University, Tanzania

Prof. Anupam Nanda

*University of Manchester,
United Kingdom*

Prof. Graeme Newell

*University of Western
Sydney, Australia*

**Prof. Karl-Werner
Schulte**

*Regensburg University,
Germany*

Prof. Robert A. Simons

*Cleveland State University,
United States of America*

Dr Timothy Tunde**Oladokun**

*Obafemi Awolowo University,
Nigeria*

Assoc. Prof. François Viruly

*University of Cape Town,
South Africa*

Assoc. Prof. Yung Yau

*Lingnan University, Hong
Kong*

JOURNAL MANAGER

Dayni Sanderson

*Urban Real Estate Research
Unit, University of Cape Town*

COPYEDITOR

Leya Mgebisa**Dr Sunday Oladokun****Dayni Sanderson**

SOCIAL MEDIA



This journal is hosted by the University of Cape Town Libraries on request of the journal owner/editor. The University of Cape Town Libraries and University of Cape Town take no responsibility for the content published within this journal, and disclaim all liability arising out of the use of or inability to use the information contained herein. We assume no responsibility, and shall not be liable for any breaches of agreement with other publishers/hosts.

Editorial for JARER Vol. 11 Issue 1, 2026

Abel Olaleye*¹ (<https://orcid.org/0000-0002-2705-4813>)

Department of Estate Management, Obafemi Awolowo University, Ile-Ife, Nigeria.
Department of Finance and Investment Management, University of Johannesburg, South Africa.

To cite this article: To cite this article: Olaleye, A. (2026) Editorial for JARER Vol 11, Issue 1, 2026. *Journal of African Real Estate Research*, 11(1), pp. v-vii. DOI: 10.15641/jarer.v11i1.2095

Editorial

The Journal of African Real Estate Research (JARER) continues to be an exciting outlet for authors across Africa and beyond to disseminate the results of their research. This is the eleventh volume and the first issue for 2026. We have witnessed greater diversity in the papers that we published and have, no doubt, increased the turnover rate of our paper reviews. We have ensured timely publication of papers by publishing each one once the publication process is complete, without waiting for the final issue to be compiled. To this end, our gratitude goes to the journal reviewers and editorial board members who have made this possible. We also appreciate the support we receive from the board members of the African Real Estate Society, the Library services at the University of Cape Town, and the Journal Manager, Ms Dayni Sanderson, from the Urban Real Estate Research Unit, who has been working tirelessly in managing the journal's operations. Our thanks go to Prof. Karl-Werner Schulte and his team from the IREBS at Regensburg University, the IRES, and ERES, from whom JARER continues to receive strong support.

A wide range of topics covering diverse areas of interest in sustainability, real estate economics and valuation, inclusive access design and space utilisation, sharing economy in the real estate market, machine learning algorithms and prediction of property prices, financing and decision-making of small-scale property developers, among others, formed the focus of the current issue, which is Vol. 11, Issue 1, 2026.

In the first paper, the impact of sustainability features on time-on-market (TOM) of commercial rental properties in Lagos, Nigeria, was analysed. The paper surveyed 150 registered estate surveying and valuation firms.

*Corresponding author's email: aolaleye@oauife.edu.ng

©2025 The Author(s). Published by UCT Library. This is an open-access article under the CC BY 4.0 license. <https://creativecommons.org/licenses/by/4>

Using factor analysis and independent-samples t-tests, the findings show that commercial properties with sustainability elements are rented out much more quickly than non-sustainable ones, which demonstrates a tangible market benefit of a green attribute.

The second paper explored the experiences and perceptions of persons with disabilities (PWDs) regarding the inclusive design of access facilities and the utilisation of spaces in the halls of residence at Makerere University. Specifically, it focused on PWDs with mobility challenges and/or visual impairments, exploring how they manoeuvre through and around the residential halls. The results of the study revealed four thematic areas: the unique challenges for each PWD gender, mobility within accommodation facilities, selective facility positioning, ground-floor accessibility limitations, and manoeuvrability in common areas.

The examination of the dynamics of the sharing economy in the real estate market and the rising demand for coworking office spaces in Lagos, Nigeria, formed the focus of the third paper. Questionnaires were administered to 14 coworking office space providers and 56 coworking office space consumers in Lagos. The findings showed that creating a community-centred workspace, supporting remote workers, and reducing vacancy risk are among the factors influencing providers to offer coworking office space. The study concluded that coworking office space providers should design strategic layout plans that separate focused work areas from high-activity areas.

The fourth paper investigated awareness of sustainability features among valuers in Nigeria and examined how their individual professional characteristics influenced that awareness. The study concluded that Nigerian valuers demonstrate good awareness of sustainability features. Still, it noted that awareness varied significantly among the professionals, given their individual characteristics, highlighting the need for targeted capacity building to deepen the integration of sustainability into valuation practice.

The fifth paper explored three selected machine learning algorithms - Random Forest (RF), Bayesian Ridge (BR), and LASSO Regression – in estimating residential property prices across three distinct sub-markets within Lagos Metropolis. The results revealed varied performance across the sub-markets, with Random Forest emerging as the most efficient model. The paper contributed to the development of location-sensitive, data-driven valuation models that can enhance valuation practice, improve investor confidence, and promote greater transparency and efficiency in the property market.

The sixth paper is a scoping literature review of the contribution of incremental housing finance to the adoption of green affordable housing in Africa, grounded in sustainable finance theory. The study synthesised evidence from 33 studies conducted between 2001 and 2025, identifying major themes such as housing microfinance (31%), sustainable housing (19%), and incremental housing finance (13%). The findings showed that incremental housing finance (IHF) is a subset of housing microfinance that addresses affordability and sustainability, particularly by contributing to green building practices.

The seventh paper focuses on how small-scale property developers in South Africa make financing and other decisions. The result suggests that the decision processes of small-scale developers are simpler than recommended in the literature and that they used fewer financial instruments than recommended by experts. The findings highlight the need for more accessible, context-appropriate development finance mechanisms, as well as supportive regulatory frameworks and trustworthy planning environments, to enable small-scale developers to contribute more effectively to the delivery of affordable housing.

While I am sure you will find the papers in this issue very informative, I look forward to receiving your feedback on this and previous issues of the journal.

Professor Abel Olaleye
Editor-in-Chief



Impact of Sustainability Features on Time on Market of Commercial Rental Property in Lagos, Nigeria

Ibrahim Olaolo Egunleti^{1*} (<https://orcid.org/0009-0007-5061-2602>), Victor Olutope Ige² (<https://orcid.org/0009-0008-5977-5210>), Kazeem Bolayemi Akinbola³ (<https://orcid.org/0000-0002-9151-2620>), Malik Raji⁴ (<https://orcid.org/0009-0005-1945-1113>) and Nwora Valentine Ngwoke⁵ (<https://orcid.org/0000-0003-2968-2239>)

^{1 3} Department of Estate Management, Olabisi Onabanjo University, Ago-Iwoye, Nigeria

² Department of Estate Management, Federal University of Technology, Akure, Nigeria

⁴ Department of Quantity Surveying, Olabisi Onabanjo University, Ago-Iwoye, Nigeria

⁵ Department of Building Technology, Olabisi Onabanjo University, Ago-Iwoye, Nigeria

To cite this article: Egunleti, I.O., Ige, V.O., Akinbola, K.B., Raji, M. and Ngwoke, N.V. (2026) Impact of Sustainability Features on Time on Market of Commercial Rental Property in Lagos, Nigeria. *Journal of African Real Estate Research*, 11(1), pp. 1- 20. DOI: 10.15641/jarer.v11i1.1875

Abstract

This research analysed how sustainability features impacted the time-on-market of commercial rental properties in Lagos, Nigeria. A quantitative research design was utilised in the study, where 250 registered estate surveying and valuation firms were sampled to administer the structured questionnaires, of which 150 valid responses were collected and analysed. The research examined how the sustainability qualities, such as energy efficiency, water conservation, indoor environmental quality, and accessibility, impacted the leasing performance. Factor analysis was used to derive the latent dimensions of sustainability, and independent samples t-tests were used to establish significant variations in the TOM between properties that had and those that did not have sustainable features. The findings show that commercial properties with sustainability elements are rented much quicker than non-sustainable ones, which proves the existence of a tangible market benefit of a green attribute. These results support the argument that sustainability is neither an environmental nor an ethical concern but rather a performance determinant of market liquidity and an investment return. The study argued that developers, investors and policymakers should mainstream sustainability ideals in property development and urban governance to improve commercial efficiencies of the market, shorten vacancy cycles, and promote environmentally friendly growth in the emerging real estate markets.

Keywords: *Sustainability Features, Green Buildings, Time-on-Market, Commercial Rental Property, Nigeria, Quantitative*

*Corresponding author's email address: egunleti.ibrahim@oouagoiwoye.edu.ng

©2026 The Author(s). Published by UCT Library. This is an open-access article under the CC BY 4.0 license. <https://creativecommons.org/licenses/by/4>

1. Introduction

Sustainability can be defined as development that can fulfil the needs of the current generation without jeopardizing the capacity of the future generation to satisfy their needs, and ensuring the balance between economic growth and development, environmental management, and societal well-being (WCED, 1987; Dasgupta, 2021; Richardson et al., 2023). The idea is still a multi-dimensional and controversial one, yet in its most generalised form, it promotes a trade-off between resource economy, environmental conservation and social equity. In the built environment, sustainable construction has become a viable implementation of this philosophy and has been defined as the process of planning, designing, constructing and operating buildings with environmental integrity, social equity and economic viability in their entire life cycles (El Hafiane et al., 2025).

Commercial real estate includes the property that is dedicated mainly to business activities (offices, shopping malls, and industrial plants), whose worth is based on the income by way of rent or appreciation of value (Geltner et al., 2025). Incorporation of sustainability into Commercial real estate is gaining acceptance as a channel to achieving resilience in the performance of assets, efficiency of resources and competitive performance in the market over the long-term. A balance between sustainability and commercial real estate is therefore connected in the form of a shorter term of lease, low vacancy rates, increased rental premiums, and the satisfaction of tenants (Hu, Kok & Palacios, 2023; JLL, 2024).

Sustainability features have taken centre stage in building innovation in the world today. Al-Jannabi et al. (2014) and Kamaruddin et al. (2020) identified such aspects as energy-efficient construction, harvesting of rainwater, recyclable and locally produced materials, green roofs, and intelligent lighting and ventilation systems as important characteristics of the sustainable building. The features enhance environmental protection, reduce operational costs, and enhance comfort among the occupants. The experience of advanced economies shows that green buildings with environmental friendliness and certification are faster in attraction, generate greater occupancy rates, and are less likely to spend time on the market (Eichholtz, Kok and Yonder, 2024; Liu et al., 2025). Nevertheless, the use of sustainable construction practices is still in its early stages in the emerging economies because of the institutional weaknesses, financing needs, and policy incentives.

In Nigeria, sustainability in the real estate sector is a growing subject matter of discussion, but there is still little action taken, and implementation is still fragmented. The cost of electricity, poor infrastructure, and lack of implementing mechanisms of control have limited the prevalence of sustainable building elements (Chinomona et al., 2024; Ankeli et al., 2025). It is quite common that commercial property developers and the owners of commercial properties are faced with the necessity of having to incorporate energy-saving systems and on-site renewables not due to environmental awareness, but due to survival reasons in the face of uncertain grid power and soaring diesel prices (Ekung, Odesola and Adewuyi, 2022; UNEP, 2023). These working realities have made sustainability practices the economic prerequisites and not the decorations.

Lagos, being the business hub of Nigeria, generates a greater proportion of about 30 percent of the national GDP and is the largest city economy in Africa (African Development Bank Group, 2024),

and offers a very attractive case study to research the topic of sustainability in Commercial Real Estate. The city is home to more than 60 percent of the headquarters of the major businesses and is still experiencing a flood of new developments with green technologies and smart infrastructure. However, even with this increasing realisation, there is still a paucity of empirical data regarding the impact of the sustainability features on time-on-market (TOM), the time that a building lies vacant until it is successfully leased to tenants, of commercial rental buildings in Lagos.

The determinants of TOM in the past have been studied mostly in terms of property characteristics, including location, clarity of the title, and asset type via previous Nigerian studies (Olaleye, Ekemode and Olapade, 2015; Bello, 2015; Sani and Gbadegesin, 2015; Adegoke and Fadeyi, 2022). Nevertheless, not many have directly assessed the impact of sustainability attributes like energy efficiency, incorporation of renewable energy, and indoor environmental quality on TOM results. This means that developers, investors, and valuers may not be able to provide empirical indicators as to whether green features offer competitive leasing benefits or have any impact on vacancy period. The evidence deficiency is a significant knowledge gap (theoretical and practical), bearing in mind that long vacancies erode income streams, raise the holding costs and reduce the returns on the investments by real estate stakeholders.

The study discusses how the sustainability features affect the time-on-market of commercial renting properties in the city of Lagos in Nigeria. Specifically, it seeks to:

- i. Determine some of the major sustainability features in commercial real estate constructions in Lagos.
- ii. Compare the time-on-market of commercially rented properties that had sustainability features and those without.
- iii. Identify the sustainability attributes that can highly affect the speed of leasing in the Lagos commercial real estate.

This research is significant in view of the growing national and international focus on sustainable urban development and energy-efficient infrastructure. Although sustainability has become the focus of the international construction discourse, the empirical data on it is limited, especially in the context of determining the implications of sustainability for the market. This paper is therefore a response to the policy impetus behind sustainable cities (**SDG 11**) and a contribution to the efforts by Nigeria to adhere to the low-carbon development strategies. The importance of the research is that it may offer practical information to various stakeholders. To developers and investors, it elucidates the sustainability integration as a way of improving marketability and occupancy performance. It gives an empirical underpinning to the issue of sustainability in valuation and marketing strategies to the estate surveyor and valuers. This study provides evidence to the urban policymakers and regulators to inform incentives and regulations that can accelerate the transformation of Nigeria into sustainable commercial property markets.

The rest of this article is organised in the following way: Section 2 provides a review of the literature on the relevance of sustainability and real estate markets, with a particular focus on the nexus of time-on-market and sustainable construction. Section 3 describes the research methodology, such as data collection and data analysis methods. Empirical results are given and discussed in Section 4, and policy implications and recommendations are given at the end of Section 5.

2. Literature Review

2.1. Conceptual Foundations

Sustainability has assumed a central place in the modern development discourse, with the priority being the need to ensure the fulfilment of the current needs of society without affecting the ability of future generations to satisfy their own needs. It was initially proposed by the World Commission on Environment and Development (WCED, 1987) and then further developed to include three mutually supportive dimensions, i.e., economic growth, environmental protection, and social equity (Dasgupta, 2021; Richardson et al., 2023). The following dimensions, also known as the Triple Bottom Line (TBL), are a keystone and basis of assessing the achievement of sustainable development.

Sustainability in the commercial real estate context implies the development of built environments that are economic, environmentally sustainable, and socially inclusive. A combination of these dimensions allows developers and other stakeholders to produce properties that not only meet the current market demands but are also able to withstand, be fair and competitive as time goes by. This holistic strategy is especially relevant in such a developing economy like Nigeria, where the process of urbanisation, lack of infrastructure, and high levels of socioeconomic inequality complicate the task of attaining sustainable growth.

Sustainable construction is an embodiment of sustainability principles in the built environment. It includes the total building lifecycle, including planning and design, construction, operation, maintenance, renovation, and eventual demolition, implemented in a manner that ensures efficient use of resources, being a good steward of the environment, and being socially equitable (El Hafiane et al., 2025; Timm et al., 2023; Wang et al., 2022). Kumar, Sharma and Sharma (2024) indicated that sustainable construction implies that the built environments should be functional within ecological limits and be proactive in alleviating social and environmental injustices.

Sustainable features across the commercial real estate sector are generally those that incorporate energy-efficient systems, water-saving technologies, site management practices that are responsible and observance of green certification systems. Such qualities not only decrease the environmental footprints but also provide direct economic benefits, including reduced operational expenses, higher asset values, and better positions on market positions (UNEP, 2023; Chinomona et al., 2024).

Time-on-Market (TOM) is one of the key performance indicators in the context of the real estate industry that quantifies the time of the property on the market before its sale or lease (Liu et al., 2024). TOM can be used as an indicator of market liquidity and efficiency: shorter terms can be associated with high demand, correct pricing, and healthy market dynamics, whereas longer TOM can be associated with overvaluation, poor demand, or structural defects (Adegoke and Fadeyi, 2022). TOM plays a significant role in the assessment of sustainability features within commercial real estate in the context of sustainability. Green certified properties or environmentally conscious elements of design are often rented at a premium, more often filled, and leased up faster. According

to the findings of global and regional studies, financial returns in sustainably designed buildings are correlated with tenant satisfaction and general performance of the building (Hu, Kok & Palacios, 2023). To illustrate, in Europe, certified green office buildings have been shown to have operating income and transaction price premiums of about 1012 per cent relative to their non-certified counterparts (Ghosh and Petrova, 2023).

Nevertheless, the empirical evidence in Nigeria is limited, especially in relation to investment in rental markets in Lagos. This research, therefore, adds to the growing literature base by offering new knowledge on the operation and market of sustainable commercial real estate in Nigeria.

2.2. Dimensions of Sustainability in Commercial Real Estate

Sustainable commercial real estate is based on three mutually reinforcing pillars, which include economic, environmental, and social sustainability (Kibert, 2022; Kumar et al., 2024). These dimensions are required to work together to achieve long term value creation and resilience. Economic sustainability focuses on the life cycle cost effectiveness and optimisation of asset value and high operational performance. Evidence also indicates that certified sustainable buildings have certain financial benefits: Western European buildings record 1012% higher operation income and selling price (Ghosh and Petrova, 2023), and ESG-certified properties have a rent premium of 25%. Property owners in Nigeria are gradually replacing conventional and energy-intensive characteristics with smart and environmentally-friendly ones to charge a premium lease fee (Alohan et al., 2023; Ejidike and Mewomo, 2023). Nevertheless, majority of local research is still descriptive and small-scale and there is a gap in methodology in quantifying the impact of sustainability features on financial performance and time-on-market.

Environmental sustainability involves reduction of ecological footprints in terms of energy, water and carbon efficiency. Climate risks and the inefficient use of energy have a negative impact on the asset value all over the world, and the average rental premium of green-certified buildings is 5.464 (CBRE, 2023; Clayton et al., 2021). Frequent flooding in Nigeria, deficient waste management and unreliable power supply have increased the demand to adopt solar and water-saving systems. However, there is little systematic measurement of environmental performance, e.g., actual energy use or embodied carbon, and little empirical evaluation of their effect on TOM.

Social sustainability relates to health, equity, and the well-being of the occupants. On the international scale, WELL-certified and other similar buildings are associated with increased tenant satisfaction, better health results, and extended lease (Singh, 2010; Allen et al., 2016; Ildiri et al., 2022; Kent, Parkinson and Schiavon, 2024). The growing demand of indoor air quality, natural lighting, and thermal comfort is an indicator of increased health awareness in Lagos. However, commercial green buildings are mostly targeted at users that are high-income earners and inclusivity and affordable nature is not majorly considered in sustainability evaluation.

2.3. Commercial Real Estate Sustainability Features and Time-on-Market

Time-on-Market, the time interval between the listing of a property and the leasing or sale of the property, is affected by various factors (location, price, condition of the property). It gives an understanding of efficiency in the market and the responsiveness of demand. Sustainable

commercial property TOM is a significant measure of the sustainability features that market values. Global empirical research indicates that lease-up and occupancy performance are linked to green certifications and sustainability characteristics. For instance, a European study by Ghosh and Petrova (2023) determines that certified buildings have greater operating income and sell quickly. According to Al-Haimi et al. (2025), 2-5% rent premiums are associated with ESG-certified buildings, which in some cases of the market may suggest rapid demand absorption (that is, low TOM). In Japan, the premiums of rent charged on green certified properties in office markets compared to noncertified properties are around 5.4-6.4 percent, which is associated with the increased demand (CBRE, 2023). Moreover, a property is less likely to experience vacancy growth and experience poor financial performance in situations when the level of tenant satisfaction is high (usually relating to sustainable features and proper property management) (Hu and Palacios, 2023).

In Nigeria, tenants who are entrepreneurs in Lagos are finding properties that have smart/green qualities more attractive, and this enables property owners to charge them higher rents (Alohan et al, 2023; Ejidike and Mewomo, 2023; Olaniran, Morales and Harris, 2025). Nonetheless, there is little or no academic empirical research directly quantifying the impact of sustainability features on TOM on commercial rental properties in Lagos. The majority of the research (such as Adegoke and Fadeyi, 2022) considers TOM as the relationship with traditional property attributes (title, location, condition, finishing) but leaves sustainability variables out. There is technically no peer-reviewed research that includes a full-fledged set of sustainability features with econometric modelling of TOM in Lagos. Moreover, in other markets, sustainability characteristics can decrease TOM, though at other times, an increase in rents can push away some tenants, which can increase TOM. How these trade-offs are being exercised in Nigeria has no consensus model. Thus, the gap in strong empirical research to measure the impacts of sustainability characteristics on the time-on-market of commercial rented buildings in Lagos, Nigeria, particularly the application of modern modelling, as well as the recent information, is critical. The absence of this evidence makes the assertions concerning the market value of the sustainability features tentative, and policy-based suggestions can have an insufficient empirical basis.

3. Methods

3.1 Research Design and Approach

The research design used was a quantitative, cross-sectional survey design, which was appropriate to empirically test quantifiable rapport involving sustainability characteristics and the length of tenure in the business rental premises (time on market). This design allows studying objective and measurable data obtained from the professional respondents working within a geographic location, which is Lagos Island, one of the central submarkets in Lagos State, Nigeria. The methodology of the research was based on the positivist epistemology, which presupposes the possibility of objective observation of real-world phenomena like the sustainability-based market performance and its statistically justifiable validation. By implication, this research used factor analysis to determine the latent constructs behind the sustainability characteristics and independent samples t-tests to prove the hypothesis of the mean difference in TOM between the sustainable and non-sustainable properties.

3.2 Population and Sampling Procedure

The study population involved all the estate surveying and valuation firms that were registered by the Nigerian Institution of Estate Surveyors and Valuers (NIESV) in Lagos State Chapter and the Estate Surveyors and Valuers Registration Board of Nigeria (ESVARBON). The 2024 NIESV Directory shows that there are 250 registered and active firms in Lagos Island. Because the population size is manageable, a total enumeration sampling method was adopted to guarantee that all the data is covered and to eliminate the effects of sampling bias. A total of one senior estate surveyor and valuer was selected purposely as respondents of each firm, usually a principal partner or managing surveyor, as such a person is directly involved in transactions and decision making in the market. Of the 250 questionnaires issued, 150 valid responses were retrieved, and this is a response rate of 60%, which is well above the 50% mark, which is considered to be a good representation in social science and real estate market studies.

3.3 Instrumentation and Data Collection Procedures

The designed questionnaire is structured according to an in-depth analysis of the previous research on the sustainable real estate and market dynamics (Eichholtz et al., 2010; Younos and Parece, 2016; Maqbool et al., 2023). The tool consisted of three significant parts:

- 1) Background section A – Generalised demographic and professional details about the respondents were obtained (academic qualification, professional status, years of experience and service scope).
- 2) Section B – Sustainability Features asked the required respondents to specify the perceived importance and prevalence rates of the identified sustainability features within the commercial premises in their control on a five-point Likert scale (1 = Not Important, 5 = Extremely Important).
- 3) Section C – Market Performance Metrics acquired quantified estimates of time-on-market (TOM) (in days) of sustainable and non-sustainable commercial rental properties.

To test relevance, clarity and construct validity, the questionnaire underwent content validation by three domain experts (two academic professors in the real estate field and one practitioner in the industry). The pilot test conducted on the Lagos mainland population of 10 firms produced a Cronbach's Alpha coefficient of 0.821, which is a high internal consistency. Physical administration and email distribution through follow-up were used in the collection of data, which lasted four weeks between January and February 2025.

3.4 Analytical Techniques

Data were analysed using IBM SPSS Statistics Version 27 following a systematic multi-stage analytical framework:

Step 1: Descriptive Statistics

Descriptive statistics (frequency counts, percentages, means, and standard deviations) were computed to profile respondents' socio-economic characteristics (as shown in Table 1).

Step 2: Factor Analysis

Factor analysis was employed to identify latent constructs underlying the perceived importance of sustainability features. The suitability of the dataset for factor analysis was first confirmed using two diagnostic tests:

Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy

$$KMO = \frac{\sum_{i \neq j} r_{ij}^2}{\sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} p_{ij}^2} \dots \dots \dots Eqn (1)$$

Where:

r_{ij} = represents the simple correlation between variables i and j , and p_{ij}
represents their partial correlation

A KMO value ≥ 0.60 (Kaiser, 1974) indicates sampling adequacy for factor analysis.

Bartlett's Test of Sphericity

$$X^2 = \left[n - 1 - \frac{2p+5}{6} \right] \ln |R| \dots \dots \dots Eqn (2)$$

Where:

n = sample size,

p = number of variables, and

$|R|$ = determinant of the correlation matrix.

A significant ($p < 0.05$) value suggests that the correlation is not an identity matrix, and factor analysis is suitable.

Factors were extracted with the help of Principal Component Analysis (PCA), and only those with an Eigenvalue of more than 1.0 were kept (Kaiser Criterion). The extracted factors were varimax rotated to get orthogonal interpretation structures. Loadings greater than 0.40 were considered significant only (Hair et al., 2019).

Step 3: Independent Samples t-Test

An Independent Samples t-test was used to test the assumption that there is a statistically significant difference in the meantime on market between commercial properties with and without sustainability features. The t-test version developed by Welch was used because they could not presuppose homogeneity of the variance. The value of the test is presented as:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \dots \dots \dots (Eqn 3)$$

Where:

$\bar{X}_1, \bar{X}_2$ = group means (TOM for sustainable and non – sustainable properties),

$s_1^2, s_2^2 = \text{group variances},$

$n_1, n_2 = \text{group sample sizes}.$

The degrees of freedom (df) for Welch's correction were computed as:

$$df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} \right)^2}{\frac{\left(\frac{s_1^2}{n_1} \right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2} \right)^2}{n_2 - 1}} \dots \dots \dots Eqn (4)$$

The level of significance was 2-tailed and was set to alpha (α) = 0.05. If $p < 0.05$, the null hypothesis ($H_0: \mu_1 = \mu_2$) will be rejected, which means that there is a significant difference in the mean TOM between the two property groups.

3.5 Ethical Considerations

The respondents' participation was voluntary, and informed consent was obtained before the data were collected. Anonymity and confidentiality was granted for the respondents, and no personally identifiable data was collected. Therefore, the methodological procedure presented the empirical basis of the results of the factor extraction (Tables 2-4) and the results of the inferential t-test (Tables 5-6) in the following section.

4. Results and Discussion

4.1 Respondents Background

The analysis of the socio-economic background of respondents working in registered estate surveying and valuation firms was conducted to verify their suitability to give adequate information to achieve the goal of this study. Their background information (academic qualification, professional qualification, year of experience and scope of service) was examined using frequency distribution. The results are presented in Table 1.

Table 1: Respondents' Background

Respondents Background	Category	Frequency (f)	Percentage (%)
1. Academic Qualification	Higher National Diploma	85	56.6
	B.Sc / B.Tech	61	40.7
	M.Sc / M.Tech	4	2.7
	Total	150	100
2. Professional Qualification	MNIVS	128	85.5
	FNIVS	22	14.5
	Total	150	100
3. Years of Experience	1–5 Years	19	13.1

	6–10 Years	28	19.3
	11–15 Years	38	26.2
	16–20 Years	48	33.1
	Above 20 Years	17	11.7
	Total	150	100
4. Scope of Services Rendered	Valuation	12	8.3
	Property Management	47	32.4
	Agency	32	22.1
	Facilities Management	52	35.9
	Property Development	7	4.8
	Total	150	100

Source: 2025 Field Survey

Table 1 encapsulates key characteristics of the valuers in the various real estate firms. The data reveal that the majority of the respondents (56.6%) held Higher National Diplomas (HND), followed closely by Bachelor's degree holders (40.7%), indicating a moderately high level of academic exposure in the real estate profession. Only a few respondents held postgraduate degrees (M.Sc/M.Tech (2.7%)), which shows that the respondents are academically inclined to do justice to the aim of the research. In terms of professional qualifications, most respondents (85.5%) were Members of the Nigerian Institution of Estate Surveyors and Valuers (MNIVS), while 14.5% were Fellows (FNIVS), suggesting a strong presence of professionally certified personnel and a smaller cohort of senior, long-standing professionals. Experience-wise, the majority of practitioners (33.1%) had been in practice for 16–20 years, followed by 26.2% with 11–15 years of experience. This indicates a predominantly experienced respondent base, which enhances the reliability of their perspectives on sustainability and rental market dynamics. Only 13.1% of respondents were early-career professionals (1–5 years), highlighting that insights were drawn mainly from mature professionals. On the scope of services, Facilities Management (35.9%) and Property Management (32.4%) were the most commonly rendered services among respondents. This is consistent with the study's thematic focus on commercial rental property markets, where such services are essential. Other areas like Valuation (8.3%) and Property Development (4.8%) were less represented, implying a more operational than developmental orientation among respondents. The socio-economic profile demonstrates a diverse yet experienced population of practitioners, well-positioned to assess the impact of sustainability features on time-on-market for commercial properties. Their academic and professional background, coupled with service scope and years of experience, lend credibility to the findings derived from the study.

4.2 Factor Analysis of Sustainability Features Affecting Time-on-Market in Lagos Commercial Properties

The underlying dimensions of sustainability features influencing the time-on-market of commercial rentals in Lagos were identified using factor analysis. Interrelated variables in the analysis were reduced to core elements that reflect estate surveyors' sustainability priorities and their role in leasing performance.

Table 2: KMO and Bartlett's Test of Sphericity

Measure	Value
Kaiser-Meyer-Olkin (KMO) Measure	0.814
Bartlett's Test of Sphericity (Chi-Square)	1784.612
Degree of freedom (Df)	153
Sig. (p-value)	0.000

Source: 2025 Field Survey

Table 2 shows that the KMO with a value of 0.814 is above the 0.60 that is accepted to be sufficient (Kaiser, 1974), which means that the sampling adequacy is meritorious to perform a factor analysis. The significance of the Bartlett Test is very high ($p < 0.001$), which means that the correlation matrix is not an identity one and factor analysis is suitable in this dataset.

Table 3: Total Variance Explained

Component	Initial Eigenvalue	% of Variance	Cumulative %
1	5.456	30.31	30.31
2	2.948	16.38	46.69
3	2.074	11.52	58.21
4	1.347	7.48	65.69

Source: 2025 Field Survey

From Table 3, four components with Eigenvalues more than 1 were obtained, and the components explain 65.69% of the total variance, leaving a good result when analysing social science research (Hair et al., 2019). This indicates a significant underlying pattern in the importance ratings of the sustainability features.

Table 4: Rotated Component Matrix of Sustainability Features Affecting Time-on-Market in Lagos

Features	Factor 1 (Energy & Water Efficiency)	Factor 2 (Indoor & Environmental Quality)	Factor 3 (Materials & Waste Management)	Factor 4 (Accessibility & Amenities)
LED Lighting	0.768			
Low-flow fixtures	0.712			
Solar Panel	0.751			
Lower energy mechanical	0.692			
Ventilation system (efficient)	0.630	0.414		

Rainwater harvesting	0.675				
Grey water system	0.668				
Indoor air quality		0.782			
Low-VOC Paint		0.748			
Motion sensor	0.684				
Sustainable materials				0.771	
Waste re-use and control				0.742	
Garbage and recycling bins				0.709	
Sustainable landscaping	0.533	0.446		0.412	
Carbon offsetting				0.501	
Energy management	0.641			0.452	
Green roof	0.511				
Elevators with accessibility					0.794
Extraction	Method:	Principal	Component	Analysis	
Rotation	Method:	Varimax	with	Kaiser	Normalisation
<i>Loadings ≥ 0.40 shown</i>					
Source: 2025 Field Survey					

Table 4 shows the factor analysis conducted on the importance ratings of the sustainability features in the management of commercial properties in Lagos Island. The table revealed four components. These components describe the views of the estate surveying and valuation firms on the sustainability priorities existing in the properties that are under their care. ***Energy and Water Efficiency***, with a total variance of 30.31%, was the first component. This aspect included applications such as LEDs, solar energy systems, reduced energy mechanical systems, and motion

sensors, as well as water conservation appliances and rainwater collection systems. The predominance of these characteristics indicates that property managers focus on the improvement of costs of operation, energy performance and water economy within the framework of the high-density urban market in Lagos Island. This outcome is consistent with international experience. According to Younos and Parece (2016), energy and water efficiency remain the most popular aspects of sustainable property management practices in resource-scarce urban environments.

The second component, which explained 16.38% of the variance, was named ***Indoor Environmental Quality***. High loading of indoor air quality management and use of low VOC paints, as well as effective ventilation systems, defined this construct. This factor is indicative of the increasing focus on human-based performance measures when it comes to managing the property of a commercial entity, as tenant health, comfort, and wellness have all become central in becoming a conscientious property man. The same trends are observed in other city markets, as enhancing indoor environmental quality becomes an increasingly desired objective thanks to its ability to significantly increase the productivity of employees and the satisfaction levels of tenants (Nurick and Thatcher, 2021).

Materials and Waste Management was the third component, and 11.52% of the overall variance. It integrated the use of sustainable materials, waste re-use and control plans, recycling, separation of garbage systems, and the use of sustainable landscaping. Its make-up shows that its management is oriented towards the reduction of environmental footprints by maximising efficiency in the use of materials and adherence to responsible waste disposal strategies. This aligns with the principles of the circular economy, built around the practice of reusing resources without any waste and waste minimisation in construction (Ghisellini *et al.*, 2016). This factor confirms the growing level of operationalisation of waste management practice in commercial real estate, yet its comparatively less significant to variance prompts that serves as a less important aspect compared to energy and indoor quality issues.

The fourth factor explained 7.48% of the variance, which was labelled ***Accessibility and Amenities***. Remarkably, this variable was characterised by features related to accessibility, such as audio announcements, wheelchair access, accessible control panels, and visual display systems. Its loading identifies a specific awareness of social sustainability and inclusivity obligations in commercial property delivery. Although this factor accounts for the least percentage of variance amongst the four, its existence cannot be ignored, as there appears to be a gradual shift towards the inclusion of inclusive design and accessibility features regarding global green building certification frameworks like LEED and BREEAM (Maqbool *et al.*, 2023).

These findings, in general, indicate a multifaceted outlook towards sustainability among the estate surveying and valuation firms handling commercial development on the Lagos Island. The fact that operational efficiency is focused on the aspects of energy and water consumption highlights cost management and energy resilience as drivers of the local property market. In this respect, accessibility, as a feature of social inclusion, is becoming better understood but is less prioritised compared to other legislations. This pattern in sustainability priorities can be explained by the evolving application of green building practice in emerging urban economies, where its adoption usually starts with the operational sustainability, then social sustainability and, in the end material sustainability (Chong and Low, 2013; Nielsen *et al.*, 2016; Ghisellini *et al.*, 2016).

4.3 T-Test of Time-on-Market Differences by Sustainability Status in Lagos

To examine the time-on-market of commercial properties with and without sustainability in Lagos State, the respondents' estate surveying and valuation firms were asked the number of days these properties remained in the market before being let/leased, and the results are presented in Table 5.

Table 5: Group Statistics for Time-on-Market of Properties With and Without Sustainability Features

Group	Mean Days on Market	Standard Assumption
With Sustainability Features	74.16 days	Equal variance not assumed
Without Sustainability Features	81.80 days	

Source: 2025 Field Survey

Table 5 compares the average days properties spent on the market across the two groups. Properties with sustainability features averaged 74.16 days, while those without averaged 81.80 days, indicating a 7.64-day difference. Though the difference might appear modest, in commercial real estate, this gap can translate into significant financial and operational implications, especially when scaled across portfolios. Moreover, the standard assumption applied was that variances between the two groups are not equal (Welch's correction), which is appropriate given the different sample sizes and distribution shapes. The reduction in average market days for sustainable buildings supports the hypothesis that such features are commercially beneficial. This aligns with Eichholtz et al. (2010), suggesting that sustainable buildings enjoy better market liquidity due to tenant preferences for cost efficiency and corporate image alignment.

Table 6: Independent Sample T-test Result

Statistic	Value
t-statistic	-2.34
p-value	0.0197
Significance Level	0.05

Source: 2025 Field Survey

Table 6 reports the results of the inferential analysis using an independent samples t-test. The t-statistic of -2.34 indicates that the difference in means is sufficiently large relative to the variability within each group. The p-value of 0.0197 is below the 0.05 threshold, thus affirming that there is a statistically significant difference in the number of days properties spent on the market based on the presence of sustainability features. This result provides robust statistical evidence that properties with sustainable features are rented more quickly than those without.

Given that the test assumes unequal variances (Welch's t-test), the finding remains valid even with differences in group sizes and internal variability. The directionality (negative t-value) further confirms that sustainable buildings reduce rental duration.

Statistically, this means sustainability is not just a qualitative preference but a quantifiable performance factor that enhances marketability. This supports global research trends and provides context-specific validation within the Lagos commercial property sector. The implication for

investors and developers is that sustainable design and retrofitting could yield measurable advantages in occupancy efficiency and reduce holding costs.

5. Conclusion and Recommendations

This research has presented empirical data regarding how the sustainability characteristics can largely determine the time-on-market of business rental properties on Lagos Island, Nigeria. The investigation that used factor analysis and independent samples t-tests proved that buildings upgraded with sustainable characteristics are more marketable and efficient in terms of leasing. In particular, energy and water-saving, better indoor environmental quality, waste disposal, and increased accessibility in properties showed a statistically significant decrease in the marketing time in terms of conventional properties ($p = 0.0197$). The results confirm that sustainability is not only a controlling or moral requirement but is a measurable performance distinguishing characteristic with direct connotations to the liquidity of markets and returns on investments. The four dimensions of sustainability that were evaluated, energy and water efficiency, were the most influential, as they depict the environmental and economic concerns of a congested city such as Lagos. The features of indoor environmental quality and accessibility also proved to become increasingly more relevant, and this indicates a change of inclusivity and user-centered design in the commercial property market.

Practically, the study shows that sustainability provides quantifiable competitive advantages in attracting tenants, minimising vacancy rates, and maximising operational efficiency. It is therefore advised that developers and investors should integrate the sustainability principles during the design and retrofit phases to ensure the assets perform as much as possible. They are essential to the practitioners of estate surveying and valuation to justify the implementation of sustainability metrics and green certification as the value-added aspect of the practice.

The research supports the need to put sustainability standards on urban development control and building regulations at the policy level. To ensure the adoption of green buildings, the Lagos State Government, in conjunction with professional associations such as the Nigerian Institution of Estate Surveyors and Valuers (NIESV), ought to provide incentive systems, including tax reductions, fast tracking of permission, certification discounts, among others. Hence, commercial property development sustainability is no longer a dream, but rather an evidenced determination of the market performance. Sustainability features of the Lagos commercial real estate market are sensitive to requirements that align with the global trends, which confirms that in Lagos sustainable buildings lease quicker, are smarter, and perform better.

Despite the empirical contribution of this study, it has a number of limitations. First, the sample was limited to commercial rental within Lagos Island, which is a prime and relatively mature submarket in Lagos State. This submarket has a different structural makeup, tenant profile and sustainability consciousness with emerging areas like Ikeja, Yaba and other mainland areas, and thus this restricts the external plausible applicability of the results on the other heterogeneous Nigerian urban markets. Second, the analysis was based primarily on the perceptions gathered from estate surveying and valuation companies, rather than on transaction or longitudinal lease data. As much as practitioner insights can offer useful market intelligence, responses based on perception are prone to reporting bias and informational asymmetry. Third, the cross-sectional nature prevents causal inferences, the relationship between sustainability features and the strategy of reduced time-on-market is observed and not necessarily proven. Lastly, the sustainability

attributes were operationalised using aggregate factor dimensions, and this might not be entirely able to reflect the granular performance differentials between certified and non-certified buildings. Future studies should combine transaction data, use a longitudinal or panel model and extend the geographies to other cities in Nigeria like Abuja, Port Harcourt and Ibadan. The inclusion of the behavioural data of tenants and formality of the green certification would also enhance the empirical soundness and policy relevance of sustainability-based market performance analysis in emerging real estate economies.

References

- Adegoke, O. J. and Fadeyi, F. D. (2022). Impacts of property features on time-on-market (TOM) of real estate assets in Lagos Metropolis, Nigeria. *UNIOSUN Journal of Engineering and Environmental Sciences*, 4(2), pp. 1–9. <https://doi.org/10.36108/ujees/2202.40.0210>
- Allen, J. G., MacNaughton, P., Satish, U., Santanam, S., Vallarino, J. and Spengler, J. D. (2016). Associations of cognitive function scores with carbon dioxide, ventilation, and volatile organic compound exposures in office workers. *Environmental Health Perspectives*, 124(6), pp. 805–812. <https://doi.org/10.1289/ehp.1510037>
- Al-haimi, B., Khalid, H., Zakaria, N.H. and Jasimin, T.H. (2025). ‘ESG strategies for real estate: What developers and investors need to know’, in Hamdan, R.K. (eds.), *Integrating Big Data and IoT for Enhanced Decision-Making Systems in Business*. Springer, Cham. https://doi.org/10.1007/978-3-031-97609-4_22
- Alkali, A. A., Mohammad, B. U. and Usman, H. A. (2024). Benefits of integrating green architecture in public buildings within the Savannah Region of Nigeria: A review. *African Journal of Environmental Sciences and Renewable Energy*, 15(1), pp. 104–112. <https://doi.org/10.62154/4bzbq615>
- Allison, O., Neil, D. and Didier, D. E. (2003). Time on the market and commercial property price. *Journal of Property Investment and Finance*, 21(6), pp. 473–494. <https://doi.org/10.1108/14635780310508677>
- Al-Jannabi, M., Thomas, G. and Donn, M. (2014). Sustainable building features and fire safety. Building a Better New Zealand Conference, Auckland, pp. 1–11.
- Alohan, E. O., Oyetunji, A. K., Amaechi, C. V., Dike, E. C. and Chima, P. (2023). An agreement analysis on the perception of property stakeholders for the acceptability of smart buildings in the Nigerian built environment. *Buildings*, 13(7), Article 1620. <https://doi.org/10.3390/buildings13071620>
- An, X. and Pivo, G. (2015). Default risk of securitized commercial mortgages: Do sustainability property features matters. Real Estate Research Institute Research Conference
- Ankeli, I. A., Adebawale, A. P., Okoh, G. F. and Sonibare, K. (2025). Green building certifications and sustainable development in Osogbo, Nigeria: The issues and challenges. *International Journal of Real Estate*, 1(2), pp. 161–176. <https://doi.org/10.5281/zenodo.15575705>
- Bello, V. A. (2015). Marketing time and sales price of residential properties in Akure, Nigeria. *Journal of Economics and Sustainable Development*, 6(24), pp. 129–134. <https://www.iiste.org/Journals/index.php/JEDS/article/viewFile/27911/28628>
- CBRE. (2023). Japan green building certification trends *Q1 2023*. <https://www.cbre.com/insights/reports/japan-report-japan-green-building-certification-trends-jun-2023>

- Chinomona, R., Moyo, S., Adebajo, A. and Okafor, C. (2024). ESG integration and economic sustainability in emerging real estate markets. *Habitat International*, 145, Article 102938. <https://doi.org/10.1016/j.habitatint.2024.102938>.
- Cirman A., Pahor M. and Verbič M. (2015). Determinants of time on the market in a thin real estate market. *Engineering Economics*, 26(1) pp. 4-11. <https://doi.org/10.5755/j01.ee.26.1.3905>
- Clayton, J., Devaney, S., Sayce, S. and van de Wetering, J. (2021). *Climate risk and commercial property values: A review and analysis of the literature*. UNEP FI. unepfi.org/publications/investment-publications/climate-risk-and-commercial-property-values/
- Colliers. (2025). Sustainability in real estate: Towards a greener skyline. Colliers International. <https://www.colliers.com/en-in/news/press-release-credai-colliers-sustainability-in-real-estate>. (Accessed September 19, 2025)
- Davies, R. (2005). *Green value - green buildings, growing assets*. London: Royal Institution of Chartered Surveyors, United Kingdom.
- Damico, L., Aulicino, A. and Di Pasquale, F. (2022). What does sustainability mean? Perceptions of future professionals across disciplines. *Sustainability*, 14(15), Article 9650. <https://doi.org/10.3390/su14159650>
- Dasgupta, P. (2021). *The economics of biodiversity: The Dasgupta Review*. London: HM Treasury. <https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review>. (Accessed September 19, 2025)
- Eichholtz, P., Kok, N. and Quigley, J. M. (2010a). Sustainability and the dynamics of green building. *Royal Institution of Chartered Surveyors (RICS)*. https://www.isurv.com/site/scripts/download_info.php?downloadID=1343 (Accessed September 19, 2025)
- Eichholtz, P., Kok, N. and Quigley, J. M. (2010b). Doing well by doing good? Green office buildings. *American Economic Review*, 100(5), pp. 2492–2509. <https://doi.org/10.1257/aer.100.5.2492>
- Eichholtz, P., Kok, N. and Sun, X. (2024). The impact of minimum energy performance standards on the commercial real estate market. *Nature Communications*. [Article in Press]. <https://doi.org/10.1038/s41467-026-70684-w>
- Eichholtz, P., Kok, N. and Sun, X. (2024). Green building adoption, regulation, and performance: Global evidence from commercial real estate markets. *Journal of Real Estate Finance and Economics*, 68(3), pp. 451–472. <https://doi.org/10.1007/s11146-024-09987-2>
- Ejidike, C.C. and Mewomo, M.C. (2023). Benefits of adopting smart building technologies in building construction of developing countries: Review of literature. *SN Applied Sciences*, 5, Article 52. <https://doi.org/10.1007/s42452-022-05262-y>
- Ekung, S., Odesola, I. A. and Adewuyi, T. (2022). Green cost premium for attaining energy-efficiency rating in Nigeria's hot-humid residential buildings. *International Journal of Building Pathology and Adaptation*, 40(5), pp. 683–699. <https://doi.org/10.1108/IJBPA-01-2021-0008>
- El Hafiane, A., En-nadi, A. and Ramadany, M. (2025). Towards sustainable construction: Systematic review of lean and circular economy integration. *Sustainability*, 17(15), Article 6735. <http://doi:10.3390/su17156735>

- Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review*, 36(2), pp. 90–100. <https://doi.org/10.2307/41165746>
- Emenike, K.C. and Ezeudu, C.U. (2020). The impact of sustainable management of commercial properties on investment returns in Orlu, Imo State. *International Journal of Progressive Sciences and Technologies (IJPSAT)*, 19(2), pp. 185–192. <https://doi.org/10.52155/ijpsat.v19.2.2573>
- Geltner, D.M., Miller, N.G., Van De Minne, A., Eichholtz, P., Lindenthal, T. and Shen, L. (2025). *Commercial real estate analysis for investment, finance and development* (4th ed.). Routledge. <https://doi.org/10.1201/9781003643838>
- Ghisellini, P., Cialani, C. and Ulgiati, S. (2016). A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, 114, pp. 11–32. <https://doi.org/10.1016/j.jclepro.2015.09.007>
- Ghosh, C. and Petrova, M. T. (2023). Building sustainability, certification, and price premiums: Evidence from Europe. *Journal of Real Estate Research*, 46(4), pp. 514–537. <https://doi.org/10.1080/08965803.2023.2267717>
- Gou, Z. (2016). Green building for office interiors: challenges and opportunities. *Facilities*, 34(11/12), 1-25. <http://dx.doi.org/10.1108/F-04-2015-0022>
- Hair, J.F., Babin, B.J., Anderson, R.E. and Black, W.C. (2019). *Multivariate data analysis* (8th ed.). England: Pearson Prentice.
- Hu, M., Kok, N. and Palacios, J. (2023). Tenant satisfaction and commercial building performance. In the 29th Annual European Real Estate Society Conference. ERES: Conference. London, United Kingdom.
- Ibrahim, T.A. (2011). Survey of infrastructural facilities and their effects on rental values of residential properties in Ilorin Metropolis. *Journal of Environmental Sciences and Resource Management*, 3, pp. 36–45.
- Ildiri, N., Bazille, H., Lou, Y. Hinkelman, K. Gray, W. A. and Zuo, W. (2022). Impact of WELL certification on occupant satisfaction and perceived health, well-being, and productivity: A multi-office pre- versus post-occupancy evaluation. *Building and Environment*, 224, Article 109539. <https://doi.org/10.1016/j.buildenv.2022.109539>
- Jayantha, W.M. and Man, W.S. (2013). Effect of green labelling on residential property price: a case study in Hong Kong. *Journal of Facilities Management*, 11(1), pp. 31–51.
- JLL. (2024). Turning green to gold: Market insights on certified buildings. <https://www.jll.nz/en/trends-and-insights/research/turning-green-to-gold>
- Kaiser, H.F. (1974). An index of factorial simplicity. *Psychometrika*, 39(1), pp. 31–36. <https://doi.org/10.1007/BF02291575>
- Kamaruddin, T., Hamid, R.A. and Ghani, S.A. (2020). Social aspect implementation in sustainable construction. *IOP Conference Series Materials Science and Engineering*, 849(1), Article 012036. DOI:10.1088/1757-899X/849/1/012036
- Kent, M.G., Parkinson, T. and Schiavon, S. (2024). Indoor environmental quality in WELL-certified and LEED-certified buildings. *Scientific Reports*, 14(1), Article 15120. <https://doi.org/10.1038/s41598-024-65768-w>
- Kibert, C.J. (2022). *Sustainable construction: Green building design and delivery* (5th ed.). Hoboken, USA: Wiley.
- Kumar, P., Sharma, L. and Sharma, N.C. (2024). ‘Sustainable development: Balancing economic viability, environmental protection, and social equity’, In M. K. Gupta & R. K. Singh

- (Eds.), *Sustainable partnership and investment strategies for startups and SMEs*. pp. 212-234. IGI Global. <https://doi.org/10.4018/979-8-3693-2197-3.ch012>
- Leung, C.K.Y., Leong Y. C. F. and Chan I. Y. S. (2002). TOM: Why isn't the price enough? *International Real Estate Review*, 5(1), pp. 91–115.
- Liu, Y., Shakib, S., Miller, E. J. and Habib, K.N. (2024). Modeling home property listings' time-on-market duration and listing outcome using a copula-based competing risk method. *Journal of Transport and Land Use*, 17(1), pp. 579–601. <https://doi.org/10.5198/jtlu.2024.2447>
- Liu, N., Zhao, Y., Yan, B. and Hutchison, N. (2025). Tenants' ESG influence on preferences and rent premiums for green buildings in commercial real estate. *Journal of Property Research*, 72(1), pp. 15–38. <https://doi.org/10.1080/09599916.2025.2494562>
- MacNaughton, P., Satish, U., Laurent, J.G.C., Flanigan, S., Vallarino, J., Coull, B., Spengler, J. D. and Allen, J.G. (2017). The impact of working in a green certified building on cognitive function and health. *Building and Environment*, 114, pp. 178–186. <https://doi.org/10.1016/j.buildenv.2016.11.041>
- Maqbool, R., Thompson, C. and Ashfaq, S. (2023). LEED and BREEAM green building certification systems as possible game changers in attaining low-cost energy-efficient urban housing projects. *Journal of Urban Planning and Development*, 149(3). <https://doi.org/10.1061/JUPDDM.UPENG-4292>
- Marques, A., Januário, J.F. and Cruz, C.O. (2024). Sustainability certifications in real estate: Value and perception. *Buildings*, 14, Article 3823. <https://doi.org/10.3390/buildings14123823>
- Miller, E. and Buys, L. (2008). Retrofitting commercial office buildings for sustainability: Tenants' perspectives. *Journal of Property Investment and Finance*, 26(6), pp. 552–561. <https://doi.org/10.1108/14635780810908398>
- Moghayed, A., Hubner, D. and Michell, K. (2022). Achieving sustainability in South African commercial properties: The impact of innovative technologies on energy consumption. *Facilities*, 41(5/6), pp. 321–336. <https://doi.org/10.1108/F-06-2022-0089>
- MSCI. (2023). South Africa Green Property Index. <https://www.bizcommunity.co.za/article/msci-south-africa-green-annual-property-index-2023-236357a>. (Accessed September 19, 2025)
- Nurick, S. and Thatcher, A. (2021). Enhanced indoor environmental quality and the link to individual productivity and organisational performance: A scoping review. *Journal of African Real Estate Research*, 6(2), pp. 83–115. <https://doi.org/10.15641/jarer.v6i2.1062>
- Olaniran, O., Morales, L. and Harris, N. (2025). Commercial real estate transformation through smart IoT-based home automation systems. *IoT*, 6, 55. (Preprint)
- Oladokun, T.T. and Shiyanbola, R.E. (2021). 'Sustainable features in commercial real estate in Nigeria', in Abdulai, R.T. and Awuah, K.G.B. (eds.), *Sustainable Real Estate in the Developing World*, pp. 39–52 <http://doi:10.1108/978-1-83867-837-120211003>
- Olaleye, A., Ekemode, B.G. and Olapade, D.T. (2015). 'Predictive capacity of asking price on property sales price in emerging market: Evidence from Lagos, Nigeria', *15th African Real Estate Society International Conference on Real Estate Markets Development: Meeting the Challenge, Making the Difference*, August 31 – September 5, 2015, pp. 258–268
- Olga, F. and Shanni, F. (2011). Time-on-market and house prices in Auckland, New Zealand. *Pacific Rim Property Research Journal*, 17(1), pp. 70–91.

- Richardson, K., Steffen, W., Lucht, W., Bendtsen, J., Cornell, S. E., Donges, J. F., Drüke, M., Fetzer, I., Bala, G., von Bloh, W., Feulner, G., Fiedler, S., Gerten, D., Gleeson, T., Hofmann, M., Huiskamp, W., Kummu, M., Mohan, C., Nogués-Bravo, D., Petri, S., Porkka, M., Rahmstorf, S., Schaphoff, S., Thonicke, K., Tobian, A., Virkki, V., Wang-Erlandsson, L., Weber, L., & Rockström, J. (2023). Earth is beyond six of nine planetary boundaries. *Science Advances*, 9(37), Article eadh2458. <https://doi.org/10.1126/sciadv.adh2458>
- Sani, K.S. and Gbadegesin, J.T. (2015). A survey of important attributes for marketing real estate developments in metropolitan Ibadan property market, Nigeria. *European Journal of Business and Social Sciences*, 4(4), pp. 25–40.
- Singh, A., Syal, M., Grady, S.C. and Korkmaz, S. (2010). Effects of green buildings on employee health and productivity. *American Journal of Public Health*, 100(9), pp. 1665–1668. <https://doi.org/10.2105/AJPH.2009.180687>
- Sinha, A., Gupta, R. and Kutnar, A. (2014). Sustainable development and green buildings. *Drvna Industrija*, 64(1), pp. 45-53. <https://doi.org/10.5552/drind.2013.1205>
- Stoddart, H. (2011). A pocket guide to sustainable development governance, Stakeholder Forum.
- Thomas, J. (2015). ‘Theory of sustainability? Consideration of a basic understanding of “sustainability science”, in Enders, J.C. and Remig, M. (eds.) *Theories of Sustainability Development*. Routledge: Abingdon-on-Thames, UK, pp. 30-42.
- Timm, J.F.G., Maciel, V.G. and Passuello, A. (2023). Towards sustainable construction: A systematic review of circular economy strategies and ecodesign in the built environment. *Buildings*, 13(8), Article 2059. doi:10.3390/buildings13082059
- United Nations Environment Programme. (2023). Global status report for buildings and construction 2023. UNEP. <https://www.unep.org/resources/publication/global-status-report-buildings-and-construction-2023>
- Wang, X. and Ramakrishnan, S. (2022). Sustainable building design. In *Environmental Sustainability in Building Design and Construction*. Springer: Cham, pp. 119–143. https://doi.org/10.1007/978-3-030-76231-5_1
- Wilkinson, S. J. and Reed, R. G. (2006). Office buildings and the environment – The increasing importance of ESD. 12th Annual Pacific Rim Real Estate Conference 22 - 25 January, University of Auckland, New Zealand, pp. 1–13.
- Yee, W. S. and Connie, S. (2018). Your green guide - Residential real estate 2018. PRD Nationwide, Australia.
- Younos, T. and Parece, T.E. (eds.). (2016). Sustainable water management in urban environments. Springer: Cham. <https://doi.org/10.1007/978-3-319-29337-0>
- Tietze, N. (2024). Refurbishment of offices – what is the status? *Apoprojekt Stock Compass / Bulwiengesa*. <https://bulwiengesa.de/en/magazin/refurbishment-offices-what-status> (Accessed September 19, 2025)
- Zhou, X., Zahirovic-Herbert, V. and Gibler, K. M. (2018). Time-on-market in Chinese condominium presales. *International Journal of Strategic Property Management*, 22(3), pp. 191–203. <https://doi.org/10.3846/ijspm.2018.1547>



The Impact of Inclusive Access Facility Design on Space Utilisation for Persons with Disabilities in Makerere University Residential Halls

Eunice Nahula^{1*} (<https://orcid.org/0009-0006-8685-6468>) and Moses Batanda Mubiru² (<https://orcid.org/0000-0001-6997-8929>).

^{1,2} Department of Quantity Surveying and Property Valuation, School of the Built Environment, Kyambogo University, Kampala, Uganda

To cite this article: Nahula, E., and Mubiru, M. B. (2026) The Impact of Inclusive Access Facility Design on Space Utilisation for Persons with Disabilities in Makerere University Residential Halls. *Journal of African Real Estate Research*, 11(1), pp. 21-39. DOI: 10.15641/jarer.v11i1.1832

Abstract

This study explored the experiences and perceptions of persons with disabilities (PWDs) regarding the inclusive design of access facilities and the utilisation of spaces in Makerere University halls of residence. Specifically, it focused on PWDs with mobility challenges and/or visual impairments, exploring how they manoeuvre through and around the residential halls. Thus, it addresses a gap in understanding the key drivers of comfort (or discomfort) for PWD users when utilising university accommodation spaces, and how they adapt to non-inclusive spaces. The research employed a descriptive research design, primarily using qualitative methods. Fifty-four PWD resident students, identified through snowball sampling, were the key units of analysis. In addition, other key informant respondents were purposively selected from Makerere University administrative and support staff. They included nineteen university administrators and twenty-nine support staff. Data on the positioning, condition, user experiences with manoeuvrability, and policy compliance were collected. The collection was done using questionnaires, structured interviews and Focused Group Discussions (FGDs). Two FGDs were conducted with PWD respondents, and additional information was collected through observation and photography. Data analysis was conducted using thematic categorisation. The results of this study indicated that the experiences and perceptions of PWD users regarding the utilisation of access facilities in university halls unfolded into four thematic areas: the unique challenges for each PWD gender, mobility within accommodation facilities, selective facility positioning, ground-floor accessibility limitations, and manoeuvrability in common areas. Overall, this study concluded that the design and condition of access facilities significantly influence the extent to which PWD users utilise accommodation spaces. While there have been some efforts to incorporate access facilities, the persistent design flaws and maintenance gaps have evidently hindered effective space utilisation and compromised their safety.

Keywords: *PwD mobility; facilities performance; Universities; Uganda*

*Corresponding author's email address: eunicenahula@gmail.com

©2026 The Author(s). Published by UCT Library. This is an open-access article under the CC BY 4.0 license. <https://creativecommons.org/licenses/by/4>

1. Introduction

The inclusiveness of accessibility in university accommodation facilities, especially for persons with disabilities (PWDs), has been increasingly concerning over the last decade. According to a 2012 United Nations report, approximately 10% of the world's population are PWDs, with 7% residing in developing countries. Such figures make this portion of the population significant enough to understand how they fall into the inclusivity debate (Hashim et al., 2012). Otherwise, without a specific, tailored focus, inclusivity may not be achieved.

In Africa, records indicate that an estimated 60-80 million individuals live with disabilities (Vanderschuren and Nnene, 2021; Worldometer, 2025). The African percentages may appear lower than global statistics, which range from 3.85% to 5.13% (Worldometer, 2025), but many cases in Africa are missed due to inadequate records (Zziwa et al., 2019). The 2011 World Report on Disability by the World Health Organisation indicates that Africa has a higher prevalence of moderate and severe disabilities compared to many other regions, particularly among people under 60 years old (Jolley et al., 2018). In Uganda, PWDs constitute a significant portion of the population and face various challenges in accessing opportunities, especially in the built environment (Ghore, 2016). According to the Uganda Bureau of Statistics (UBOS) 2016 Census Report, approximately 12.4% of Ugandans live with some form of disability, amounting to around 4.5 million individuals (Kaggya, 2019). Such figures underscore the importance of designing buildings and infrastructure in Uganda to accommodate the needs of PWDs.

Meeting the needs and expectations of PWDs is integral to achieving the Sustainable Development Goals (SDGs), which aim for universal inclusivity and leave no one behind (Panda & Kaur, 2024), with special emphasis on SDG 10, which focuses on reducing inequalities. The SDGs and the "Leave No One Behind" agenda prioritise the inclusion of marginalised groups, particularly people with disabilities, in mainstream development (Jolley et al., 2018). Also, Goal 4 focuses on inclusive, quality education and lifelong learning, aiming to develop educational facilities that accommodate the needs of children, PWDs, and people with diverse gender identities, ensuring safe, inclusive, and effective learning environments for all (Kavishe & Isibika, 2018). The United Nations Convention on the Rights of Persons with Disabilities also emphasises the importance of making adaptations to enable PWDs to participate in society fully (Jolley et al., 2018).

On-campus student accommodation is crucial in meeting the students' needs and creating a supportive living and learning environment. Universities are therefore charged with addressing concerns such as the performance of access facilities and building quality to ensure satisfaction and inclusivity, especially for PWD students (Oke et al., 2017). Therefore, the design of access facilities in student residences is crucial for social inclusion and usability for PWDs, as social structures and attitudes can create or worsen disabilities, affecting their ability to access residential halls (Mubiru, 2022).

The inclusive design of access facilities for PWDs is specific. It incorporates features such as ramps, lifts, and accessible bathrooms equipped with grab bars, which optimise space utilisation and enable seamless navigation (Amole, 2009). Others may be designated parking spaces near entrances and furniture layouts that promote spaciousness in communal areas. They also include clear signage, wide corridors, automatic doors, tactile indicators for navigation,

and accessible amenities such as accessible public quadrangles for resting, along with conveniently located, comfortable seating areas (Soyingbe et al., 2007). Effective designs are expected to enhance accessibility and autonomous manoeuvrability within the residence halls. If this is achieved, it may incorporate an ecological architecture approach, which is likely to improve the user experience (Hutabarat and Siahaan, 2022). In this way, inclusive accessibility features that simplify access to common areas are essential to how comfortably PWDs use and interact with the campus residential space.

Studies of students' manoeuvrability on non-inclusive access facilities at university campuses in Africa have been a focus of several scholars in recent years. For instance, recent research has focused mainly on the experiences of PWD in academic and public spaces. Identifying barriers within these environments and emphasising the need for accessible design adhering to regulatory standards (Ilako et al., 2020; Kavishe and Isibika, 2018; Mubiru, 2022). However, a gap remains in understanding how such non-inclusive design principles influence space utilisation within residential settings of public campuses for PWDs, as well as how they adapt to these spaces without inclusive features. By filling this gap, this study aimed to provide insights to inform improvements to residential design standards and to create more inclusive living environments for PWDs in residential halls. This study thus examines the effects of the non-inclusive access facility on PWDs' utilisation of space in Makerere University residence halls. Specifically, it will focus on PWDs with mobility challenges and/or visual impairments, exploring how they manoeuvre through and around the non-inclusive halls. The PWD space expectations, especially when using institutional accommodation facilities, are unique, specific and sensitive to inclusivity standards. Once such expectations aren't met, PWD users risk failing to maximise the utilisation of accommodation spaces and the core purpose of their being in the university. The inclusivity space requirements and expectations are elaborated in this section.

1.1. Inclusivity

The terms “inclusive”, “inclusion”, and/or “inclusivity”, used interchangeably, have a wide range of meanings, especially in educational and social settings. Some schools of thought contextualise it in terms of active engagement and the integration of diverse individuals, guaranteeing equal access and participation irrespective of their distinct characteristics (Hyde et al., 2017; Sturm et al., 2011). Others associate inclusivity with a teaching approach that ensures all students, regardless of disability, ethnicity, socioeconomic status, or cultural background, have equal access to education and opportunities for active participation (Clark and Gorski, 2001; Thomson, 2018). Inclusivity emphasises recognising and embracing diversity to create meaningful learning experiences for every student (de Borba et al., 2024). Inclusion aims to bridge the gap between students with and without special educational needs. One way to achieve this is to foster interaction and social skills among students with special needs (Arupam, 2025). However, despite its positive intentions, implementing inclusive education, especially in public universities in sub-Saharan Africa, faces several practical bottlenecks today.

Inclusive design of access facilities must be tailored to meet the end users' specific needs. Such conformance is particularly relevant in university residential halls, where the extent to which access facilities accommodate PWD users' preferences directly affects users' ability to utilise space efficiently. Inclusivity in residential facilities extends beyond mere compliance with accessibility standards; it must be assessed by how well the infrastructure aligns with the movement patterns and daily activities of PWDs. Therefore, while it is widely accepted that

the model of a residential hall should be inclusive (LeBlanc, 2023; Yessenbayev et al., 2024), the concept remains somewhat ambiguous, leading to uncertainty about how to capture its essence.

Hamilton et al. (2022) argue that ensuring an inclusive property management model should encompass more than just its functional utility. It should also consider how it is managed, as well as the specific challenges and contexts related to the project. Such contexts must include user demographics, environmental factors, regulatory requirements, and social dynamics. In such a way, the concept of inclusivity will likely focus on creating practical, reliable, and feasible models. This framework can be applied by property and facility management teams when designing access facilities in halls of residence to ensure they meet the needs of PWDs. For instance, Khozaei et al. (2011) indicated how inclusive accommodation would boost students' identity, well-being, and satisfaction. In this way, for PWD students, satisfaction could be linked to the availability of accessible infrastructure. This would include installing ramps, elevators, and expanded entryways, which significantly affect their mobility and overall experience in residential facilities.

An effective approach to student accommodation should provide adequate shelter and inclusive, safe, and accessible environments that promote academic success and well-being. Universal Design principles, including wheelchair-accessible ramps, elevators, and adjustable furniture, make housing accessible to PWD students, improving their ability to use available spaces efficiently (Taylor, 2019). However, such fit-for-purpose facilities and equipment may not be successfully installed without user feedback.

There are several ways to seek feedback. For instance, an approach suggested by Gomide et al. (2024) emphasises going beyond minimum legal standards to achieve genuine inclusivity. Rather than adding only accessibility features like back ramps, campuses may strive to create equal student experiences by integrating features such as adjustable furniture and gently sloped walkways, thereby promoting safety, choice, and accessibility. Ensuring that inclusive design elements reduce accident incidences, enhance PWD preferences, and optimise space utilisation.

1.2. Space utilisation

Adequate space and manoeuvrability are fundamental in the design of access facilities. The efficiency of space utilisation among PWDs in residence halls depends on how well access facilities accommodate their mobility and the execution of various activities. Accessibility elements, such as well-placed handrails, adjustable furniture, and step-free access routes, contribute to optimal use of space (Gomide et al., 2024). Concurrently, poorly designed spaces, such as narrow hallways or bathrooms with inaccessible fixtures, reduce PWDs' ability to navigate and utilise their living environment effectively. Moreover, accessibility, coupled with the guarantee of the security and privacy of PWD students, ensures satisfaction with the buildings' performance.

Additionally, the PWD's perceived safety is enhanced by secure entrances, surveillance systems, and improved lighting, enabling students to focus on academics and social life without constant concerns about their well-being. Furthermore, an inclusive and efficient space should allow PWD students to navigate their living spaces safely without obstacles. Such design features will likely improve the students' overall quality of life, allowing them to fully engage in university life (Khozaei et al., 2011).

Reducing the incidence of accidents among users is one strategy for maximising the performance of residential halls. Such accidents among PWDs in halls of residence often result from poorly designed access facilities, including slippery surfaces, a lack of tactile indicators, steep staircases without railings, and improperly maintained elevators. Thus, Taylor (2019) it is asserted that inclusive designs incorporating anti-slip flooring, warning signals for visually impaired students, and adequately spaced corridors significantly help reduce such incidents. Furthermore, adaptive, accessible common areas encourage social interaction and engagement in university life, fostering relationships and a sense of belonging. Such focus on inclusivity transforms accommodations into supportive environments where every student feels connected (Khozaei et al., 2011). However, inadequate access facility designs, such as poorly positioned grab bars or malfunctioning lifts, hinder mobility and increase the risk of falls and injuries. This highlights the critical role of inclusive design in minimising accidents among PWD students.

In line with the standards, several scholars have opined on the minimum dimensions for access facilities for PWDs. Such facilities are expected to include wide doorways with a minimum unobstructed opening of 900 millimetres and clear pathways between 900 and 1200 millimetres wide for easy movement around furniture and counters (Maczka, 2013; Okafor and Nwosu, 2024). Additionally, ramps are expected to be at least 1200 millimetres long, with resting areas every 6 meters to facilitate smooth transitions between levels. Restrooms must also have ample space for wheelchair users, with entrances that open in both directions and sufficient manoeuvring space. Prioritising such design elements enables universities to create inclusive environments that improve mobility and the overall experience for PWD students (Ashraf and Rahat, 2023). Therefore, once expectations regarding space manoeuvrability aren't well met, there is usually a vulnerability to an inefficient use of the residential premises. Accidents involving disabled students on campus often result from inadequate barrier-free facilities and design flaws that compromise safety and accessibility.

The key scope of this article is to build on existing debates about the inclusivity of university accommodation facilities, especially on African public campuses. Several studies on facility inclusivity linked to space utilisation have largely been quantitative and have lacked empirical and policy contexts in Uganda. Thus, users' narratives, captured and analysed qualitatively, provide greater clarity on aspects of inclusivity that are generally addressed in the existing literature, especially in the Ugandan context, which has been underexplored in this regard. Other specifics to be addressed by this article include users' gender-specific experiences and the manoeuvrability of site works. Additionally, the narratives explored in this article provide the necessary accommodation for user feedback, which can guide building managers and policymakers in planning and installing fit-for-purpose facilities and equipment in the university residential halls.

2. Methods

2.1. Design

The study utilised a descriptive research design with a mixed-methods approach, though largely qualitative. This choice enables a comprehensive understanding of how inclusive design elements influence space utilisation for PWDs by combining statistical data and personal experiences. A descriptive design is well-suited for assessing specific design elements, such as ramps, elevators, and accessible restrooms, and their influence on PWDs' use of space. This

choice enables a broad understanding by collecting statistical insights and personal experiences of users and decision-makers (Creswell, 2009).

2.2. Study area

The selected case study area was Makerere University, Kampala. Makerere University is the oldest public university in Eastern and Central Africa. The university was chosen as the case study because of its large and diverse student body, including several PWD students. However, the current official records do not provide an accurate picture of the total numbers relied upon in this research. Such a presence would provide a valuable setting for analysing the experiences PWD users encounter when using non-inclusive access facilities in residential spaces. Examining a university of this magnitude thus provides a comprehensive view of accessibility challenges and possible solutions towards inclusivity of university access facilities.

Additionally, Makerere University's halls of residence face significant accessibility challenges due to their outdated design and infrastructure. Many of these halls were built before modern accessibility standards were established and feature narrow doorways, steps, and insufficient space for mobility aids. Makerere's diverse range of residence halls, with varying designs and accessibility standards, makes it ideal for assessing how facilities lacking conventional inclusive design elements affect PWD space utilisation. Furthermore, unlike other institutions, Makerere lacks a dedicated residential hall specifically designed to accommodate the unique needs of PWDs. This makes Makerere an ideal case for analysing the challenges, perceptions, and experiences of PWDs regarding space utilisation in residential environments.

2.3. Study population

In this study, the units of analysis included PWD students residing in the Makerere University halls. There were fifty-four PWD respondents. The key informants included university administrators at different levels, staff from the Disability Resource Centre, Estate/Facilities Managers, and hall administrators. Additional key informants included counsellors from the University Counselling Services, faculty members from the Department of Architecture and the Makerere University Students' Guild members (N=19). Finally, support staff totalling 29 formed another segment of key informant respondents, including cleaners, canteen attendants, dining staff, and PWD guides. In this paper, respondents have been classified according to the allocated acronyms: PWDs (CA), Administrators (CB), and Support staff (CC).

It was vital to separate the two key respondent categories, 'CB' and 'CC', because of the unique responses expected from each. For 'CB', the researchers expected responses on the policy strategy and direction. In contrast, for CC, the expected responses would focus on the challenging hotspots to drive the discussion toward the design shortfalls of the access facilities. Finally, we applied the principle of data saturation. For CA, saturation was reached at 40 responses; for CB, at 15; and for CC, at 20. The additional numbers after the saturation point are from the authors' effort to ensure that no additional or diversionary responses were obtained.

Overall, it was important to engage the key informants, as they were better placed to provide input on the policy and design issues of the university's accommodation facilities. They would further comment on the university's strategy/plan for inclusivity of its facilities and, in a way, help triangulate responses from the student PWDs. Eventually, the highlighted respondents collectively offered a well-rounded perspective on accessibility and inclusivity at Makerere University.

2.4. Sampling

A representative sample was selected using purposive and snowball sampling techniques. The techniques enabled targeted selection of participants who could provide valuable insights specific to the study objectives, such as PWDs residing in university halls and key informants involved in accessibility and facility management. Such insights were further aided by the tools adopted, such as 'questerviews' (Adamson et al., 2004), interviews, and FGDs. This sampling approach ensures a comprehensive, representative sample that reflects the experiences and needs of PWDs. Specifically, the purposive sampling targeted key informants, such as university administrators and support staff, with specific knowledge of the design and management of access facilities. The selected key informants would further elucidate the university's policy strategies regarding the inclusivity of access systems.

The uniqueness of the snowball sampling strategy made it relevant for selecting the PWD respondents. The snowball technique usually identifies and recruits participants through referrals from initial subjects. It starts with a small group of known individuals who refer others from their networks, creating a "snowball" effect (Geddes et al., 2018; Mubiru et al., 2022). The selection of PWDs through snowball (save for their leaders, who were known and picked through a purposive technique) was mainly based on two reasons: Firstly, the PWDs belonged to the Hard-to-Reach or identify Population category, which is usually disenfranchised when selected through random techniques. Starting with a few known individuals, this method allowed the researcher to reach additional participants through referrals, particularly those who may not actively participate in disability groups/associations but still have relevant experiences to share. Additionally, potential respondents were reluctant to identify themselves for inclusion in official records, anticipating stigma (Cormier, 2022). Yet for others, it was a mindset issue (Waitoller and Thorius, 2022), as they did not subscribe to the disability perception. So, the incompleteness of official records of PWD numbers constrained the researchers to the snowball sampling approach. Secondly, by relying on referrals, snowball sampling helped establish trust, as participants felt more comfortable participating when approached through their trusted social networks. This encouraged more honest and open sharing.

2.5. Data collection

Data were gathered from fifty-four PWD respondents, through unstructured questionnaires, interviews and focus group discussions (FGD), with a choice determined by the respondents' convenience, and a vital need for data triangulation. The tools were designed to assess the adequacy, usability, and comfort of access facilities for PWDs. Additionally, space utilisation metrics, such as the count of accessible rooms and communal areas, were documented. Although questionnaires are widely used in quantitative research (Humble, 2020; Yin, 2003), the unstructured nature of the questions allowed the collection of qualitative data to weigh users' experiences and perceptions. Such tools have been dubbed 'Questerviews' by Adamson et al. (2004).

In addition, in-depth interviews and focus group discussions allowed participants to share experiences and challenges, and to suggest improvements to the inclusivity of the access facilities in the residential spaces. Together, these methods comprehensively analyse the current design's inclusivity and functionality (Kumar, 2018). Thus, such respondents had the option of either completing the questionnaires online or in hard copy. Therefore, when

designing the unstructured questionnaires, we followed a similar line of questioning adopted for the interviews to help us gather the required qualitative data.

Data was also collected through observation. During the data collection phase spanning two weeks, the researchers visited the study area and conducted strategic observations of the residential halls and their siteworks to assess the existing visible conditions. During observation, we particularly focused on the location and distribution of access facilities. Other components under focus included the specific design, finishing materials, and condition of the facilities. Also, the presence or absence of specific facilities in the residential spaces was our focus. Such a surveying technique helped gain a direct understanding of the environment and identify additional insights not captured by other data collection methods.

Finally, the researchers collected data through FGD. The researchers conducted two FGDs, with six respondents each, comprising PWD students and their group/association leaders. The key asset of this method lies in its ability to efficiently explore participants' attitudes, perceptions, beliefs, and experiences in a dynamic group setting, enabling interaction and dialogue among participants (Kumar, 2018). Focus group discussions were instrumental in strengthening and balancing the responses from the interviews and in clarifying some of the components observed by the researchers. If the FGDs were not conducted, the data collected from the other methods and their eventual analysis would be lopsided. Therefore, the FGD strategy wasn't applied as a stand-alone; rather, it played a secondary role in strengthening the other methods.

2.6. Analysis

To analytically examine the experiences, challenges, and attitudes of PWD users when using or manoeuvring residential space facilities, the authors adopted a content analysis technique. Using this technique, the collected data were categorised, coded, analysed, and presented, as recommended by Braun and Clarke (2021). Themes and sub-themes were generated from categorised interview and FGD responses. The thematic analysis was employed to examine patterns and themes in how PWDs interact with access facilities in residence halls and the policy shortfalls associated with them. English was used for field data collection, and audio recorders were used in some sessions with respondents' consent. The study then undertook transcription later, thematically grouping and coding for more appropriate analysis. Some of the key categories rotated around: manoeuvrability, gender-specific access vulnerabilities, utilisation of common areas, provision of human assistance for PWD daily movement, and the actual distribution and orientation of the facilities. After that categorisation, themes were developed to guide the eventual analysis and discussion.

While transcribing the information, the authors were keen not to deviate from the real or key meaning (Mubiru, 2023; Stuckey, 2014). Additionally, the transcription was conducted to avoid bias and distortion of the study's key target. Importantly, direct quotations from interview transcripts were used to illustrate themes and provide the context for the respondents' responses.

2.7. Ethical considerations

Several ethical protocols were followed in conducting this research. In addition to obtaining written consent from Makerere University, the researchers ensured that they first introduced

themselves to the participants and clearly explained the purpose of the study. This helped in obtaining the respondents' consent before data collection. Furthermore, personal information and narrations collected, such as names, recordings, and photographs, were kept anonymous. In reporting the respondents' narratives, the researchers adopted pseudonyms: PWDs (CA), university administrators (CB), and support staff (CC). The subsequent numbering of the responses and narrations from the respondents followed the initial pseudonym assigned to each respondent, for instance, CA1, CA2, etc.

3. Results

This study empirically examines the experiences, challenges, and perceptions encountered by PWD users regarding their manoeuvrability and utilisation of access facilities in the residential spaces of Makerere University. This study attempted to balance user experiences, design inclusivity, and administrative and policy compliance with inclusivity expectations. The analysis of this subject matter was presented through particular themes, including: gender-specific accessibility challenges, mobility within accommodation facilities, selective facility positioning, ground-floor accessibility limitations, and manoeuvrability in common areas.

3.1. Gender of Respondents

The gender distribution of respondents in this study was essential to understanding the distinct impact of the unavailability of inclusive access facilities on both male and female PWDs. The higher proportion of male PWD students (60%) compared to females (40%) in this study may reflect enrollment trends or disparities in access to university education (Githinji, 2013) (see Figure 1). Hence, analysing these PWD gender trends helps in understanding the varying degrees to which the absence of inclusive design affects the challenges that both PWD genders experience when using university accommodation facilities.

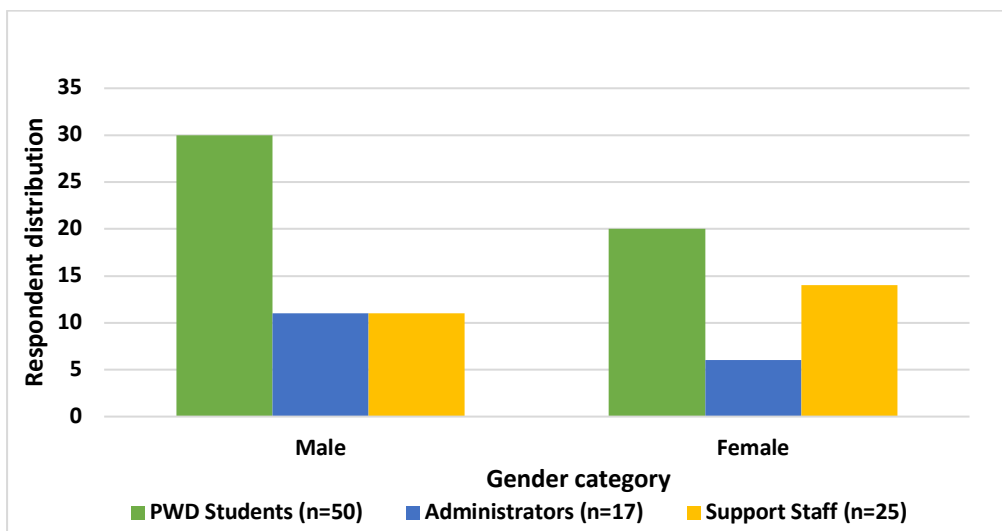


Figure 1: A Graph Showing the Distribution of Participants by Gender.
Source: Field Data (2024)

Gender of the PWDs was further important in this study, as it could influence space utilisation patterns, mobility challenges, and the effectiveness of accessibility interventions of both male and female PWD users of multi-storey accommodation facilities. This resonates with Imrie (2016), who suggests that men and women may experience built environments differently due to physiological and social factors affecting how they navigate university halls of residence.

Therefore, it was important to understand the user experiences in the absence of clearly inclusive facilities.

3.2. Gender-Specific Challenges Faced by PWDs in Halls of Residence

a. Bathroom Accessibility Issues

A significant proportion of PWD female students (65%) reported difficulties using bathrooms compared to 58% of their male counterparts. Some scholars suggest that gender-sensitive accessible facilities are often overlooked in institutional settings, leading to disparities in bathroom usability (Imrie, 2016). Female PWDs would experience additional barriers related to privacy, menstrual hygiene, and the unavailability of gender-appropriate modifications, which are crucial for independent use of sanitary facilities. Additionally, Rohwerder (2015) claims that the absence of accessible disposal units, that are usable even if one is physically challenged, especially units to accommodate female-specific waste and gender-specific bathroom designs, can negatively impact the PWDs' comfort and dignity. On the other hand, male PWDs' concerns largely focused on the lack of supportive fixtures, such as urinals with handrails, to protect them from slippery surfaces. Such fixtures, though necessary for non-PWD users, are recognised as extremely vital for individuals with mobility impairments (Steinfeld & Maisel, 2012). Additionally, respondent CA1 reported:

“The doors in bathrooms are so hard to push at Africa Hall. I come with my crutches and a bucket, but pushing the door often makes me fall. The toilets have mini stairs to climb to where I'm supposed to squat—it's so hard and painful to access. There are no grab bars to support myself. It's terrible. I always avoid using the toilets here and prefer to use the toilets at my department.”

This narrative highlights the lack of essential supportive access features, such as grab bars and easy-to-open doors, which are critical for the safe and independent use of bathrooms by PWDs, especially those who are physically challenged.

b. Building Manoeuvrability

A high percentage of both genders report challenges with movement within halls of residence (72% of female and 68% of male PWDs). Such statistics suggest that most access facilities remain inadequate, making navigation difficult regardless of the gender of the PWD user. Studies indicate that poorly designed pathways, staircases, and inaccessible doorways significantly hinder mobility for PWDs in university environments (Alhusban and Almshaqbeh, 2024). Furthermore, female PWDs may experience greater mobility constraints due to physical strain linked to biological factors such as menstruation-related fatigue (Van den Bosch and Sang, 2017), and the location and design of the dumping facilities of their menstrual waste.

The lack of sanitary disposal units and the poor maintenance of shared facilities exacerbate the issue. Female PWDs are more likely to face difficulties due to the need for private, well-maintained, and gender-sensitive sanitation infrastructure. In contrast, while male PWDs also report challenges, their needs are more closely related to general cleanliness and availability than to gender-specific concerns, as Mont and Nguyen (2018) opined.

PWD female students (85%) reported higher privacy concerns than PWD male students (55%). This suggests that privacy is critical to the design of accessible accommodation facilities, particularly for female students (Wernsman, 2008). In mixed-gender residential halls, female PWDs may feel unsafe due to a lack of secure, designated spaces, increasing their discomfort and limiting their willingness to use shared facilities (Steinfeld and Maisel, 2012). The absence of gender-sensitive modifications in the halls, such as adapted spaces for assistive devices, also affects the overall usability of residential spaces for male PWDs (Imrie, 2016). Inclusive housing policies that consider the privacy concerns of users, irrespective of disability status (De Macedo et al., 2022), have been shown to improve overall well-being and space utilisation for PWDs.

3.3. Mobility in the accommodation facilities

This study assessed the distribution and performance of ramps, elevators, bathroom accessibility, and other accommodation facilities, with respect to their non-inclusiveness and the subsequent influence. The findings indicate that current access facilities partially address PWDs' needs but do not fully meet their preferences. While some ramps exist, their design and usability remain limited, indicating gaps in adherence to universal design principles. For instance, only 10% of ramps were distributed across halls, and no elevators/lifts were installed in any of the buildings. Although there are visible efforts towards inclusivity, such as the provision of a few ramps, the halls' overall design shows minimal compliance with universal design principles. The mismatch between facility design and the mobility requirements of PWDs significantly affects their navigation and space utilisation. A PWD respondent stated:

“At first, I lived in Mitchell Hall, but navigating the area felt impossible, especially on the first day when I tripped over a trench near the entrance and around our block. I later moved to University Hall, but the staircases and live fences with barbed wire forced me to take longer, often unsafe routes to get around. No hall is safe for me; you just have to learn to live the harsh way.” (CA2)

This response emphasises systemic design flaws that hinder accessibility, to the extent that some PWD users resign themselves to their circumstances. For instance, steep ramp gradients and poorly maintained pathways exacerbate difficulties for PWDs, leading to injuries and reduced mobility. Comparing these findings with scholarly insights reveals consensus with Kadir and Jamaludin (2012). Those who assert that functional ramps, elevators, and accessible pathways are vital for reducing injury risks and facilitating safe movement for PWDs.

The distribution of facilities, such as ramps, was uneven, making them less effective in providing consistent access. Additionally, some ramps are too steep, and pathways are narrow, hindering usability, especially for wheelchair users. Safety is also a concern, as the lack of handrails on ramps and the presence of hazardous live fences further increase the risk of injury, creating significant barriers to mobility and accessibility for PWDs. Such deficiencies create a mismatch between the design and mobility needs of PWDs. For example, a wheelchair user's journey within the hall involves navigating poorly designed ramps, often leading to frustration or accidents. Thus, this study reveals that despite some attempts to provide inclusive facilities, systemic challenges and poor design undermine accessibility for PWDs in Makerere University halls. Addressing these gaps requires prioritising universal design principles, regular maintenance, and stakeholder engagement to ensure that facilities truly meet the preferences and needs of PWD users.

Furthermore, entrances to several halls, including Complex and Livingstone, are poorly designed, featuring steep steps without alternative ramps, effectively restricting PWDs from accessing their residences independently. These structural barriers not only hinder mobility but also contribute to social isolation and the underutilisation of key spaces, as many PWDs avoid areas that are difficult to navigate.

The study assessed how well PWDs can navigate and utilise residential spaces at Makerere University, given the existing access facilities. Findings indicate that while some modifications have been made, significant shortcomings persist, highlighting the urgent need for comprehensive improvements to ensure accessibility and inclusivity across all residence halls. A respondent from Nsibirwa Hall shared that:

“The pathways are too narrow and uneven, making it very difficult to move. Sometimes, I need someone to assist me because the terrain is not manageable for my wheelchair.” (CA3)

Another respondent from Mitchel Hall expressed the opinion as follows:

“The corridors are narrow and often crowded, on top of that, surrounded by an open trench. On my first day here, I fell into the trench while trying to navigate the pathway, and since then, I have avoided using it as much as possible. I walk using the columns by touching one by one until I reach my room.” (CA4)

These narrations and experiences highlight the everyday struggles PWDs face due to non-inclusive designs and maintenance of pathways, which are crucial for seamless mobility. Such observations align with those of Imrie (2016), who noted that poorly designed pathways and narrow corridors limit mobility and contribute to social isolation among PWDs.

Furthermore, Steinfeld and Maisel (2012) emphasise that accessible pathways are a cornerstone of universal design, enabling equal participation and independent manoeuvrability within the built environment. The results underline the urgent need for inclusive design interventions to improve corridor and pathway accessibility. Addressing these challenges would significantly enhance the usability and satisfaction of spaces for PWDs in university buildings.

3.4. Selective positioning of facilities/ distribution bias

Respondents indicated that access features distributed in the university residential halls often fell short of accommodating the full spectrum of disability needs, irrespective of gender. A respondent with mobility impairments at Lumumba Hall said:

“While ramps provide access to the main entrance and the PWD level, there are no ramps to the dining hall, which is situated on a raised level above the ground floor. Access to the dining hall is only possible via stairs, so we must order food and pay a delivery fee to our rooms. Though we would prefer to eat in the dining hall and watch TV there, the lack of ramps limits this option.” (CA 5)

Such a narration by CA 5 implies significant limitations in mobility and space, restricting the freedom of movement for PWDs. Additionally, such a predicament entails additional expenses likely to be incurred by PWD users to enable them to adequately utilise some services. Such

costs may not be sustainable, implying that users who cannot manage them in the long term may opt to vacate the accommodation or suffer through.

Similar concerns were exhibited by respondents with visual impairments. For instance, respondent CA6, residing in Nkrumah Hall, stated, “It's risky to move around the hallways because there are no tactile markers or audible signals to help guide me”, supporting Chidiac et al. (2024) view on the importance of tactile markers in inclusive spaces. The absence of proper safety features, such as grab bars on the walkways at Mitchel and University Halls, attracted similar responses. Such observations indicate a gap in design elements that affect PWDs’ ability to navigate independently and safely within the halls.

Regarding corridors and pathways, it was noted that inadequate space design makes PWD navigation difficult. For instance, the narrow pathways and obstacles, such as open trenches and uneven surfaces, severely limit mobility, particularly in Complex Hall and University Hall. According to the Uganda National Accessibility Standards (Uganda National Action on Physical Disability, 2015), corridors should have a minimum width of 1.3m and preferably 1.5m to allow proper manoeuvrability for wheelchair users. For two-way wheelchair traffic, the minimum width should be 1.5m, preferably 1.8m. The slope of accessible pathways should not exceed 1:20 (5 cm per meter), and the surface must be smooth, continuous, firm, and non-slippery.

3.5. Ground Floor Accessibility Limits

Many respondents noted that their functionality is limited even when ramps are present. For example, a PWD from Africa Hall mentioned that ramps only provide access to the ground floor, preventing movement to upper floors for gatherings or meetings. Such an observation, which aligns with Rahman et al. (2024), highlights a significant gap between the design of accessibility features and the mobility needs of PWDs, thereby restricting their participation in various activities within the halls. The partial access provided by these ramps reinforces a dependency on others or excludes PWDs from important events, making it clear that the design of these facilities is inadequate for promoting autonomy and full inclusion. This finding suggests a need for comprehensive redesigns that provide access to all floors, eliminating the need for peer assistance or exclusion from activities.

3.6. Manoeuvrability in Common Areas

Access to social enjoyment in the common areas is a key ingredient of inclusivity in student accommodation. According to this study, such common areas included corridors and stairways, bathroom facilities, study rooms, compound areas, and dining spaces (see Figure 2).

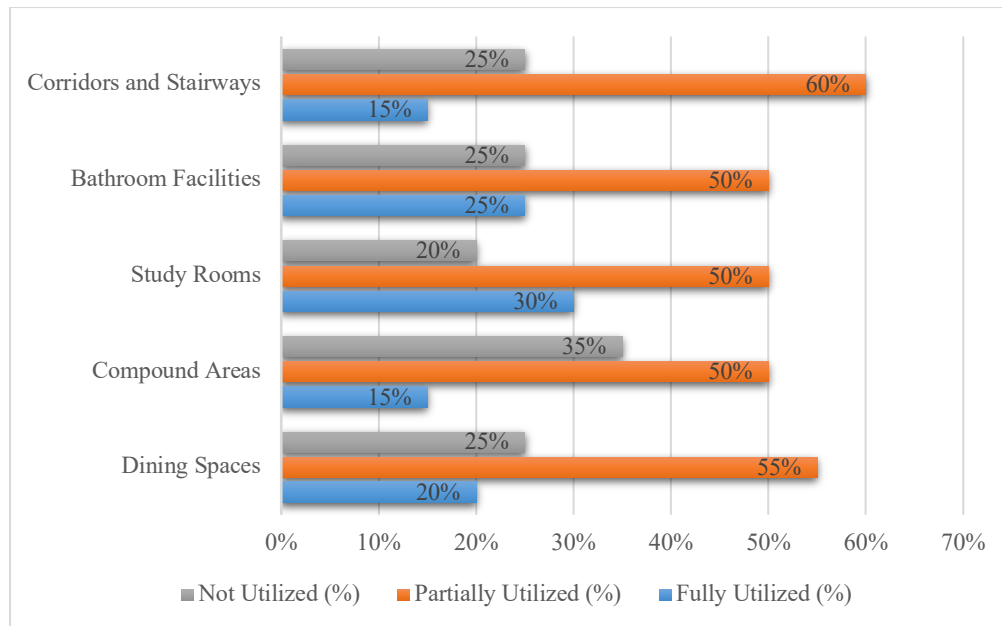


Figure 2: A Graph Showing Utilisation of Common Areas in Halls of Residence
Source: Field Data (2024)

The experiences of PWD users regarding certain critical portions of common areas varied. For instance, regarding dining spaces, a respondent at Africa Hall explained:

“The dining spaces are slippery, crowded and not accessible for me because there are no ramps to reach them. I have to depend on someone to bring me food and avoid going altogether.” (CA 7)

Concerning a further experience with compound area accessibility, a respondent from Livingstone Hall stated:

“I love spending time outside, but the compound areas are surrounded by barbed wire hidden in the live fences, uneven terrain, and stairs. Moving around is exhausting and unsafe. Since the time I fell into the fences and got bruises, I stopped using them.” (CA 8)

Additionally, with common study rooms, a respondent residing at Africa Hall noted:

“The study rooms are easier to access compared to other areas, but they still have narrow doorways, which can be a problem for my wheelchair.” (CA 7)

The narrations highlight the critical importance of common areas in student accommodation, as accessibility compromises the intended maximal utilisation of the accommodation halls by PWD users. Such an assertion aligns with Amole (2009), who indicated that poorly designed common areas hinder the independent use by PWDs, thereby limiting their engagement with communal activities, which would be instrumental in boosting their relaxation and socialisation. Steinfeld and Maisel (2012) also argue that common areas, such as dining halls, study rooms, and compounds, should prioritise universal design features, such as ramps, wide pathways, and grab bars, to promote inclusivity and safety. Moreover, Naami (2019) emphasises that the absence of essential features, such as non-slip flooring and wide doorways, restricts accessibility and contributes to underutilisation and under-enjoyment of the accommodation facilities. In such a case, if the accessibility of common areas is not prioritised, then achieving the highest and best use of students’ accommodation facilities remains a fallacy.

4. Conclusion and Recommendations

This study delved into understanding the experiences, challenges, and perceptions encountered by PWD users regarding their manoeuvrability and utilisation of access facilities in the residential spaces of Makerere University. The analysis of this subject matter has been presented through five thematic areas: PWD gender-specific experiences with non-inclusive facilities, mobility within accommodation facilities, selective positioning of facilities, ground-floor accessibility limitations, and manoeuvrability in common areas. Overall, the findings underscore the vital role of inclusively designed university accommodation facilities in enabling PWDs to utilise residential spaces at Makerere University optimally. While some efforts have been made to incorporate accessibility features such as ramps, elevators, and accessible bathrooms, persistent design flaws and maintenance gaps have evidently hindered effective space utilisation and compromised their safety. For instance, several ramps are steeper than recommended guidelines, and accessible bathrooms are poorly maintained or lack essential features, such as grab bars and adequate turning space for wheelchair users. This has considerably compromised the safety of PWDs and their optimal enjoyment of the accommodation facilities.

Given the findings, it is clear that PWDs experience significant challenges navigating their residential spaces, often relying on helpers or adopting inconvenient, undignified means to move around. Ultimately, while the presence of inclusive access facilities reflects a commitment to accessibility, their inadequacies highlight the need for improvements in design, maintenance, and policy enforcement to ensure that PWDs can fully utilise their living spaces with ease, dignity, and independence.

This study has established that the design and condition of access facilities significantly influenced the extent to which PWD users utilise accommodation spaces. Even with well-designed ramps, spacious hallways, and functional elevators, there is still a gap in the more inclusive and efficient utilisation of the spaces. Despite such difficulties, some PWDs adapted by crawling, receiving assistance from peers to move around, or covering long distances to lecture rooms, university buildings, playgrounds, and revision areas, thereby improving accessibility rather than relying on inaccessible spaces within their halls of residence. To foster a more inclusive and equitable living environment, Makerere University and other public campuses should take proactive steps to customise access facility designs, enforce universal accessibility standards, and implement regular maintenance programs. Additionally, establishing emergency evacuation protocols tailored explicitly for PWDs is essential in ensuring their safety. By addressing these deficiencies, public universities would enhance accessibility, promote autonomy, and create a supportive environment where PWDs can fully participate in academic and social activities without unnecessary barriers.

References

- Adamson, J., Gooberman-Hill, R., Woolhead, G. and Donovan, J. (2004). 'Questerviews': Using questionnaires in qualitative interviews as a method of integrating qualitative and quantitative health services research. *Journal of Health Services Research & Policy*, 9(3), pp. 139–145.
- Alhusban, A.A. and Almshaqbeh, S.N. (2024). Delivering an inclusive built environment for physically disabled people in public universities (Jordan as a case study). *Journal of Engineering, Design and Technology*, 22(6), pp. 1980–1998.
- Amole, D. (2009). Residential satisfaction in students' housing. *Journal of Environmental Psychology*, 29(1), pp. 76–85.
- Arupam, S. (2025). The role of inclusive education in improving social skills of children with special needs. *International Journal of Social Society and Research Innovation*, 1(1), pp. 26–33.
- Ashraf, M.T. and Rahat, R. (2023). Hurdling barriers: Exploring inaccessibility in higher education institutions for mobility assistive device users. *Contemporary Issues in Social Sciences and Management Practices*, 2(3), pp. 143–157.
- Braun, V. and Clarke, V. (2021). *Thematic analysis: A practical guide*. London: Sage.
- Chidiac, S., Reda, M. and Marjaba, G. (2024). Accessibility of the built environment for people with sensory disabilities—Review quality and representation of evidence. *Buildings*, 14(3), Article 707. <https://doi.org/10.3390/buildings14030707>
- Clark, C. and Gorski, P. (2001). Multicultural education and the digital divide: Focus on race, language, socioeconomic class, sex, and disability. *Multicultural Perspectives*, 3(3), pp. 39–44.
- Cormier, K.K. (2022). *We're still emerging: A poetic inquiry exploring the tensions between inclusive mindsets, teacher identity and disability stigma*. PhD thesis. Rowan University. <https://rdw.rowan.edu/etd/3043/>
- Creswell, J.W. (2009). *The research design* (3rd ed.). London: Sage.
- de Borba, N.J., Ferreira, V.A.S., dos Santos, T.P. and Carvalho, S. (2024). Inclusive education: Strategies and impact on contemporary society. *Revista Gênero E Interdisciplinaridade*, 5(3), pp. 182–191.
- De Macedo, P.F., Ornstein, S.W. and Elali, G.A. (2022). Privacy and housing: Research perspectives based on a systematic literature review. *Journal of Housing and the Built Environment*, 37(2), pp. 653–683.
- Geddes, A., Parker, C. and Scott, S. (2018). When the snowball fails to roll, the use of 'horizontal' networking in qualitative social research. *International Journal of Social Research Methodology*, 21(3), pp. 347–358.
- Ghore, Y. (2016). *Participatory livelihoods mapping with persons with disabilities in Uganda*. Brighton: Institute of Development Studies. Available at: <https://www.ids.ac.uk/publications/participatory-livelihoods-mapping-with-persons-with-disabilities-in-uganda/> (Accessed: Thursday September 25, 2026)
- Githinji, J.W. (2013). *Access to university education for persons with disabilities: Towards inclusion*. Unpublished Master's thesis. University of Nairobi.
- Gomide, F.P.D.B., Bragança, L. and Casagrande Junior, E.F. (2024). The synergy of community, government, and circular economy in shaping social housing policies. *Buildings*, 14(7), Article 1897.
- Hamilton, S.H., Pollino, C.A., Stratford, D.S., Fu, B. and Jakeman, A.J. (2022). Fit-for-purpose environmental modelling: Targeting the intersection of usability, reliability and feasibility. *Environmental Modelling & Software*, 148, Article 105278.
- Hashim, A.E., Samikon, S.A., Ismail, F., Kamarudin, H., Jalil, M.N.M. and Arrif, N. M. (2012). Access and accessibility audit in a commercial complex: Effectiveness in respect to

- people with disabilities (PWDs). *Procedia-Social and Behavioral Sciences*, 50, pp. 452–461.
- Humble, S. (2020). *Quantitative analysis of questionnaires: Techniques to explore structures and relationships*. London: Routledge.
- Hutabarat, C.N., & Siahaan, N.M. (2022). Disability-friendly flats with ecology architecture approach. *International Journal of Architecture and Urbanism*, 6(1), pp. 86–95.
- Hyde, M., Carpenter, L. and Conway, R.N. (2017). *Diversity, inclusion and engagement*. London: Oxford University Press.
- Ilako, C., Maceviciute, E. and Muwanguzi, J.B. (2020). 'Creating inclusive library spaces for students with disabilities (SWDs): Perceptions and experiences', in Sundqvist, A., Berget, G., Nolin, J. and Skjerdingsstad, K.I. (eds.) *Sustainable digital communities: 15th International Conference, iConference 2020, Borås, Sweden, 23–26 March 2020*. Lecture Notes in Computer, vol. 12051. Cham: Springer, pp. 487–494.
- Imrie, R. (2016). 'Disability, embodiment and the meaning of the home', in Hall, E. and Chouinard, V. (eds.) *Towards enabling geographies: 'Disabled' bodies and minds in society and space*. London: Routledge, pp. 23–44.
- Jolley, E., Lynch, P., Virendrakumar, B., Rowe, S. and Schmidt, E. (2018). Education and social inclusion of people with disabilities in five countries in West Africa: A literature review. *Disability and Rehabilitation*, 40(22), pp. 2704–2712.
- Kadir, S.A. and Jamaludin, M. (2012). Users' satisfaction and perception on accessibility of public buildings in Putrajaya: Access audit study. *Procedia-Social and Behavioral Sciences*, 50, pp. 429–441.
- Kaggya, B.N. (2019). Successes and challenges in the reporting about the situation of persons with disabilities inline with the SDGs: The Uganda case. Paper presented at the United Nations Experts Group Meeting on Strengthening Evidence Based Research for Disability Inclusive Implementation, Monitoring and Evaluation of the Sustainable Development Goals. New York: United Nations Headquarters. <https://www.un.org/development/desa/disabilities/wp-content/uploads/sites/15/2019/10/Beatrice-Kaggya.pdf> (Accessed: Wednesday, October 01, 2025)
- Kavishe, G.F. and Isibika, I.S. (2018). Provision of library services for users in wheelchairs at Ardhi University and University of Dar es Salaam Libraries. *Library Philosophy and Practice*. Article 1672. <https://digitalcommons.unl.edu/libphilprac/1672>
- Khozaei, F., Hassan, A.S. and Razak, N.A. (2011). Development and validation of the student accommodation preferences instrument (SAPI). *Journal of Building Appraisal*, 6(3), pp. 299–313.
- Kumar, R. (2018). *Research methodology: A step-by-step guide for beginners*. London: Sage.
- LeBlanc, B.C. (2023). Student experience in Brett Hall: A case study of renovations to facilitate inclusion. <https://scholarworks.umass.edu/bitstreams/46362885-6557-4eaa-bd13-7c148cf94dea/download>
- Maczka, K. (2013). *Assessing physically disabled people at home*. Cham: Springer.
- Mubiru, M.B. (2022). Mobility challenges and experiences for students with disabilities in Tanzania universities: Dealing with a social inclusion nightmare in property management. *Property Management*, 40(4), pp. 560–580. <https://doi.org/10.1108/PM-09-2021-0068>
- Mubiru, M.B. (2023). *Exploring the socioeconomic drivers of housing location choices in informal settlements: The case of female-headed households in Kampala City, Uganda*. PhD Thesis. Ardhi University.

- Mubiru, M.B., Nuhu, S., Kombe, W. and Limbumba, T.M. (2022). Women-headed households and housing location preferences in the informal settlements: What can we learn from Luzira, Uganda? *Habitat International*, 127, Article 102648.
- Naami, A. (2019). Access barriers encountered by persons with mobility disabilities in Accra, Ghana. *Journal of Social Inclusion*, 10(2), pp. 68–84.
- Okafor, C.E. and Nwosu, A.G. (2024). Accessibility in sports complex design: Examining the inclusion of people with disabilities in three Nigerian facilities. *Ayden International Journal of Law, Political Science, and Administration*, 12(1), 20–29.
- Oke, A.E., Aigbavboa, C.O. and Raphiri, M.M. (2017). Students' satisfaction with hostel accommodations in higher education institutions. *Journal of Engineering, Design and Technology*, 15(5), pp. 652–666.
- Panda, S. and Kaur, N. (2024). Leaving no one behind: Achieving the sustainable development goals through accessibility for people with disabilities. *International Journal of Educational Communications and Technology*, 4(1), pp. 16–26.
- Rahman, A.A., Mahmood, C.H. and Termida, N.A. (2024). Obstacles faced by people with disabilities (PWD) in higher education institutions on the east coast of Malaysia. *Recent Trends in Civil Engineering and Built Environment*, 5(2), 114–125.
- Rohwerder, B. (2015). *Disability inclusion: Topic guide*. Birmingham, UK: GSDRC, University of Birmingham.
- Soyingbe, A., Ogundairo, A. and Adenuga, O. (2007). 'A study of facilities for physically disabled people in public buildings in Nigeria', in *Proceedings of the 4th International Research Symposium (SCRI) in conjunction with the International Built and Human Environment Research*. Salford: University of Salford, 26-27 March 2007, pp. 251–264.
- Steinfeld, E. and Maisel, J. (2012). *Universal design: Creating inclusive environments*. Hoboken: John Wiley & Sons.
- Stuckey, H.L. (2014). The first step in data analysis: Transcribing and managing qualitative research data. *Journal of Social Health and Diabetes*, 2(1), pp. 6–8.
- Sturm, S.P., Eatman, T., Saltmarsh, J. and Bush, A. (2011). *Full participation: Building the architecture for diversity and public engagement in higher education* (White paper). New York: Columbia University Law School, Center for Institutional and Social Change.
- Taylor, I. (2019). 'Student housing', in Taylor, I (ed.) *Future campus*. London: RIBA Publishing, pp. 70–75.
- Thomson, S. (2018). Achievement at school and socioeconomic background—An educational perspective. *npj Science of Learning*, 3, Article 5.
- Van den Bosch, M. and Sang, Å.O. (2017). Urban natural environments as nature-based solutions for improved public health—A systematic review of reviews. *Environmental research*, 158, pp. 373–384.
- Vanderschuren, M.J. and Nnene, O.A. (2021). Inclusive planning: African policy inventory and South African mobility case study on the exclusion of persons with disabilities. *Health research policy and systems*, 19, pp. 1–12.
- Waitoller, F.R. and Thorius, K.K. (2022). *Sustaining disabled youth: Centering disability in asset pedagogies*. New York: Teachers College Press.
- Wernsman, M.G. (2008). *The process of designing and constructing an accessible residence hall for people with disabilities on a public university campus*. PhD Thesis. Colorado State University.
- Worldometer. (2025). *Africa's population*. Available at: <https://www.worldometers.info/world-population/africa-population/> (Accessed 27 October 2025).

- Yessenbayev, A., Akhmetshin, E., Kurikov, V., Hajiyeu, H., Chernova, O., Litvinov, A., Shichiyakh, R. and Alkhanov, N. (2024). Application of the adaptive approach for forming the concept of an inclusive residential environment in the context of regional differences. *Civil Engineering and Architecture*, 12(4), pp. 3480–3499.
- Yin, R.K. (2003). *Case study research: Design and methods*. (Applied Social Research Methods Series, vol. 5). Thousand Oaks: Sage.
- Zziwa, S., Babikako, H., Kwesiga, D., Kobusingye, O., Bentley, J. A., Oporia, F., Nuwematsiko, R., Bachani, A., Atuyambe, L. M. and Paichadze, N. (2019). Prevalence and factors associated with utilisation of rehabilitation services among people with physical disabilities in Kampala, Uganda. A descriptive cross sectional study. *BMC Public Health*, 19(1), Article 1742.



Sharing Economy in the Real Estate Market: The Rising Demand for Coworking Office Spaces in Lagos, Nigeria

Priscilla Oyebola Bello^{1*} (<https://orcid.org/0009-0002-0139-2731>) and Alirat Olayinka Agboola² (<https://orcid.org/0000-0001-5733-6144>)

¹ Department of Estate Management, Obafemi Awolowo University, Ile-Ife, Nigeria

² Department of Estate Management, Obafemi Awolowo University, Ile-Ife, Nigeria

To cite this article: Bello, P. O., and Agboola, A. O. (2026) Sharing Economy in the Real Estate Market: The Rising Demand for Coworking Office Spaces in Lagos, Nigeria. *Journal of African Real Estate Research*, 11(1), pp. 40-59. DOI: 10.15641/jarer.v11i1.1786

Abstract

Traditional real estate offices are increasingly incompatible with the current demands of office consumers due to the growing virtual nature of human interactions driven by rapid technological advancements, which has led to a shift away from the traditional requirement for location-dependent use of physical spaces. This study calls for the re-evaluation of office space consumption, particularly regarding office sharing. The study adopted a quantitative approach. Questionnaires were administered to 14 coworking office space providers and 56 coworking office space consumers in Lagos. The data were analysed using descriptive statistics, including a frequency distribution table, a weighted mean score, and a bar chart, and inferential statistics, including factor analysis. The findings revealed that 64.3% of coworking office spaces have been operating for more than 4 years. The major factors influencing providers to offer coworking office space are creating a community-centred workspace, supporting remote workers, and reducing vacancy risk, with weighted mean values of 4.57, 4.57, and 4.50. The top-rated challenges faced by consumers are noise and distractions, lack of privacy and difficulty finding a suitable seat. The primary factors influencing coworking consumers are flexibility and cost efficiency, with a total variance of 8.194, and collaborative and social interaction, with a total variance of 3.979. The growing preference for coworking office spaces suggests that real estate investors in Nigeria need to rethink their office investments to accommodate the shift in consumer behaviour. To offer a good consumer experience, the study recommends that coworking office space providers design strategic layout plans that separate focused work areas from high-activity areas, such as communal lounges, to minimise the noise and distractions coworking office space consumers face.

Keywords: *Nigerian real estate market, sharing economy, coworking space investment, coworking office space, coworking*

*Corresponding author's email address: bellopriscilla@pg-student.oauife.edu.ng

©2026 The Author(s). Published by UCT Library. This is an open-access article under the CC BY 4.0 license. <https://creativecommons.org/licenses/by/4>

1. Introduction

The term ‘sharing economy’ was first introduced by Lessig in 2008 (Laurenti et al., 2019). It has since been associated with related concepts such as the platform economy, collaborative consumption, the access economy, and the peer-to-peer economy (Hamari et al., 2016; Basselier et al., 2018). It entails numerous actions to share the use of assets, properties, spaces, services, or capital between people (UNECE, 2022). The sharing economy has gained significant traction in developed countries' markets. It is seen in virtually every market sector, such as transportation (Uber and Lyft), logistics (DoorDash and Uber Eats), and real estate (House and office provision, such as Airbnb and coworking spaces) (Muñoz and Cohen, 2018; Netter et al., 2019).

Within the sharing economy, office spaces have shifted from traditional ownership and long-term leasing models to more flexible arrangements, with coworking spaces playing a key role in driving economic growth through innovation and collaborative professional networks (Pavithra, 2024). Coworking spaces are regarded as a practice within the sharing economy ecosystem because the physical workplaces and resources are shared with other users or co-users who do not necessarily need to be employees of the same company but have converged to create a community of space users (Ayodele et al., 2022b). These changes have significant implications for the commercial real estate market, as investors and landlords must adapt to the growing demand for flexible leasing models, reconfigure office layouts, and respond to evolving tenant preferences (Bhaves, 2026). Moreover, economic conditions such as COVID-19 have accelerated the adoption of remote work, leading to 40%–60% vacancy rates in traditional offices in certain regions (Howell, 2022; Mariotti et al., 2023). Coworking office practices have thus emerged as a bridge between traditional offices and home offices, offering greater flexibility than conventional office spaces while providing more structure than home-based work environments (Kraus et al., 2020).

In Nigeria, the greatest adoption of coworking office spaces has been in the Lagos real estate market, with a few pockets of presence in other states. According to coworker.com (a website that lists coworking spaces in cities around the world), there are several coworking spaces in Lagos, such as Workhaven, Moneta Hub, and Civic Hub, each offering unique features and catering to different types of professionals. The coworking office spaces attract a diverse range of people, and not all consumers have the same motivations as drivers for using them. It has become a preference, especially among those who cannot afford traditional office space, thereby increasing demand for such spaces. The increasing demand for coworking spaces in Lagos has been met with several challenges, including power outages, poor internet connectivity, and layout design issues in the market.

Research on coworking spaces in Nigeria remains insufficient. The few existing studies in this area focused on the coworking space consumers (Ayodele et al., 2022a; Ayodele et al., 2022b; Memud and Tabibi, 2023). Interestingly, much work has been done in developed economies on the practices and factors that motivate providers and consumers to offer and use coworking office spaces (Biagetti et al., 2025; Vogl and Arkesteijn, 2025; Janati et al., 2026). However, differences in economic conditions, infrastructural constraints, regulatory frameworks, and cultural work practices between developed countries and Nigeria may influence coworking space provision and use, thereby limiting the direct applicability of findings from developed economies. Therefore, this study addresses the gap by examining both providers and consumers of coworking spaces, identifying the factors that drive providers and consumers to provide and use coworking spaces, as well as the challenges consumers face when using them.

Consequently, the paper is organised as follows: Section two is the literature review, followed by research methods in Section three, findings and discussion in Section four, and Section five provides the conclusion, policy implications and recommendations.

2. Literature Review

Coworking spaces have become a major form of investment, with investors providing top-notch facilities and services such as open spaces, fixed and hot desks, enclosed spaces, event rooms, meeting rooms, Wi-Fi, printing, projectors, and a kitchen (Vanichvatana et al., 2017). The investment in coworking spaces is driven by rising consumer demand for coworking office spaces.

Empirical studies across different contexts have identified several factors influencing consumers' use of coworking spaces. Weijs-Perrée et al. (2019) examined coworking users' preferences in the Netherlands. Data were collected using a questionnaire from 219 respondents across 25 coworking spaces. The collected data were analysed using a mixed multinomial logit model. The findings revealed that coworkers' motivations for coworking spaces were affordable accommodation, accessibility, and atmosphere/interior. Vlugt (2022) studied coworking as a pathway to sustainability amongst different age groups. The findings highlighted flexibility as a major factor influencing consumers to use coworking spaces. Bhavesh (2026) examined the growth of coworking spaces and their impact on traditional office markets in India and found that cost savings, flexibility, and acceleration of hybrid work post-COVID-19 were the major drivers of coworking usage. These findings suggest that flexibility emerges as a consistent factor across different studies, reflecting the growing demand for adaptable work arrangements in the post-COVID-19 era. Cost considerations also appear significant, particularly regarding affordability and cost savings, while accessibility and workspace design elements, such as atmosphere, influence user preferences. These findings collectively highlight that coworking space usage is driven by a combination of economic, functional, and experiential considerations, although the relative importance of these factors may vary across regions and user groups.

In Nigeria, literature on coworking spaces is sparse. Ayodele et al. (2022b) conducted a study on coworking space practices: assessing space users' preferences and challenges in Ibadan, Nigeria. The findings revealed that economic and social factors were the primary drivers of people's use of coworking spaces. The findings from Ayodele et al. (2022b) reflect the importance of cost considerations in an emerging economy. In contrast, Memud and Tabibi (2023) conducted a study on the effective design of coworking spaces to improve users' experience in Lagos, Nigeria. The study showed that the primary driver of people's use of coworking spaces was the need to connect, network, and collaborate with like-minded people, while economic factors were less important. This contrast shows that motivations for coworking space usage may differ even within the same country, possibly due to differences in urban dynamics and user characteristics. However, both studies focus solely on coworking space consumers and do not examine the factors influencing coworking space providers to provide these spaces. This limits a comprehensive understanding of the coworking market, as both demand- and supply-side factors jointly shape its development. Furthermore, the reliance on descriptive statistical techniques in studies such as Memud and Tabibi (2023) constrains deeper analysis of the underlying structure of these factors.

Studies on the factors driving coworking office space providers and consumers are critical, as they can serve as a foundation for providers or investors to design the value propositions of

their coworking space business models in Nigeria. However, while many consumers are drawn to coworking spaces for the benefits they offer, they are often plagued by numerous challenges, such as inconsistent power supply, inadequate infrastructure, and distractions, which can affect both the provision and use of coworking spaces. Howell (2022) examined the use of online coworking spaces. The research adopted an exploratory empirical approach. Data was collected through surveys and interviews with consumers in the eastern United States. The study found that distractions and loss of productivity were the major challenges faced. Similarly, Ayodele et al. (2022b) studied coworking space practices in Ibadan, Nigeria, highlighting the challenges in an emerging economy. The study identified nine coworking spaces and fifteen coworkers from each. The collected data were analysed with descriptive and inferential statistics. Disturbance and noise, lack of privacy, and poor internet connectivity were among the major challenges consumers faced when using coworking spaces. The findings of Ayodele et al. (2022b) support the results of Howell (2022), which indicate that distractions and loss of productivity were major challenges faced. Distractions and loss of productivity come from disturbances and noise, such as conversations, phone calls, meetings, eating, and coworking events (Bouncken et al., 2018; Tan and Lau, 2021). The challenges faced by coworking office space consumers will assist coworking office space providers and investors to make informed investment decisions to meet the coworker's market demands and preferences, as well as have a competitive advantage.

In line with this, this study examines the factors influencing both coworking space providers and consumers in Lagos, while also investigating the challenges faced by consumers in this context. By integrating both supply- and demand-side perspectives, the study provides a more comprehensive understanding of coworking space dynamics and offers practical insights into how consumer challenges can inform provider strategies to improve workspace design and service delivery in the Lagos coworking market.

3. Methods

This study adopted a quantitative research approach. The coworking spaces were identified on coworker.com, a website that lists coworking spaces in various cities worldwide. A total of fourteen coworking spaces were identified in Ikeja and Yaba in Lagos, Nigeria. These locations were selected because Yaba and Ikeja (the capital of Lagos) attract a high concentration of entrepreneurs, remote workers, tech companies, and government institutions. The study focused on providers of coworking spaces offering flexible leases ranging from daily, weekly, and monthly to bi-quarterly. The providers were represented by the managers responsible for day-to-day operations, as they are best positioned to provide insights into operational and customer-related factors. To ensure representation from all fourteen coworking spaces in Ikeja and Yaba, five consumers were selected from each space, resulting in a total of seventy consumers. The number of consumers varies across coworking spaces; however, selecting an equal number from each space ensured a balanced representation for comparative analysis. This approach was necessary due to limitations in obtaining complete lists of consumers from the coworking spaces. A self-administered, closed-ended questionnaire was used as the data-collection instrument. The questionnaires were structured with relevant sections including demographics, factors influencing provision (for providers), factors influencing use (for consumers), and challenges faced (for consumers). The questionnaires were designed using insights from the existing literature on coworking spaces, including Racek and Holenka (2015), Tan and Lau (2021), and Ayodele et al. (2022a). This ensured that the items captured relevant dimensions such as workspace features, user motivations, and challenges experienced. Thus, the questionnaire was administered to fourteen coworking space providers and seventy coworking space consumers. Only 56 (80%) of the questionnaires were retrieved from the

consumers and found suitable for the analysis. Frequency tables were used to summarise coworking providers' profiles, facilities, and coworking consumers' profiles. Weighted mean scores were also used to rank the factors influencing providers' decisions to offer coworking spaces. The weighted mean scores were measured using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The midpoint of the scale was 3, calculated as the average of the minimum and maximum values (Udoh et al., 2025). Factor analysis was used to analyse the factors influencing consumers' use of coworking spaces. Bar charts were used to visually present the challenges faced by consumers, allowing easy interpretation of the most frequent issues.

4. Findings and discussion

This section encompasses the analysis of data obtained from the administered questionnaire and the discussion of the findings.

4.1 Coworking space providers and consumers

Tables I and II describe the providers of coworking spaces in terms of their year of operation, coworker description, average daily users, peak hours, highest occupancy day, opening and closing hours on weekdays and weekends, and facilities. Table III describes coworking space consumers by gender, age, occupation, income, discipline, frequency of use, duration of use, year of use, and communication.

4.1.1 Coworking Space Providers

Table I presents data obtained from the providers on their year of operation, coworker description, average daily users, peak hours, highest occupancy day, and opening and closing hours on weekdays and weekends.

Table I: Coworking Space Providers

Coworking Space Providers	Frequency	Percentage (%)
Year of Operation		
Less than a year	2	14.3
1 – 2 years	0	0.0
2 – 3 years	1	7.1
3 – 4 years	2	14.3
More than 4 years	9	64.3
Total	14	100.0
Average Number of Daily Users		
Less than 5	0	0.0
6 – 10	4	28.6
11 – 15	3	21.4
16 – 20	3	21.4
Above 20	4	28.6
Total	14	100.0
Coworking Space Peak Hours		
7 am – 10 am	2	14.3
10 am – 2 pm	9	64.3
2 pm – 5 pm	3	21.4
5 pm – 10 pm	0	0.0

10 pm onwards	0	0.0
Total	14	100.0
Coworking Space Highest Occupancy		
Monday	9	64.3
Tuesday	2	14.3
Wednesday	2	14.3
Thursday	1	7.1
Friday	0	0.0
Total	14	100.0
Weekday Opening Hours		
7 am	0	0.0
8 am	11	78.6
9 am	3	21.4
10 am	0	0.0
11 am	0	0.0
Total	14	100.0
Weekday Closing Hours		
4 pm	0	0.0
5 pm	7	50.0
6 pm	4	28.6
7 pm	0	0.0
7 pm onwards	3	21.4
Total	14	100.0
Weekend Opening Hours		
7 am	0	0.0
8 am	2	14.3
9 am	2	14.3
10 am	3	21.4
Do not open on weekends	7	50.0
Total	14	100.0
Weekend Closing Hours		
4 pm	2	14.3
5 pm	3	21.4
6 pm	0	0.0
7 pm onwards	2	14.3
Do not open on Weekends	7	50.0
Total	14	100.0

Source: Author's Field Survey, 2024

From Table I, 35.7% of the coworking spaces have been in operation for less than 4 years, while 64.3% have been in operation for more than 4 years. The presence of both long-established and newly emerging coworking spaces suggests the sustained interest and ongoing investment in flexible office arrangements in Lagos. This indicates continued growth of the coworking sector in the local real estate market.

From the Table, 28.6% of the coworking space providers have an average daily user count between 11 and 15 and above 20, while 21.4% have an average daily user count between 11 and 15 and between 16 and 20. The majority (64.3%) of coworking spaces reported peak hours between 10 am and 2 pm. The possible reasons for these peak hours could be due to work

routines or flexible work patterns among users. The highest occupancy occurs on Monday, accounting for 64.3% of coworking spaces, as reported by the respondents in Table I.

Table I shows that all coworking space providers open their office spaces by 8 am (78.6%) or 9 am (21.4%) and close by 5 pm, 6 pm, and 7 pm, as reported by 50.0%, 28.6%, and 21.4% of the respondents, respectively. The findings support the study by Vanichvatana et al. (2017), which found that the majority of coworking spaces' opening hours were at 8 am or 9 am. Table I also shows that 50.0% of the coworking space providers do not open on weekends. However, the rest (50%) are open on weekends, with the majority (21.4%) of coworking spaces opening by 10 am and closing by 5 pm.

Table II presents data from coworking space providers and shows the available facilities, amenities, and services offered by these spaces.

Table II: Coworking space facilities (Providers)

S/N	Facilities	Frequency	Percentage
(a)	Open workspaces		
	Available	14	100.00
	Not Available	0	0.0
	Total	14	100.0
(b)	Hot desks		
	Available	14	100.00
	Not Available	0	0.0
	Total	14	100.0
(c)	Meeting rooms/conference rooms		
	Available	14	100.00
	Not Available	0	0.0
	Total	14	100.0
(d)	Dedicated desks		
	Available	14	100.00
	Not Available	0	0.0
	Total	14	100.0
(e)	Flexible lease		
	Provided	14	100.0
	Not Provided	0	0.0
	Total	14	100.0
(f)	High speed internet		
	Provided	14	100.0
	Not Provided	0	0.0
	Total	14	100.0
(g)	CCTV		
	Available	11	78.6
	Not Available	3	21.4
	Total	14	100.0
(h)	Biometric scan		
	Available	2	14.3
	Not Available	12	85.7
	Total	14	100.0
(i)	Printing and scanning facilities		

	Available	10	71.4
	Not Available	4	28.6
	Total	14	100.0
(j)	Projectors		
	Available	14	100.0
	Not Available	0	0.0
	Total	14	100.0
(k)	Childcare facilities		
	Available	0	0.0
	Not Available	14	100.0
	Total	14	100.0
(l)	Parking facility		
	Available	13	92.9
	Not Available	1	7.1
	Total	14	100.0
(m)	Fitness/gym		
	Available	1	7.1
	Not Available	13	92.9
	Total		100.0
(n)	Kitchen/pantry		
	Available	13	92.9
	Not Available	1	7.1
	Total	14	100.0
(o)	Lounge areas		
	Available	9	64.3
	Not Available	5	35.7
	Total	14	100.0
(p)	Access cards		
	Provided	5	35.7
	Not Provided	9	64.3
	Total	14	100.0
(q)	ID cards		
	Provided	1	7.1
	Not Provided	13	92.9
	Total	14	100.0
(r)	Networking events/workshops		
	Provided	13	92.9
	Not Provided	1	7.1
	Total	14	100.0
(s)	Toilet		
	Available	14	100.0
	Not Available	0	0.0
	Total	14	100.0
(t)	Bath/showers		
	Available	6	42.9
	Not Available	8	57.1
	Total	14	100.0
(u)	Bar/café		
	Available	3	21.4
	Not Available	11	78.6

	Total	14	100.0
(v)	Storage lockers		
	Available	10	71.4
	Not Available	4	28.6
	Total	14	100.0
(w)	Administrative support		
	Provided	13	92.9
	Not Provided	1	7.1
	Total	14	100.0
(x)	IT support		
	Provided	7	50.0
	Not Provided	7	50.0
	Total	14	100.0
(y)	Cafeteria		
	Available	4	28.6
	Not Available	10	71.4
	Total	14	100.0

Source: Author's Field Survey, 2024

As shown in Table II, all the coworking spaces have open workspaces, hot desks, dedicated desks, meeting rooms/conference rooms, flexible subscriptions, high-speed internet, projectors, and toilets. Most (78.6%) of the coworking spaces have CCTV installed, while 21.4% do not. A majority (85.7%) of the respondents do not provide biometric scanning. This could be a result of the high implementation costs and reliance on alternative security measures, such as CCTV or manual monitoring. The majority (71.4%) of coworking spaces offer printing and scanning facilities, while 28.6% do not. 92.9% of the respondents provide parking facilities, while none of the coworking spaces provides childcare facilities. This highlights a potential service gap in the Lagos coworking market, which limits the appeal of these spaces to working parents who require childcare support. Addressing such gaps could be an avenue for value addition and differentiation by providers.

Table II also shows that a few (7.1%) of the coworking spaces provide fitness and gym facilities. The majority (92.9%) of the respondents have a kitchen or pantry, 64.3% have lounge areas, 35.7% provide access cards, and 92.9% do not offer ID cards. Almost all the coworking spaces (92.9%) reported conducting networking events and workshops. Only 42.9% of the respondents provide baths and showers. The majority (78.6%) of the spaces do not have a bar or café; 71.4% report providing storage lockers; 92.9% offer administrative support; 50.0% offer IT support; and 71.4% do not have cafeterias. These results suggest that coworking spaces prioritise functional amenities and networking opportunities over recreational facilities, reflecting the evolving needs of Lagos-based professionals. The findings from the Table are consistent with Vanichvatana et al. (2017) and Howell (2022), which report that the most prevalent amenities in coworking spaces are hot desks, dedicated desks, WiFi, printers, scanners, kitchens, event and meeting rooms, and projectors.

4.1.2 Coworking space consumers

Table III presents data from coworking space consumers, organised by gender, age, occupation, income, discipline, frequency of use, duration, year of use, and communication.

Table III: Office Sharing Consumers

Demographics	Frequency	Percentage (%)
Gender		
Male	28	50.0
Female	28	50.0
Total	56	100.0
Age		
Less than 20 years	0	0.0
21 – 30 years	40	71.4
31 – 40 years	15	26.8
41 – 50 years	1	1.8
Above 50 years	0	0.0
Total	56	100.0
Marital Status		
Single	46	82.1
Married	9	16.1
Divorced/Separated	1	1.8
Widowed	0	0.0
Others	0	0.0
Total	56	100.0
Highest Educational Qualification		
SSCE	3	5.4
OND	4	7.1
HND/BSc/B.Tech	42	75.0
MSc/M.Tech	7	12.5
Ph.D	0	0.0
Total	56	100.0
Monthly Income		
Less than 100,000	8	14.3
101,000 – 200,000	10	17.9
201,000 – 300,000	13	23.2
301,000 – 400,000	11	19.6
Above 400,000	14	25.0
Total	56	100.0
Occupation		
Freelancer/Self-employed/Entrepreneur	19	33.9
Private Employee	36	64.3
Government Staff	0	0.0
Student	1	1.8
Others	0	0.0
Total	56	100.0
Discipline		
Information Technology (IT)	27	48.2
Consultancy	7	12.5
Real Estate/Finance	8	14.3

Writing/blogging	3	5.4
Project management/marketing	11	19.6
Total	56	100.0
Frequency of Use		
Daily	12	21.4
Twice a week	5	8.9
3 – 4 days per week	23	41.1
5 – 6 days per week	13	23.2
Once a month	3	5.4
Total	56	100.0
Duration of Use		
No particular time	4	7.1
1 hour – 3 hours	2	3.6
3 hours – 5 hours	13	23.2
5 hours – 7 hours	10	17.9
Above 7 hours	27	48.2
Total	56	100.0
Year of Use		
Less than 6 months	20	35.7
6 months – 1 year	11	19.6
1 year – 2 years	10	17.9
2 years – 3 years	9	16.1
Above 3 years	6	10.7
Total	56	100.0
Communication between consumers		
Never	2	3.6
Not Frequent	5	8.9
Slightly frequent	13	23.2
Frequent	23	41.1
Very Frequent	13	23.2
Total	56	100.0

Source: Author's Field Survey, 2024

As shown in Table III, there are equal numbers of male (50.0%) and female (50.0%) consumers using coworking spaces. The findings of the research contradict those of Racek and Holenka (2015) and Ayodele et al. (2022b), who opined that more men use coworking spaces. From Table III, the highest proportion (71.4%) of the consumers in the study area were in the age bracket of 21-30 years. These findings are consistent with Ayodele et al. (2022b), who found that most people aged 20-29 were the primary users of coworking spaces in Ibadan. Racek and Holenka (2015) also found that the average age of users of coworking spaces in Slovakia was 30 years. This pattern suggests that coworking spaces almost always offer a more affordable alternative to leasing traditional office space for young professionals and entrepreneurs.

As shown in Table III, the findings indicate that single consumers accounted for the highest proportion (82.1%) of respondents in the study area. This might be linked to the fact that the majority of consumers are between 21 and 30 years old and may not be married. A majority

(75.0%) of the respondents have HND/BSc/B.Tech. The findings are consistent with Ayodele et al. (2022b), which report that the majority of consumers have an HND, BSc, or B.Tech. From Table III, the majority (75.0%) of the consumers earn less than ₦400,000. Traditional office spaces are very expensive, and consumers' low incomes may be one reason they prefer to share offices rather than set up a traditional office. The findings in the Table support the study by Ayodele et al. (2022b), which found that low income might be a factor influencing the use of coworking spaces. Table III also shows that 64.3% of the consumers are privately employed, 33.9% are freelancers/self-employed/entrepreneurs, and 1.8% are students. The results may be linked to rising traditional office rental prices and increased remote work, which will further lower demand for traditional office space. The vast majority (48.2%) of the respondents work in IT. The findings corroborate a recent study by Fu et al. (2023) that the majority of consumers work in IT.

As shown in Table III, 41.1% of the respondents use the coworking space 3-4 days per week, 23.2% use it 5-6 days per week, 21.4% use it daily, 8.9% use it twice a week, and 5.4% use it once a month. The result shows an increase in remote and flexible work structures, where employees do not need to go to the office every day of the week. 48.2% of the respondents spend more than 7 hours when using the coworking space, 23.2% of the consumers spent between 3 hours and 5 hours, 17.9% spent between 5 hours and 7 hours, 7.1% had no particular time spent in the space, while 3.6% spent between 1 hour and 3 hours. From Table III, most (89.3%) of the respondents have been coworking for about 3 years, while 10.7% are above 3 years. As seen in the Table, 3.6% of the respondents reported never communicating with other consumers; 8.9% reported not frequently; 23.2% reported slightly frequently; 41.1% reported frequently; and 23.2% reported very frequently. Overall, 96.4% of the respondents reported communicating with other consumers. Due to the physical layout of most coworking spaces, consumers are usually in close proximity to one another, which increases opportunities for communication and interaction and fosters networking and community. This finding is consistent with Gerdenitsch et al. (2016), who found that coworking spaces foster coworking and networking.

4.2 Factors Influencing Coworking Office Space Providers and Consumers

This section shows the factors influencing both the providers and consumers of coworking office spaces.

4.2.1 Factors Influencing Coworking Office Space Providers

Table IV presents data obtained from coworking office space providers. The Table presents the factors influencing providers to offer coworking office spaces to consumers, using weighted mean scores.

Table IV: Factors Influencing Coworking Space Providers to Offer Coworking Office Spaces

Factors	Strongly Disagree (1)	Disagree (2)	Fairly Agree (3)	Agree (4)	Strongly Agree (5)	Mean Rating Value	Mean Ranking
Create a community centred workspace	0	0	0	6	8	4.57	1st
Support remote workers	0	0	0	6	8	4.57	1st

Lower Vacancy Risks	0	0	0	7	7	4.50	2nd
Provide flexible office options	0	0	0	8	6	4.43	3rd
Assist the development of businesses	0	0	1	6	7	4.43	3rd
Foster knowledge among coworkers	0	0	2	6	6	4.29	4th
Provide work-life balance	0	0	3	5	6	4.21	5th
Profit and financial opportunity	0	1	2	7	4	4.00	6th
Promote sustainability	0	2	7	3	2	3.36	7th

Source: Field Survey, 2024

In Table IV, the factors that influence providers to offer coworking office spaces are to create a community centred workspace, support remote workers, lower vacancy risks, provide flexible office options, assist the development of businesses, foster knowledge among coworkers, provide work-life balance, profit and financial opportunity, and promote sustainability, with a weighted mean value of 4.57, 4.57, 4.50, 4.43, 4.43, 4.29, 4.21, 4.00, and 3.36 respectively. The findings show that the providers are driven by a blend of social and economic factors, with the strongest focus on community building and remote work support, and the weakest on sustainability.

4.2.2 Factors influencing consumers to use coworking spaces

This section describes the factors that influence consumers to use coworking spaces, as detailed in Table V, VI, VII, Figure I, and Table VIII.

Table V: KMO and Bartlett's Test of Factors

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.836
Approx. Chi-Square	913.968
Bartlett's Test of Sphericity	Df
	171
	Sig.
	0.000

Source: Author's Field Survey, 2024

The Kaiser-Meyer-Olkin (KMO) test is used to assess the adequacy of the sample. A KMO value of 1 depicts a perfectly adequate sample, while a KMO of 0 denotes a perfectly inadequate sample. Table V above shows a KMO value of 0.836, a chi-square of 913.968, and a significant Bartlett's test of sphericity ($p < 0.05$). This indicates that the results of the KMO measure of sampling adequacy and Bartlett's test of sphericity are sufficient to carry out factor analysis.

Table VI: Communalities of Factors Influencing Consumers to Use Coworking Spaces

	Initial	Extraction
Cheaper than having my own office	1.000	.776
Flexible Rental Fee/Subscription	1.000	.775
Reduced administrative hassles	1.000	.706
Knowledge/Idea sharing	1.000	.865
Networking with coworkers	1.000	.895
Access to events/workshops	1.000	.739
Possibility of collaborative opportunities	1.000	.740
Enhanced productivity	1.000	.582
To avoid loneliness	1.000	.589
Work life balance	1.000	.654
Employer's preference	1.000	.934
Ability to work from any location	1.000	.676
Promote sustainability	1.000	.840
Flexible work hours	1.000	.726
Inspiring and creative atmosphere	1.000	.748
Meeting people from diverse professions	1.000	.807
Access to resources	1.000	.866
Professional environment for company	1.000	.812
Good value for money	1.000	.843

Source: Author's Field Survey, 2024

Table VI shows the proportion of variance in the variables accounted for by the extracted factors. Factors with high extraction communalities (above 0.8) include knowledge and idea sharing, networking with coworkers, employer's preference, promoting sustainability, meeting people from diverse professions, access to resources, a professional environment within the company, and good value for money. Lower extraction communalities (below 0.6) include enhanced productivity and the avoidance of loneliness.

Table VII shows the total variance explained of factors influencing office-sharing consumers.

Table VII: Total Variance Explained of Factors Influencing Office Sharing Consumers

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
			Cumulative %			Cumulative %			Cumulative %
	Total	Variance		Total	Variance		Total	Variance	
1	8.194	43.124	43.124	8.194	43.124	43.124	4.706	24.766	24.766
2	3.979	20.940	64.063	3.979	20.940	64.063	4.571	24.057	48.823
3	1.358	7.150	71.213	1.358	7.150	71.213	4.114	21.652	70.475
4	1.042	5.485	76.698	1.042	5.485	76.698	1.182	6.223	76.698
5	.841	4.428	81.126						
6	.631	3.322	84.448						

7	.563	2.962	87.411
8	.402	2.118	89.528
9	.373	1.962	91.491
10	.298	1.570	93.061
11	.282	1.482	94.543
12	.238	1.252	95.795
13	.205	1.079	96.874
14	.160	.842	97.716
15	.137	.721	98.437
16	.098	.513	98.950
17	.082	.429	99.380
18	.067	.354	99.733
19	.051	.267	100.000

Source: Author's Field Survey, 2024

As shown in Table VII, before extraction, nineteen components were identified within the data set. Four components were extracted with eigenvalues above 1.0 (8.194, 3.979, 1.358, and 1.0420), accounting for 43.124%, 20.940%, 7.150%, and 5.485% of the variance, respectively. Thereafter, the four components accounted for 76.698% of the variation in the factors influencing consumers to use coworking spaces. This shows that the four components are the principal factors influencing consumers in Lagos. Figure I illustrates the eigenvalues for each variable.

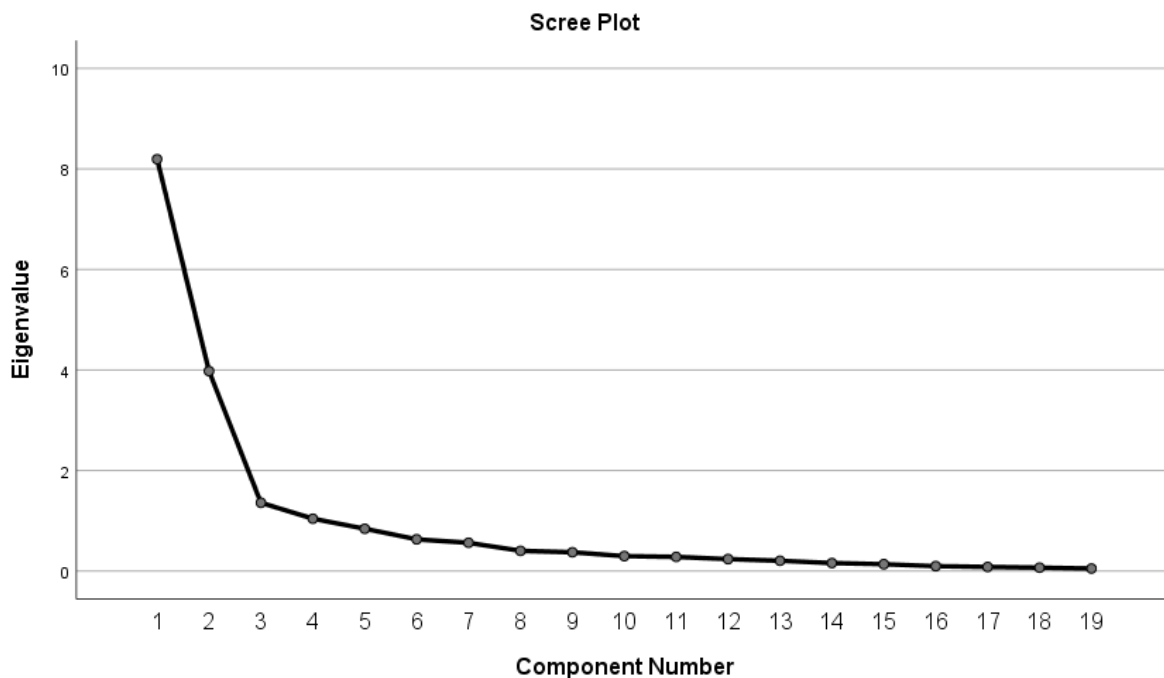


Figure I: Scree Plot Showing the Relationship between the Factors and their Eigenvalues for Coworking Space Consumers

Source: Field Survey, 2024

There is a significant change in the slope's direction at point 3, resulting in a steady decline in the slope up to the 19th component. This shows that 3 components explain most of the variance. Although the scree plot suggests three components based on visual inflexion point, four components were retained in the total variance table because each had an eigenvalue greater than 1, satisfying Kaiser's criterion. This reflects that the fourth component contributes marginal variance and may represent a minor underlying factor, but was retained for completeness.

Table VIII presents the rotated component matrix of factors influencing consumers' use of coworking spaces.

Table VIII: Rotated Component Matrix of Factors Influencing Consumers to Use Coworking Spaces

	Component			
	1	2	3	4
Cheaper than having my own office	.853			
Flexible Rental Fee/Subscription	.827			
Reduced administrative hassles	.565			
Knowledge/Idea sharing		.886		
Networking with coworkers		.902		
Access to events/workshops		.725		
Possibility of collaborative opportunities		.732		
Enhanced productivity	.719			
To avoid loneliness		.658		
Work life balance	.538	.601		
Employer's preference				.961
Ability to work from any location	.637	.515		
Promote sustainability	.787			
Flexible work hours	.717			
Inspiring and creative atmosphere			.839	
Meeting people from diverse professions			.871	
Access to resources			.918	
Professional environment for company			.890	
Good value for money			.910	

Source: Author's Field Survey, 2024

From Table VIII, component 1 is loaded with cheaper than having my own office, flexible Rental Fee/Subscription, reduced administrative hassles, enhanced productivity, ability to work from any location, promotes sustainability, and flexible work hours. This component is named flexibility and cost-efficiency. Component 2 is loaded with knowledge/Idea sharing, networking with coworkers, access to events/workshops, opportunities for collaboration, avoiding loneliness, and work-life balance. This component is termed collaborative and social interaction. Component 3 is loaded with an inspiring and creative atmosphere, meeting people from diverse professions, access to resources, a professional environment for the company, and good value for money. Component 3 is named the creative and resourceful environment.

Component 4 is loaded with the employer's preferences and is referred to as the Employer workspace requirement.

Overall, based on the above findings, the result established that the factors influencing coworking space consumers in the Lagos property market are flexibility and cost efficiency, collaborative and social interaction, creative and resourceful environment, and employer workspace requirements. This shows that the combination of these factors influences consumers' office coworking choices. Furthermore, Table VII shows that flexibility and cost efficiency (43.124%) and collaborative and social interaction (20.940%) are the two most important factors influencing office sharing consumers.

4.3 Challenges faced while using the coworking spaces

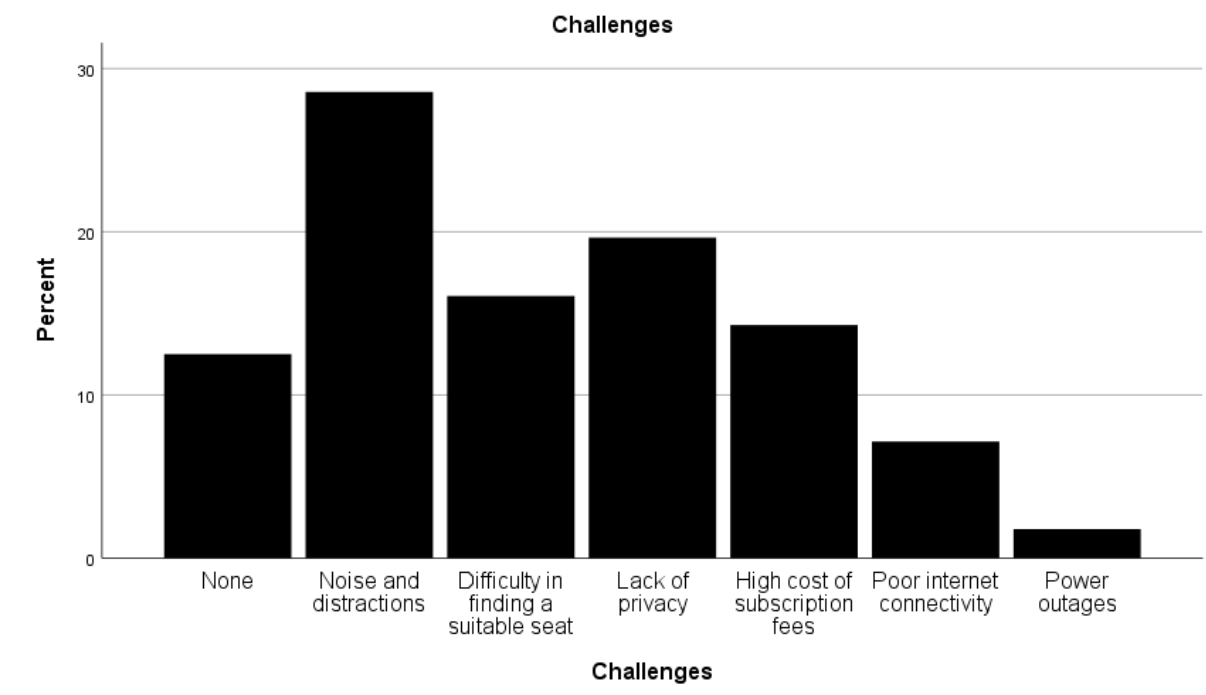


Figure II: Coworking Space Consumers' Challenges

Figure II illustrates the challenges consumers face when using coworking spaces. The majority of respondents (28.6%) identified noise and distractions as a major challenge, which may stem from movements, phone conversations, and discussions within the shared environment (Bouncken et al., 2018). Difficulty in finding a suitable seat (16.1%) and lack of privacy (19.6%) were also commonly reported. These findings suggest that the spatial layout and design of coworking spaces (e.g., open plan seating) directly influence users' experiences and productivity. Managers may need to consider soundproofing and flexible seating arrangements to mitigate these issues. These findings are consistent with the studies of Bouncken et al. (2018), Perera et al. (2019), and Howell (2022).

High subscription fees were reported by 14.3% of the consumers as a challenge, indicating that affordability remains a concern in shared work environments. This aligns with Zhao et al. (2020) and Dell'Aversana and Miglioretti (2024), who stated that cost can limit access and affect job satisfaction. Design and management strategies, such as tiered membership plans or employer-supported subscriptions, could help make coworking spaces more accessible.

Interestingly, poor internet connectivity (7.1%) and power outages (1.8%) were among the least reported challenges, despite being common infrastructural issues in Nigeria (Ayodele et al., 2022b). This may be due to consumer adaptation strategies, such as using personal internet subscriptions, power banks, or noise-cancelling headsets. Such findings indicate that providers' interventions may be more effective if they target human-centred solutions, such as providing quiet zones or ergonomic furniture.

Comparing these results with global research, challenges such as noise, privacy, and seating appear consistent across coworking contexts (Bouncken et al., 2018; Perera et al., 2019; Howell, 2022). This implies that certain workspace design and management issues are universal rather than unique to Lagos. However, the lower impact of infrastructural challenges (internet, power) may reflect a pattern of local adaptation, emphasising the importance of contextual factors in coworking management strategies.

5. Conclusion

In an attempt to study the sharing economy in the Nigerian real estate market, the research focused on coworking office spaces (office sharing) with particular reference to Lagos State. The findings provide valuable insights to real estate investors, practitioners, policymakers, researchers, and consumers. The study found that coworking space consumers are predominantly young professionals aged 21–30 with relatively low-income levels, highlighting the role of coworking spaces as affordable alternatives to traditional office spaces. The key factors influencing the provision of coworking spaces include the need to support remote work practices and to create community-centred work environments that foster collaboration among users. Similarly, the key factors influencing the use of coworking spaces are flexibility, cost-efficiency, collaboration, and social interaction. In addition, challenges such as noise, lack of privacy, difficulty finding seats, and high subscription fees were identified as key issues affecting consumer experience.

Based on the findings of this study, the study recommends that coworking space providers should prioritise flexible and affordable workspace options, as these were identified as key factors influencing user decisions. This is particularly important for young professionals and entrepreneurs with relatively low incomes. The providers should also address key issues such as noise and lack of privacy to enhance consumers' satisfaction and productivity. This study contributes to the growing body of literature on coworking spaces by providing empirical evidence from an emerging economy. Future research can build on this study by adopting larger sample sizes, longitudinal approaches, or comparative analyses across different cities to better understand the evolving dynamics of coworking spaces. Further studies may also explore the integration of coworking spaces into smart city development and affordable workspace solutions.

References

- Ayodele, T., Kajimo-Shakantu, K., Gbadegesin, J., Babatunde, T. and Ajayi, C. (2022a). Exploring investment paradigm in urban office space management: Perspectives from coworking space investors in Nigeria. *Journal of Facilities Management*, 20(1), pp. 19–31.
- Ayodele, T., Ogunbayo, O., Kajimo-Shakantu, K. and Babatunde, T. (2022b). Coworking space practices: assessing space users' preferences and challenges in Ibadan, Nigeria. *Journal of Corporate Real Estate*, 24(4), pp. 256–272.
- Basselier, R., Langenus, G. and Walravens, L. (2018). The rise of the sharing economy. *Economic Review*, 3, pp. 57–78.
- Baum, A. (2017). PropTech 3.0: The future of real estate. Oxford: University of Oxford Saïd Business School. <https://www.sbs.ox.ac.uk/sites/default/files/2018-07/PropTech3.0.pdf>
- Biagetti, M., Mariotti, I., Rossi, F. and Scicchitano, S. (2025). Did remote working push the growth of coworking spaces? The Italian cities case study. *Cities*, 166, pp. 106–272.
- Bouncken, R. and Reuschl, A. (2018). Coworking-spaces: How a phenomenon of the sharing economy builds a novel trend for the workplace and for entrepreneurship. *Review of Managerial Science*, 12, pp. 317–334.
- Bouncken, R., Aslam, M. and Reuschl, A. (2018). 'The dark side of entrepreneurship in coworking-spaces', in Porcar, A. and Soriano, D. (eds.), *Inside the Mind of the Entrepreneur: Cognition, Personality Traits, Intention, and Gender Behaviour*, Cham: Springer, pp. 135–147. <https://doi.org/10.1007/978-3-319-62455-6>
- Dell'Aversana, G. and Miglioretti, M. (2024). Coworking spaces for remote workers: an inclusive solution? Advantages and challenges from affiliated workers' perspectives. *Review of Managerial Science*, 19, pp. 1131–1160.
- Fu, Y., Li, Y. and Li, X. (2023). Coexisting or coworking? the reconfigured office spaces in two emerging global cities. *Journal of Urban Affairs*, 47(5), pp. 1691–1708.
- Gerdenitsch, C., Scheel, T., Andorfer, J. and Korunka, C. (2016). Coworking spaces: a source of social support for independent professionals. *Frontiers in Psychology*, 7, Article 581. <https://doi.org/10.3389/fpsyg.2016.00581>
- Hamari, J., Sjöklint, M. and Ukkonen, A. (2016). The sharing economy: Why people participate in collaborative consumption. *Journal of the Association for Information Science and Technology*, 67(9), pp. 2047–2059.
- Howell, T. (2022). Coworking spaces: An overview and research agenda. *Research Policy*, 51(2), pp. 104–447.
- Isac, C. (2019). Coworking spaces: A source for developing creative business. *Ovidius University Annals, Economic Sciences Series*, 19(2), pp. 36–41.
- Kraus, S., Bouncken, R., Görmann, L., González-Serrano, M. and Calabuig, F. (2022). Coworking spaces and makerspaces: Mapping the state of research. *Journal of Innovation & Knowledge*, 7(1), pp. 100–161.
- Laurenti, R., Singh, J., Cotrim, J., Toni, M. and Sinha, R. (2019). Characterizing the sharing economy state of the research: A systematic map. *Sustainability*, 11(20), Article 5729. <https://doi.org/10.3390/su11205729>
- Lee, S. (2018). *Third places to work in the digital age: Implications from coworking space users' motivations and preferred environmental features*. Master's thesis, Cornell University.
- Mariotti, I., Akhavan, M. and Rossi, F. (2023). The preferred location of coworking spaces in Italy: An empirical investigation in urban and peripheral areas. *European Planning Studies*, 31(3), pp. 467–489.

- Memud, M. and Tabibi, B. (2023). Effective design of co-working spaces to improve users' experience in Lagos State, Nigeria. *Art and Design Review*, 11(2), pp. 80–103. <https://doi.org/10.4236/adr.2023.112007>
- Müller, A. (2016). The digital nomad: Buzzword or research category? *Transnational Social Review*, 6(3), pp. 344–348.
- Muñoz, P. and Cohen, B. (2018). A compass for navigating sharing economy business models. *California Management Review*, 61(1), pp. 114–147.
- Netter, S., Pedersen, E. and Lüdeke-Freund, F. (2019). Sharing economy revisited: Towards a new framework for understanding sharing models. *Journal of Cleaner Production*, 221, pp. 224–233.
- Pavithra, R. (2024). A collaborative work environment: An in-depth analysis of coworking spaces. *UGC Care Group I Journal*, 54, pp. 95–104.
- Perera, W., Perera, B. and Jayasena, N. (2019). Adaptability of the shared workspace concept for office buildings in Sri Lanka. *Intelligent Buildings International*, 13(4), pp. 327–341. <https://doi.org/10.1080/17508975.2019.1588701>
- Piscicelli, L., Ludden, G. and Cooper, T. (2019). What makes a sustainable business model successful? An empirical comparison of two peer-to-peer goods-sharing platforms. *Journal of Cleaner Production*, 172, pp. 4580–4591.
- Racek, M. and Holenka, M. (2015). Coworking spaces in Slovakia. *Management Review*, 9(2), pp. 29–43.
- Suttiraksiri, S. (2017) *Consumer behaviour towards coworking space business*. Master's thesis, Mahidol University. Available at: <https://archive.cm.mahidol.ac.th/bitstream/123456789/1958/1/TP%20GM.010%202016.pdf>
- Tan, T. and Lau, K. (2021). Understanding users' and hosts' motives to co-working space: Case of Kuala Lumpur, Malaysia. *Open House International*, 46(1), pp. 81–95.
- Udoh, E., Ogar, B., Ema, I. and Samson, E. (2025). Assessment of forestry extension service delivery among rural farmers living around Awi Forest Reserve in Cross River State, Nigeria. *Journal of Applied Sciences and Environmental Management*, 29, pp.197–204.
- UNECE. (2022). *Sharing economy and its effects on housing markets*. Geneva: REM- UNECE reports.
- Vanichvatana, S., Varapark, N. and Poontirakul, P. (2017). Characteristics of co-working spaces in Bangkok, paper presented at the Second International Research Conference on Management and Business (IRCMB), 29 July, Bandung, Indonesia.
- Vlugt, J. (2022). *Coworking the way to sustainability: Motivations and influences on the adoption of a sustainable innovation amongst different age groups-the case of Space*. Master's thesis.
- Vogl, T. and Arkesteijn, M. (2025). Coworking space users: A literature review on characteristics, motivations and workplace preferences in urban and non-urban areas. *Journal of Corporate Real Estate*, 28(1), pp. 28–49.
- Weijss-Perrée, M., Van de Koeving, J., Appel-Meulenbroek, R. and Arentze, T. (2019). Analysing user preferences for co-working space characteristics. *Building Research and Information*, 47(5), pp. 534–548.
- Zhao, F., Prentice, C., Wallis, J., Patel, A. and Waxin, M. (2020). An integrative study of the implications of the rise of coworking spaces in smart cities. *Entrepreneurship and Sustainability Issues*, 8(2), pp. 467–486. [https://doi.org/10.9770/jesi.2020.8.2\(28\)](https://doi.org/10.9770/jesi.2020.8.2(28))



Individual Level Characteristics That Drive Awareness of Sustainability Features in Property Valuation: The Nigerian Experience

Adebola Olufunmilola Adeyemo^{1*} (<https://orcid.org/0009-0001-1076-2178>) and Cyril Ayodele Ajayi² (<https://orcid.org/0000-0002-0227-5994>)

¹Department of Estate Management, University of Ibadan, Ibadan, Nigeria

²Department of Estate Management, Obafemi Awolowo University, Ile-Ife, Nigeria

To cite this article: Adebola, O.A., and Cyril, A. A. (2026) Individual Level Characteristics that Drive Awareness of Sustainability Features in Property Valuation: The Nigerian Experience. *Journal of African Real Estate Research*, 11(1), pp. 60-77. DOI: 10.15641/jarer.v11i1.1585

Abstract

Persistent mispricing by property valuers has contributed to global economic instability. With increasing emphasis on sustainability in property markets, valuers face growing pressure to account for sustainability premiums in their assessments. However, valuers, particularly in developing markets like Nigeria, lack adequate knowledge to incorporate sustainability considerations into valuation practice. Focusing on valuers in Nigeria, called Estate Surveyors and Valuers (ESVs), this study investigates awareness of sustainability features and examines the influence of valuers' individual professional characteristics on this awareness. The target population comprises estate surveyors and valuers working in established real estate firms listed by the Nigerian Institution of Estate Surveyors and Valuers (NIESV). Respondents were drawn from professionals within 198 randomly selected firms, representing 50% of the national register, to ensure broad representation. Data on the respondents' educational and professional qualifications, designations, and genders were collected through structured questionnaires. The data were analysed using percentages and means to summarise valuers' professional characteristics and awareness levels, while a one-sample t-test and a Chi-square test were used to examine the relationships between professional characteristics and sustainability awareness. Findings revealed mean awareness scores above the benchmark of 3.0 on a 5-point Likert scale, with the highest for energy-efficient features (mean = 3.86) and the lowest for water-efficient features (mean = 3.40). Significant relationships ($p = 0.004-0.029$) were observed between awareness and variables such as education, gender, designation, and professional qualification. The study concludes that Nigerian ESVs demonstrate good awareness of sustainability features. However, awareness varies significantly among professionals, given their individual characteristics, highlighting the need for targeted capacity building to deepen the integration of sustainability in valuation practice.

Keywords: *Property Valuation, Sustainability features, Awareness, Individual professional characteristics, Estate Surveyors and Valuers*

*Corresponding author's email address: adebola.adeyemo@ui.ng.com

©2026 The Author(s). Published by UCT Library. This is an open-access article under the CC BY 4.0 license.
<https://creativecommons.org/licenses/by/4>

1. Introduction

Sustainability is defined as development that meets present needs without compromising the ability of future generations to meet theirs (Brundtland, 1987). It has become a central principle in the global real estate sector, which is a major contributor to energy consumption and greenhouse gas emissions. (Newell & Marzuki, 2022). In response, there is growing emphasis on sustainable property development, investment, and valuation (Ghosn, Warren-Myers & Candido, 2024). Within this context, property valuation plays a vital role. The process of estimating value increasingly demands that valuers understand how environmental, social, and governance (ESG) considerations influence property performance and market perception (Bradley, Sayce & Lewis, 2010; Lützkendorf & Lorenz, 2011; Doan et al., 2017; Neri, 2021; Pham, Doan, & Nguyen, 2021). Sustainability features, sometimes referred to as ‘green features’ or ‘green technologies’, include attributes such as energy efficiency, natural lighting, water and energy conservation, renewable energy integration, air quality and temperature control, and the use of sustainable materials (Ahmad, Thaheem & Anwar, 2016). Others include building quality, thermal comfort, carbon emissions reduction, recycling of construction materials, accessibility to transport, and social impact (Dell’Anna & Bottero, 2021). These features contribute not only to environmental goals but also to financial performance, as properties with strong sustainability credentials often attract higher rental growth and market premiums, commonly termed sustainability premiums (Adeyemo, 2024; MacAskill et al., 2021; Ibraeva et al., 2020; Facchrudin & Fachrudin, 2017).

In developed markets, professional standards and valuation frameworks now integrate these sustainability aspects through energy ratings, certification levels (e.g., LEED, BREEAM), and life-cycle cost assessments embedded in valuation reports (Royal Institution of Chartered Surveyors [RICS], 2014; Oladeji & Okoro, 2024). This progression reflects broader market recognition of the value implications of sustainability features, supported by expanding datasets and clearer market signals.

Measuring the impact of these features requires valuation approaches that move beyond traditional methods. Conventional valuation techniques such as comparison, cost, and income are designed for tangible and explicit features such as size, number of rooms, building age, and structural condition. (Wong *et al.*, 2020) However, sustainability attributes are often implicit, and their value impact is indirect, harder to quantify, and influenced by market awareness (Warren-Myers, 2016). This situation has prompted the adoption of advanced analytical models such as hedonic pricing, spatial econometric models, and life-cycle cost analysis, particularly in developed economies with extensive datasets and transparent markets (Sanchez-Ollero, 2014; Abidoye & Chan, 2017; Hindagoda & Gunawardhana, 2020). For instance, Sohn et al. (2020) employed spatial models to examine the capitalisation effects of flood mitigation infrastructure, such as detention and retention ponds, which contribute to flood resilience, a

critical dimension of environmental sustainability. While these ponds primarily serve as flood-control measures, they support sustainability by enhancing urban resilience, protecting properties, and promoting sustainable land and water management.

The growing global recognition of sustainability has led professional bodies, including the Royal Institution of Chartered Surveyors (RICS, 2024), to issue valuation guidelines that encourage explicit inclusion of ESG and sustainability indicators in valuation reports. Similar progress has been observed in countries such as the United Kingdom, Australia, and the United States, where valuation frameworks now include sustainability checklists and disclosure requirements (Warren-Myers, 2022). Yet, even in these markets, challenges persist as valuers face data limitations, methodological uncertainty, and client resistance (Thanh Le & Warren-Myers, 2019).

In developing countries, these challenges are more pronounced. In Nigeria, the Estate Surveyors and Valuers Registration Act of 1975 legally recognises Estate Surveyors and Valuers (ESVs) as the only professionals authorised to undertake property valuation. Explicit attributes, such as the number of bedrooms, floors, plot size, or age, are directly measurable using traditional valuation methods (Abidoye & Chan, 2016). In contrast, implicit attributes, including sustainability and environmental performance, require interpretive judgement, advanced modelling, and a clear understanding of market perception (Warren-Myers, 2016). Research across Nigeria and comparable markets indicates that valuation reports continue to emphasise traditional determinants, such as location, structural condition, and comparable sales, while sustainability indicators are seldom documented (Babawale & Oyalowo, 2011; Abidoye & Chan, 2017; Adeyemo, 2024). Factors responsible for this include limited awareness and technical knowledge, weak regulatory frameworks, and market unreadiness for investment in sustainability (Adeyemo & Ajayi, 2025). Among these barriers, awareness stands out as a fundamental determinant. (Essiz, Yurteri, Mandrik, & Senyuz, 2023; Warren-Myers, 2023).

Research has shown that awareness among professionals is influenced by several professional characteristics. Marques et al. (2024) found that age, years of experience, and professional training shape valuers' perception of sustainability benefits. Similarly, those with limited education or access to continuing professional development are less likely to incorporate sustainability considerations into their valuation work (Warren-Myers 2023). Empirical research examining valuers' awareness of sustainability and its incorporation into valuation practice in Nigeria remains sparse, highlighting a critical area for further study.

Given these realities, this study examines the individual professional characteristics of Estate Surveyors and Valuers in Nigeria that shape their awareness of sustainability. Enhanced awareness will enable valuers to pursue the requisite knowledge to produce more accurate and globally aligned valuations, promote green investment, and strengthen professional competitiveness.

2. Literature review

Sustainability in real estate refers to practices that promote environmental stewardship, economic efficiency, and social well-being across a building's life cycle. It involves integrating features such as renewable energy systems, water conservation technologies, thermal comfort, and material recycling, which collectively enhance building performance and mitigate environmental impact. Sustainability features in buildings have been classified in various ways across the literature. Ahmad et al. (2016) group them broadly as green technologies, including natural lighting, control technologies, energy and water conservation, renewable energy, and air-quality and temperature-control systems. Rating tools such as LEED and Malaysia's GBI offer simplified categories, including energy efficiency, indoor environmental quality, water efficiency, sustainable site planning, resource management, and innovation. Similarly, the IMMOVALUE (2010) framework highlights features such as building and thermal quality, energy efficiency, carbon-emission reduction, material recycling, accessibility, and social impact.

Energy efficiency relates to practices that reduce energy demand through design, insulation, natural lighting, and renewable technologies. Indoor air quality concerns ventilation, lighting, and the reduction of pollutants that affect occupant health. Sustainable site planning emphasises accessibility, erosion control, and integration with essential services. Water efficiency promotes reduced water use through rainwater harvesting, recycling, and low-flow fittings. Economy and resource management involve using durable materials, efficient design layouts, and food gardening. Waste management covers the control and recycling of waste, noise and fumes mitigation, wastewater treatment, and reduces reliance on generators.

Studies across developed markets reveal that embracing sustainability can enhance property performance and market value. Empirical evidence from Europe, North America, and parts of Asia (Dell'Anna & Bottero, 2021; MacAskill et al., 2021) consistently demonstrates that properties with green certifications or sustainability attributes attract rent and price premiums. Consequently, professional valuation standards, including those of the Royal Institution of Chartered Surveyors (RICS) and the International Valuation Standards Council (IVSC), now emphasise the integration of environmental, social, and governance (ESG) considerations into valuation practice (Hossain et al., 2023). Yet, translating these sustainability metrics into measurable value indicators remains challenging, even in mature markets, due to data limitations and methodological inconsistencies (Thanh Le & Warren-Myers, 2019; Jayasiri & Wickramaarachchi, 2022).

In developing economies, the conversation is still emerging. Scholars such as Michl, Lorenz, Lützkendorf, & Sayce (2016) and Babas, Auwal, & Gambo (2024) note that valuers in these contexts often face unique institutional, market, and knowledge constraints that limit the integration of sustainability into valuation practice. Research from countries such as South

Africa, Malaysia, and Indonesia highlights similar issues, including low awareness, limited training, and a lack of market evidence to justify sustainability premiums (Fachrudin & Fachrudin, 2017; Tauringana, 2021). These findings emphasise the need to understand how professional education, policy frameworks, and market dynamics influence valuers' responses to sustainability in emerging markets.

In Nigeria, a few studies have begun to address this knowledge gap. Babawale and Oyalowo (2011) observe that while Nigerian valuers acknowledge the importance of sustainability, most lack the technical capacity to assess its impact on property value. The study reveals that valuation practice continues to rely on traditional methods that overlook sustainability premiums, resulting in potential undervaluation of sustainable buildings. Similarly, Ibiyemi et al. (2019) identify barriers such as inadequate training, poor institutional support, and low awareness as major constraints to integrating sustainability into valuation practice. More recently, Adeyemo and Ajayi (2025) identified the lack of regulatory enforcement and market unreadiness for sustainable investment as major barriers to sustainability valuation in Nigeria. These findings highlight that weak institutional support reduces valuers' motivation to acquire sustainability knowledge, while low market demand limits the relevance of such expertise.

Emerging global evidence further suggests that valuers' awareness of sustainability is not only shaped by institutional and market factors but also by professional characteristics. Variables such as age, education, gender, professional qualification, and years of experience have been shown to influence valuers' knowledge and attitudes toward sustainability (Marques et al., 2024; Warren-Myers, 2023; Hossain et al., 2023; Lejárraga-García et al., 2024; Foroudi et al., 2025). This suggests that valuers with higher levels of education or access to continuous professional development are more likely to understand and apply sustainability concepts in their work.

In the Nigerian context, empirical studies linking valuers' professional characteristics to their sustainability awareness are scarce. Most previous works have emphasised general awareness levels or methodological barriers, overlooking the human and professional dimensions that may drive sustainable valuation practice. This study, therefore, addresses this critical gap by examining how the professional characteristics of Nigerian Estate Surveyors and Valuers (ESVs) influence their awareness of sustainability features in property valuation. Drawing from these established classifications and adapting them to the realities of developing markets, this study operationalises sustainability features under six categories. These are: Energy Efficiency (EE), Indoor Air Quality (IAQ), Innovation/Sustainable Site Planning (IS), Water Efficiency (WE), Economy and Materials Conservation (E), and Waste Management (WM). This Nigerian study, within the global discourse, contributes not only to local policy and professional development but also enriches international understanding of how contextual and individual-level characteristics shape the adoption of sustainable valuation practices in emerging markets.

3. Data and methods

This study employed a quantitative research design using primary data obtained through structured questionnaires administered to registered Estate Surveyors and Valuers (ESVs) in Lagos State, Nigeria. This target population comprises professionals who are licensed by the Estate Surveyors and Valuers Registration Board of Nigeria (ESVARBON), the statutory body responsible for regulating valuation and estate management practice in the country. Nigeria has over 1,400 registered valuation firms, with approximately 35% located in Lagos, reflecting the state's economic and real estate dominance (NIESV Directory, 2024).

The instrument collected data on respondents' professional characteristics, such as gender, qualification, designation, and years of experience, as well as their awareness of sustainability features in valuation practice. The sustainability features were grouped into six categories: energy efficiency (EE), water efficiency (WE), innovation and site planning (IS), economy and materials conservation (E), waste management (WM), and indoor air quality (IAQ).

A 5-point Likert scale was employed for most items because of its simplicity and reliability in measuring attitudes and perceptions. Respondents rated their level of awareness on a scale from 1 (very low awareness) to 5 (very high awareness). Numerical scores were assigned to each response, and mean values were computed to determine the overall awareness level for each sustainability category. A mean score of **3.0** was adopted as the benchmark, representing a neutral or moderate level of awareness; values above 3.0 indicate high awareness, and those below 3.0 suggest low awareness. This approach aligns with prior valuation studies (Ibiyemi et al., 2019; Warren-Myers, 2022) that applied similar thresholds to interpret sustainability awareness among property professionals.

. Using simple random sampling, 198 ESVs, representing almost 50% of registered practitioners in Lagos, were selected to ensure equal representation and minimise selection bias. A total of 118 valid responses were received, representing a response rate of 60%, which is considered satisfactory for survey research.

Data were analysed using descriptive and inferential statistics. Descriptive statistics summarised categorical variables through percentages and mean scores to reveal dominant characteristics and awareness levels among estate surveyors and valuers. Inferential analysis included a one-sample t-test comparing valuers' mean awareness ratings of sustainability features against a benchmark of 3.0, representing moderate or baseline awareness; values above 3.0 indicate higher-than-average awareness, while those below 3.0 suggest low awareness. A chi-square test further examined relationships between professional characteristics and awareness levels. These analyses provided empirical insight into how professional characteristics influence sustainability awareness in valuation practice in Lagos State, Nigeria.

4. Results and discussions

This section presents the results of the analysis of data collected during the study. In the first place, we present the results of the individual professional characteristics of ESVs, their level of awareness of sustainability features and the relationship between their level of awareness and their individual socio-economic characteristics.

4.1 Valuers' professional characteristics

This section examines the characteristics of the valuers who participated in the study. Understanding these characteristics is crucial, as they provide insight into the professional background, experience, and competencies that may influence the level of awareness and application of sustainability principles in real estate valuation. Essentially, the analysis lays the groundwork for interpreting variations in sustainability awareness in terms of human and professional factors.

Data on respondents' professional characteristics covered key variables such as gender, designation, and academic and professional qualifications. The study focused on these few characteristics to maintain focus on practice-related variables.

The results presented in Table 1 reveal that 47% of the respondents are owners or principals of their valuation firms, indicating that nearly half of the participants possessed informed perspectives derived from both managerial and professional valuation experience within the sample.

Table 1: Professional Characteristics of Individuals in Selected ESV Firms

Item		Frequency	Percentage
Designation	Principal Partner	54	47
	Associate	41	35.7
	Head of Valuation	5	4.3
	Others	13	11.3
	No Response	2	1.7
	Total	115	100
Gender	Male	101	87.8
	Female	14	12.2
	Total	115	100
Professional Qualification	FNIVS	18	15.7
	ANIVS	82	71.3
	Others	10	8.7

Educational Qualification	No Response	5	4.3
	Total	115	100
	PhD	7	6.1
	Masters	40	34.8
	BSc	24	20.9
	Btech	4	3.5
	HND	33	28.7
	PGD	6	5.2
	No Response	1	0.9
	Total	115	100

A 71.3% majority belong to the Membership cadre of the Nigerian Institution of Estate Surveyors and Valuers (NIESV), signifying active membership and professional recognition. Furthermore, 34% of respondents held at least a Master's degree, suggesting that most participants have advanced academic exposure and the requisite intellectual capacity to engage meaningfully with sustainability-related valuation concepts.

4.2. Level of awareness of the Estate Surveyors and Valuers (ESVs) of sustainability features

This section evaluates the level of awareness of Estate Surveyors and Valuers (ESVs) regarding key sustainability features (SFs) relevant to real estate valuation practice. Assessing this awareness is central to the study's aim, as valuers' understanding of sustainability directly influences their ability to incorporate such features into market assessments and value judgements. The responses were analysed using mean ratings to determine relative levels of awareness across feature categories, and a one-sample t-test was conducted to assess whether the observed mean values significantly differed from the neutral benchmark of 3.0. Statistical significance at $p < 0.05$ indicates that respondents' awareness levels are meaningfully higher than average, rather than due to random variation.

The analysis in Table 2 reveals valuers' awareness levels across individual sustainability variables before aggregation into the six major categories. For Energy Efficiency, valuers show high awareness of features such as LED lighting (mean = 4.24), natural lighting (4.09), and solar panels (4.10), all significantly above the benchmark value of 3.0. Awareness of motion-sensitive switches is lower (3.29) but remains statistically significant. These item scores collectively produced a high aggregate mean of 3.86, indicating strong awareness of energy-related sustainability practices. For Water Efficiency, awareness varies considerably. While valuers are highly aware of water-saving bathroom fittings (3.83), awareness of rainwater harvesting (3.05) and drainage systems for gardening (3.17) is comparatively low and

statistically insignificant. The aggregate mean of 3.34, therefore, reflects moderate awareness driven largely by familiarity with conventional water-saving devices.

Under Innovation and Site Planning, valuers demonstrate strong awareness of space efficiency (4.11) and access to public transportation (4.15) but low awareness of green certification (2.68), which falls significantly below the benchmark. The aggregate mean of 3.65 captures this mixed pattern: high awareness of practical planning features but limited exposure to certification-based metrics. For Economy and Materials Conservation, valuers are familiar with durable materials (4.12) and open-plan designs (3.48), whereas awareness of food gardening (2.86) is low and not statistically significant. These variations produce a moderate aggregate mean of 3.53. Awareness of Waste Management features is generally high, with strong recognition of reduced-generator use (3.92) and non-burning waste-disposal methods (3.99). Moderate awareness is observed for wastewater treatment (3.30) and recycling bins (3.27), resulting in an aggregate mean of 3.56. For Indoor Air Quality, all variables, including cross-ventilation (3.86), effective exhaust vents (3.74), and fire extinguishers (3.98), show high and statistically significant awareness, yielding an aggregate mean of 3.75.

Overall, the aggregate means were computed as the average of the individual item scores within each sustainability category, enabling clearer interpretation of valuers' general awareness patterns. The results show that valuers are most aware of tangible, performance-based sustainability features, such as energy use, ventilation, and waste control.

Conversely, green certification and food gardening record lower mean ratings (2.86), indicating limited awareness among valuers. This may be because such features are relatively new and uncommon in the Nigerian property market, where sustainable development is still emerging. Most valuers are more familiar with conventional building elements than with advanced green standards or landscape-based sustainability measures. The low awareness also reflects the limited availability of certified green buildings and the absence of formal training or regulatory emphasis on these sustainability metrics in local valuation practice.

These findings suggest that valuers in Lagos focus more on practical sustainability elements, such as energy efficiency and indoor air quality, because they are visible and directly influence property performance. In contrast, certification-based features are less recognised, likely due to their limited application and the absence of regulatory enforcement in Nigeria. This pattern indicates that sustainable valuation practice is still evolving, as valuers prioritise tangible building attributes over formal green standards. Similar trends have been observed in earlier studies, where valuation reports in developing markets continue to rely mainly on conventional determinants (Babawale & Oyalowo, 2011; Abidoye & Chan, 2017). The result also provides a benchmark for professional development initiatives aimed at deepening valuers' knowledge and improving the integration of sustainability criteria into valuation reports.

Further analysis of the mean ratings in Table 2 reveals that water-efficiency features have the lowest awareness level among all sustainability categories assessed. This finding is particularly striking given that water scarcity and management are critical issues in developing economies like Nigeria. The low awareness of water-efficiency features among valuers may be linked to the way water is supplied and managed in many urban areas in Nigeria. Because most properties rely on privately drilled boreholes or wells rather than regulated municipal systems, building owners tend to prioritise access to water rather than conservation. Consequently, features such as water recycling, rainwater harvesting, or low-flow fixtures are seldom installed, publicised, or considered essential. The widespread practice of each building sinking its own borehole, often with minimal regulatory oversight, reinforces the perception that water is abundant once a borehole is in place, reducing the incentive to adopt efficiency technologies. Such practice probably limits valuers' exposure to water-efficiency innovations and contributes to the low awareness recorded.

Table 2: One-sample t-test indicating level of awareness of ESVs

	Descriptives	One-Sample Test (Test Value = 3.00)	
	Mean		p-value
Energy Efficiency			
Solar Panel	4.1	11.857	0
Motion Sensitive Switches	3.29	2.246	0.027
Led Light Bulbs and other low energy lighting	4.24	12.431	0
Energy Star Appliances	3.48	4.175	0
Natural lighting	4.09	9.912	0
<i>Aggregate</i>	3.86	11.347	0
Water Efficiency			
Rain water harvesting	3.05	0.377	0.707
Water saving facilities in toilet and bathroom	3.83	7.979	0
Drains to channel water for gardening	3.17	1.395	0.166
<i>Aggregate</i>	3.34	3.912	0
Innovation/Site Planning			
Easy access to public transportation	4.15	10.686	0
Space efficiency	4.11	12.754	0
Green areas	3.6	5.102	0
Adaptability of building for mixed uses	3.74	7.405	0
Green Certification	2.68	-2.584	0.011
<i>Aggregate</i>	3.65	8.012	0

Economy and Material Conservation					
Use of durable materials	4.12	11.987			0
Food gardening (subsistence farming)	2.86	-1.268			0.207
Storey house	3.72	6.675			0
Reduction of walls and doors through open plans	3.48	4.25			0
Aggregate	3.53	6.487			0
Waste Management					
Control of pollution (noise , fumes, wastes etc)	3.74	6.761			0
Treatment of waste water	3.3	2.556			0.012
Waste recycle bin for plastics	3.27	2.122			0.036
Waste disposal not burning	3.99	9.373			0
Reduced use of generators	3.92	9.441			0
Aggregate	3.56	6.741			0
Indoor Air Quality					
Low Fence	3.56	5.056			0
Cross Ventilation for reduced air conditioning	3.86	8.457			0
Effective exhaust and air vent	3.74	6.713			0
Availability of fire extinguishers	3.98	8.271			0
Aggregate	3.75	8.151			0

Items with p-values less than 0.05 are significant.

This pattern corroborates the findings of an earlier study by Adeyemo (2024), who observed that water efficiency exerted the least influence on property valuation decisions in Lagos, Nigeria. The implication is that the depth of valuers' awareness of specific sustainability features directly affects the extent to which those features are reflected in their valuation assessments. Hence, improving professional knowledge and exposure to water conservation measures could enhance the integration of sustainability criteria in future valuation practice.

4.3 The nexus between individual valuers' professional characteristics and awareness of sustainability features

This section examines the relationship between individual valuers' professional characteristics, including educational qualification, gender, professional qualification, and designation, and their level of awareness of sustainability features (SFs) in property valuation. Establishing this relationship is central to the study's aim of identifying the valuers' professional characteristics that shape their awareness and consequent integration of sustainability principles in valuation practice. The analysis was conducted using the Chi-square **test** to assess how these characteristics influence awareness across sustainability dimensions, including energy efficiency (EE), water efficiency (WE), indoor air quality (IAQ), and innovation and site planning (IS).

The results in Table 3 revealed education as the most influential characteristic driving awareness across multiple sustainability dimensions. Educational qualification shows a strong positive association with awareness of energy efficiency ($p < 0.01$) and water efficiency ($p < 0.05$) (Table 3). This indicates that valuers with higher academic qualifications, particularly those with postgraduate degrees, are more conversant with sustainability concepts, likely due to exposure through academic research, professional training, and continuing education. Their deeper understanding of building performance and environmental management translates into higher sensitivity to sustainability features that affect property value and operational efficiency. These findings align with evidence from more developed markets, where valuers' education and professional qualifications consistently influence their awareness of sustainability. Studies such as Marques et al. (2024), Warren-Myers (2023), Hossain et al. (2023), Lejárraga-García et al. (2024), and Foroudi et al. (2025) show that valuers with greater academic training or ongoing professional development are more likely to understand and apply sustainability concepts. This global trend reinforces the present study's result that education is a key driver of sustainability awareness.

The analysis also indicates that gender influences awareness levels, with male valuers showing higher awareness of energy efficiency features than female valuers. This difference may partly reflect the male-dominated composition of the sample and broader professional trends. However, it is also possible, though speculative, that cultural and organisational practices in Nigeria assign more technically demanding tasks, such as large-scale commercial valuations and energy audits, to male valuers, which could increase their exposure to sustainability-related knowledge. This discussion reinforces the importance of providing equitable access to professional development and sustainability training to ensure awareness gaps are not reinforced by cultural or institutional norms.

Table 3: Nexus between Profile of the Respondents/Firms and the Level of Awareness of SF

Profile	EE		WE		IS		E		WM		IA Q	
	Df	Asym p. Sig.	Df	Asym p. Sig	Df	Asym p. Sig	df	Asym p. Sig	df	Asym p. Sig.	df	Asym p. Sig.
		(2-sided)		(2-sided)		(2-sided)		(2-sided)		(2-sided)		
Designation	72	0.295	36	0.401	60	0.025	45	0.175	69	0.424	69	0.219
Professional												
Qualification	46	0.768	24	0.1	38	0.805	28	0.556	44	0.706	46	0.029
Educational	120	0.004	60	0.049	100	0.28	75	0.277	115	0.678	110	0.092
Gender	24	0.005	12	0.473	20	0.658	15	0.379	23	0.427	23	0.488
Year of registration with ESVARBO N	69	0.654	33	0.792	54	0.66	42	0.677	69	0.133	66	0.436
Location	24	0.772	12	0.197	20	0.375	15	0.555	23	0.475	23	0.525
Year of Establishment	69	0.87	33	0.818	57	0.827	42	0.774	66	0.297	69	0.403

Furthermore, the professional qualification of valuers was found to be significantly associated with awareness of indoor air quality (IAQ). IAQ is a technical sustainability feature requiring specialised knowledge of ventilation systems, thermal comfort, and their impact on property performance and market value. The result suggests that valuers with higher professional qualifications possess the technical competence to understand how IAQ influences both the functional and economic performance of buildings.

Similarly, designation within the firm was significantly related to awareness of innovation and site planning (IS) features. This pattern indicates that decision-making authority, within a firm, influences how sustainability innovations are recognised and adopted. Senior partners and firm

owners, who represent nearly half of the study's respondents, tend to have greater exposure to emerging market trends, client demands, and regulatory expectations, positioning them as key gatekeepers in determining whether new sustainability practices are integrated into valuation assignments. This hierarchical influence also highlights the role of leadership in shaping firm-level commitment to sustainable valuation practices in Lagos, Nigeria. This finding is novel in the Nigerian valuation context, as prior studies have rarely examined how firm leadership influences sustainability awareness. Its plausibility is supported by global evidence indicating that professional roles and leadership positions shape engagement with ESG and sustainability frameworks (Marques et al., 2024; Warren-Myers, 2023; Hossain et al., 2023). Thus, leadership within firms may serve as a key gatekeeper for integrating sustainability innovations into valuation practice. The result also emphasises the need for equitable access to sustainability-related capacity building across all professional levels to enhance firm-wide adoption of sustainable valuation practices in Lagos, Nigeria.

Taken together, the results confirm that individual valuers' characteristics significantly shape awareness of sustainability features. Education, professional qualification, designation, and gender all contribute to awareness, with education emerging as the strongest predictor. Valuers with advanced training and professional standing exhibit higher awareness of technical and operational sustainability features, while a leadership position determines the extent to which such awareness translates into firm-level action.

5. Conclusion

This study investigates valuers' awareness of sustainability features and explores how their individual professional characteristics influence that awareness. The study reveals that Estate Surveyors and Valuers (ESVs) in Lagos demonstrate a moderate to high level of awareness of sustainability features, particularly those related to operational efficiency and building performance, such as energy use and indoor air quality. However, awareness of certification-based or formally standardised aspects of sustainability remains limited. This pattern reflects the evolving nature of sustainable valuation practice in Nigeria, where functional features are more readily understood and applied than formal sustainability standards. Furthermore, the study establishes that the individual characteristics of ESVs, specifically their education, gender, professional qualification, and designation, significantly influence their level of sustainability awareness. These findings collectively highlight that both professional exposure and personal attributes shape valuers' understanding of sustainability in property valuation, underscoring the need for targeted professional development to deepen competence in formal sustainability assessment and reporting.

Valuers with higher educational qualifications exhibit greater awareness of energy- and water-efficient features, while male ESVs demonstrate higher awareness of energy efficiency than female ESVs. Similarly, professional qualification and designation are linked to greater understanding of indoor air quality (IAQ), suggesting that advanced technical competence and

senior professional status promote recognition of complex sustainability attributes in valuation practice.

Overall, the findings show that ESVs in Nigeria have a moderate to high level of awareness of sustainability features, though awareness remains low for green certification and food gardening. This highlights the need for targeted professional training and curriculum review to strengthen valuers' capacity. In addition, government policies and incentives should encourage the recognition and integration of certified sustainable features in property valuation practice across Nigeria. The link between education and awareness of energy and water efficiency highlights the need for academic institutions and professional bodies to revise curricula and strengthen continuing professional development (CPD) programmes that emphasise practical sustainability assessment skills.

Observed gender differences in awareness should be interpreted cautiously, as the sample includes a higher proportion of male valuers. Nonetheless, the pattern suggests the potential value of inclusive professional development and mentorship programmes to enhance female participation and leadership in sustainability-focused valuation, ensuring equitable access to knowledge and capacity-building opportunities across genders. Since professional qualification and designation correlate with awareness of indoor air quality (IAQ), institutions such as the Nigerian Institution of Estate Surveyors and Valuers (NIESV) should incorporate sustainability metrics into professional examinations and licensure frameworks, ensuring consistent consideration of sustainability in valuation practice. Such measures would align Nigerian valuation standards with global ESG benchmarks and support progress toward Sustainable Development Goal 11 (Sustainable Cities and Communities).

A key limitation of this study is its focus on a few selected professional characteristics that drive this awareness. Future research could also examine other socio-economic characteristics, such as age, religion, or cultural background, to determine whether these factors influence valuers' awareness and integration of sustainability features in valuation practice. Understanding these influences would help design more targeted professional development programmes and policies to strengthen sustainable valuation practices. This is not only relevant in Nigeria but also in other developing and emerging markets that face similar challenges in integrating sustainability into valuation practice.

6. References

- Abidoye, R. B., & Chan, A. P. C. (2016a). Critical determinants of residential property value: Professionals' perspective. *Journal of Facilities Management*, 14(3), 283–300.
- Abidoye, R. B., & Chan, A. P. C. (2017). Achieving property valuation accuracy in developing countries: The implication of data source. Retrieved from <https://www.emeraldinsight.com/1753-8270.htm>

- Adeyemo, A. (2024). Valuers' perception of the relative influence of sustainability features in Nigerian property valuation. *Lagos Journal of Environmental Studies*, 13(1), 43–54.
- Adeyemo, A., & Ajayi, C. A. (2025). Factors influencing the incorporation of sustainability into property valuation in developing markets: Evidence from Lagos, Nigeria. *Journal of the Nigerian Institution of Estate Surveyors and Valuers*, 46(1), June.
- Ahmad, T., Thaheem, M. J., & Anwar, A. (2016). Developing a green-building design approach by selective use of systems and techniques. *Architectural Engineering and Design Management*, 12(1), 29–50.
- Babas, L. Y., Auwal, U., & Gambo, Y. L. (2024). Integrating sustainability in property valuation: A Nigerian perspective. *ATBU Journal of Environmental Technology*, 17(2), 92-108.
- Babawale, G., & Oyalowo, B. (2011). Incorporating sustainability into real estate valuation: The perception of Nigerian valuers. *Journal of Sustainable Development*, 4(4).
- Bradley, J. F., Sayce, S., & Lewis, A. (2010). Sustainability and built environment professionals: A shifting paradigm. In *Sustainability Education* (pp. 257-272). Routledge.
- Brundtland, G. H. (1987). Our common future world commission on environment and development. Dell'Anna, F., & Bottero, M. (2021). Green premium in buildings: Evidence from the real estate market of Singapore. *Journal of Cleaner Production*, 286, 125327.
- Dell'Anna, F., & Bottero, M. (2021). Green premium in buildings: Evidence from the real estate market of Singapore. *Journal of Cleaner Production*, 286, 125327.
- Doan, D. T., Ghaffarianhoseini, A., Naismith, N., Zhang, T., Ghaffarianhoseini, A., and Tookey, J. (2017). A critical comparison of green building rating systems. *Building and Environment*, 123, 243–260. doi: 10.1016/j.buildenv.2017.07.007
- Essiz, O., Yurteri, S., Mandrik, C., & Senyuz, A. (2023). Exploring the value-action gap in green consumption: roles of risk aversion, subjective knowledge, and gender differences. *Journal of Global Marketing*, 36(1), 67-92.
- Fachrudin, K. A., & Fachrudin, H. T. (2017, March). The effect of green home, green behavior, and livability on the financial incentive in Medan City, Indonesia. In *IOP Conference Series: Materials Science and Engineering*, 180(1). IOP Publishing.
- Foroudi, P., Marvi, R., Cuomo, M. T., & D'Amato, A. (2025). Sustainable Development Goals in a regional context: conceptualising, measuring and managing residents' perceptions. *Regional Studies*, 59(1), 2373871.
- Ghosn, C., Warren-Myers, G., & Candido, C. (2024). Mapping the International Valuation Standards ESG criteria and sustainability rating tools adopted at scale by the Australian commercial real estate market. *Journal of Property Investment & Finance*, 42(5), 494-523.

- Hindagoda, W. T. D., & Gunawardhana, T. (2020). Incorporating sustainable building features into property valuation: A review. In *Proceedings of International Conference on Real Estate Management and Valuation*, 37(1), 2–16.
- Hossain, S. M., Van De Wetering, J., Devaney, S., & Sayce, S. (2023). UK commercial real estate valuation practice: Does it now build in sustainability considerations? *Journal of Property Investment & Finance*, 41(4), 406–428. <https://doi.org/10.1108/jpif-11-2022-0083>
- Ibiyemi, A. O., Adnan, Y. M., Daud, N. M., & Piaw, C. Y. (2019). The relationships between valuers' support systems for capturing property sustainability in Nigeria and their knowledge perceptions. *Property Management*, 37(1), 2-16.
- Ibraeva, A., de Almeida Correia, G. H., Silva, C., & Antunes, A. P. (2020). Transit-oriented development: A review of research achievements and challenges. *Transportation Research Part A: Policy and Practice*, 132, 110-130.
- IMMOVALUE. (2010). *Summary report*. Retrieved from <http://www.immvalue.org/pdf/immvalue%20result%20oriented%20report.pdf>
- Jayasiri, K. G. K. & Wickramaarachchi, N. C. (2022). Application of Green Features in Property Valuation in Sri Lanka: Perspectives of Professional Valuers. In *Proceedings of International Conference on Real Estate Management and Valuation*. 6 <https://doi.org/10.31357/icremv.v6.6226>
- Lejárraga-García, A. M., Ortiz-Martínez, E., & Marín-Hernández, S. (2024). Accounting graduates' perceptions on sustainability. *Social Responsibility Journal*, 20(8), 1467-1488.
- Lützkendorf, T., and Lorenz, D. (2011). Capturing sustainability-related information for property valuation. *Building Research & Information*, 39(3), 256-273.
- MacAskill, S., Roca, E., Liu, B., Stewart, R. A., & Sahin, O. (2021). Is there a green premium in the green bond market? Systematic literature review revealing premium determinants. *Journal of Cleaner Production*, 280, 124491.
- Marques, A., Januário, J. F., & Cruz, C. O. (2024). Sustainability certifications in real estate: Value and perception. *Buildings*, 14(12), 3823.
- Michl, P., Lorenz, D., Lützkendorf, T., & Sayce, S. (2016). Reflecting sustainability in property valuation—a progress report. *Journal of Property Investment & Finance*, 34(6), 552-577.
- Neri, S. (2021). Environmental, social and governance (ESG) and integrated reporting. In *Global challenges to CSR and sustainable development: Root causes and evidence from case studies* (pp. 293-302). Cham: Springer International Publishing.
- Newell, G., & Marzuki, M. J. (2022). The increasing importance of environmental sustainability in global real estate investment markets. *Journal of Property Investment & Finance*, 40(4), 411–429.
- Oladeji, J., & Okoro, C. (2024). Green building certification in South Africa: Evaluating adoption, greenwashing and location clusters trends. *Journal of African Real Estate Research*, 9(2), 140-165.

- Pham, D. C., Do, T. N. A., Doan, T. N., Nguyen, T. X. H., & Pham, T. K. Y. (2021). The impact of sustainability practices on financial performance: empirical evidence from Sweden. *Cogent Business & Management*, 8(1), 1912526.
- RICS (2014), *RICS Valuation- Professional Standards*, Royal Institution of Chartered Surveyors, London
- Royal Institution of Chartered Surveyors. (2024). *ESG and valuation*. RICS. Retrieved from <https://www.rics.org/>
- Sánchez-Ollero, J. L., García-Pozo, A., & Marchante-Mera, A. (2014). How does respect for the environment affect final prices in the hospitality sector? A hedonic pricing approach. *Cornell Hospitality Quarterly*, 55(1), 31–39.
- Sohn, W., Kim, H. W., Kim, J. H., & Li, M. H. (2020). The capitalized amenity of green infrastructure in single-family housing values: An application of the spatial hedonic pricing method. *Urban Forestry & Urban Greening*, 49, 126643.
- Tauringana, V. (2021). Sustainability reporting challenges in developing countries: towards management perceptions research evidence-based practices. *Journal of Accounting in Emerging Economies*, 11(2), 194-215.
- Thanh Le, T., & Warren-Myers, G. (2019). An examination of sustainability reporting in valuation practice: A case study of Melbourne, Australia. *Property Management*, 37(1), 136–153.
- Warren-Myers, G. (2016). Sustainability evolution in the Australian property market: Examining valuers' comprehension, knowledge and value. *Journal of Property Investment & Finance*, 34(6), 578–601. <https://doi.org/10.1108/jpif-04-2016-0025>
- Warren-Myers, G. (2022). Valuing sustainability part 1: A review of sustainability consideration in valuation practice. *Journal of Property Investment & Finance*, 40(4), 398–410.
- Warren-Myers, G. (2023). Valuing sustainability part 2: Australian valuers' perception of sustainability in valuation practice. *Journal of Property Investment & Finance*, 41(4), 351–379. <https://doi.org/10.1108/jpif-11-2021-0092>
- Wong, S. Y., Susilawati, C., Miller, W., & Mardiasmo, D. (2020). Perspectives of Australian property practitioners on sustainability features in residential property. *Journal of Housing and the Built Environment*, 35 (3), 783-805



Comparative Performance of Selected Machine Learning Algorithms in Predicting Residential Property Price Across Sub-Markets in Lagos Metropolis

Thomas A. Ashaolu¹ (<https://orcid.org/0000-0003-4906-4550>), Amos O. Adewusi² (<https://orcid.org/0000-0002-0194-069X>) and Abiodun N. Oyelakin² (<https://orcid.org/0000-0002-0194-069X>)

¹ Department of Estate Management, Federal University of Technology, Ilaro, Nigeria

² Department of Estate Management, Federal University of Technology, Akure, Nigeria

To cite this article: Ashaolu, T.A., Adewusi, A.O. and Oyelakin, A.N. (2026) Comparative Performance of Selected Machine Learning Algorithms in Predicting Residential Property Price Across Sub-Markets in Lagos Metropolis, *Journal of African Real Estate Research*, 11(1), pp. 78-100. DOI: 10.15641/jarer.v11i1.2029

Abstract

Traditional techniques of property valuation are increasingly criticised for their subjectivity, vulnerability to data insufficiency, and other discrepancies, thereby fuelling a methodological shift towards automated and data-driven valuation frameworks. Hence, this study explores three selected machine learning algorithms - Random Forest (RF), Bayesian Ridge (BR), and LASSO Regression – in estimating residential property prices across three distinct sub-markets within Lagos Metropolis. The study seeks to identify the algorithm that achieves the highest predictive precision and to examine the extent to which sub-market heterogeneity affects model reliability. The dataset utilised for the study comprised 469 residential property transactions concluded over the years by thirteen registered Estate Surveying and Valuation firms operating within the Metropolis. The results revealed varied performance across the sub-markets, with Random Forest emerging as the most efficient model, demonstrating the model's robustness and adaptability to nonlinear property data and spatial variability. The Bayesian Ridge Regression model produced moderate results, performing reliably in sub-markets characterised by stable property structures, while LASSO Regression yielded the least accuracy, owing to its sensitivity to linear assumptions and coefficient shrinkage. By situating algorithmic comparison within a spatially segmented urban framework, this research contributes to the development of location-sensitive, data-driven valuation models that can enhance valuation practice, improve investor confidence, and promote greater transparency and efficiency in Nigeria's property market.

*Corresponding author's email address: Thomas.ashaolu@federalpolyilaro.edu.ng

©2026 The Author(s). Published by UCT Library. This is an open-access article under the CC BY 4.0 license. <https://creativecommons.org/licenses/by/4>

Keywords: *Bayesian Ridge, LASSO Regression, Machine Learning algorithms, Random Forest, Residential Property, Valuation*

1. Introduction

Proper valuation remains a central component of investment decisions in real estate. In the residential sector, reliable price estimation is crucial for market stability, as mispricing can distort investment flows, erode investor confidence, and create macroeconomic inefficiencies (Chow and Leung, 2021; Han and Hong, 2023). For emerging markets like Nigeria, the real estate/property market requires reliable valuation to operate transparently and secure investors' confidence. However, traditional valuation techniques, such as the comparative, income, and cost approaches, are increasingly criticised for their subjectivity, reliance on valuers' experience, reliance on inadequate data, and inconsistent selection and adjustment of pertinent variables (Babawale and Ajayi, 2011; Ajibola et al., 2022). Previous studies have expressed concerns about remarkable discrepancies among practitioners when valuing the same property, a phenomenon aptly described as 'valuation variance' (Adewusi, 2024). These discrepancies are part of a broader shift towards automated and data-driven valuation tools, such as machine learning algorithms (MLAs), believed to reduce bias and improve predictive accuracy. Unlike traditional regression models, these MLAs are also expected to provide computational techniques to handle 'complex, nonlinear interactions among property characteristics, locational factors, and socio-economic variables' (Park and Bae, 2022; Peterson and Flanagan, 2023). In fact, researchers appear to be in unison on the capacity of MLAs to outperform conventional econometric models in terms of predictive accuracy, adaptability, and generalisation (Abidoye and Chan, 2017; Raji et al., 2023; Deng and Zhang, 2025). In the Hong Kong housing market, for instance, Chow and Leung (2021) found that ensemble-based algorithms achieved superior results. Similarly, Han and Hong (2023) concluded that gradient boosting yielded lower mean absolute errors than hedonic regression in Seoul. Peterson and Flanagan (2023) observed that, for the United States and the United Kingdom, ensemble models more effectively captured locational heterogeneity and spatial autocorrelation than traditional linear models. Abidoye and Chan (2017) and Adewusi (2024) have reported similar improvements, noting that artificial neural networks reduced valuation errors compared to hedonic pricing models and that ML techniques provided more consistent price predictions within Lagos.

In spite of the foregoing, earlier studies had often modelled entire cities as single, uniform markets, regardless of inter-neighbourhood variations in socio-economic or infrastructure parameters (Abidoye and Chan, 2017; Ajibola et al., 2022; Adewusi, 2024). On the other hand, large cities such as Lagos, London, and Seoul comprise multiple sub-markets with distinct socioeconomic characteristics, land-use structures, and neighbourhood dynamics (Raji et al., 2023; Han and Hong, 2023). Ajayi and Babawale (2011) observed that within Lagos, valuation variance existed in different levels across neighbourhoods, indicating that local context significantly influences price formation.

Recent studies increasingly challenge the homogeneity assumption of urban housing markets, leveraging on urban economic models such as the Bid-Rent Theory (Alonso, 1964) and the Multiple Nuclei Theory (Harris and Ullman, 1945), both of which assert that cities evolve as polycentric systems, each generating distinct rent and price gradients. Empirical research supports these theoretical claims. In the United Kingdom, Orford (2017) demonstrated that London's housing sub-markets responded differently to accessibility and neighbourhood quality. Goodman and Thibodeau (2007) found that price determinants varied significantly between downtown and suburban sub-markets in the United States. In Seoul, South Korea, and Singapore, studies have indicated that ensemble models achieve higher predictive accuracy when trained on localised sub-market data (Park and Bae, 2022; Han and Hong,

2023). These studies confirm that residential property markets exhibit significant spatial heterogeneity requiring explicit modelling for reliable price predictions.

Nigerian studies have not sufficiently explored spatial heterogeneity in valuation frameworks. Though Abidoye and Chan (2017) and Adewusi (2024) confirmed that ML algorithms outperform hedonic and regression-based models, their analyses were conducted using aggregated city-level data. Likewise, Ajibola et al. (2022) and Raji et al. (2023) examined urban housing markets in Lagos without decomposing datasets into income-based or density-based sub-markets. While established valuation literature confirms that property value determinants vary significantly across neighbourhoods (Oyedepi et al., 2018; Oshodi et al., 2020; Ajibola et al., 2022), a few machine learning studies in the Nigerian context have nonetheless employed aggregated, city-level datasets that implicitly obscure these sub-market differences. This study specifically addresses that methodological gap. Meanwhile, Lagos is a mosaic of distinct socio-spatial zones like the high-income Lekki; the mid-income, mixed-use corridor of Ikeja; and the low-income, high-density districts of Mushin–Agege. Each sub-market reflects different combinations of infrastructure, accessibility and neighbourhood amenities that influence price behaviour differently (Adewusi, 2024; Raji et al., 2023). Adopting the same valuation model across varied market environments is tantamount to generating biased estimates and unreliable forecasts. In fact, the heterogeneity of sub-markets aligns with traditional urban theories, which have been acknowledged in emerging discourse, where the accuracy of machine learning algorithms varies across spatial contexts, especially with differences in data density, neighbourhood diversity, and variable interactions (Chow and Leung, 2021; Park and Bae, 2022). The gap identified here is not that researchers have recommended uniform models, but rather that empirical ML valuation studies for Lagos have consistently relied on citywide datasets without submarket stratification. This study addresses this specific and demonstrable methodological absence. Hence, the aim of this study is to examine machine learning performance across multiple sub-markets within Lagos Metropolis.

2. Literature Review

2.1. Concept of Spatial Heterogeneity and Property Sub-Markets

In property markets, neighbourhoods exhibit differing characteristics, as reflected in the quality of infrastructure, accessibility, development density, and socio-economic features. Invariably, these exert influence on property pricing. In Lagos, these differences are particularly pronounced due to stark variations in neighbourhood amenities, accessibility, and income levels, leading to significant price disparities among submarkets (Braithwaite, 2007; Jimoh, 2017). Lagos property sub-markets are distinct geographical segments with unique price dynamics, as demonstrated by notable contrasts, such as upscale Lekki having better infrastructure than the more affordable and densely populated Mushin (Jimoh, 2017; Otegbulu, 2017).

Urban economic theories highlight that property prices are influenced by spatial factors rather than being uniform across a city. Alonso's (1964) Bid-Rent Theory posited that property values decline with increasing distance from the city centre due to commuting costs and changes in accessibility. The Multiple Nuclei Theory (Harris and Ullman, 1945) explained that cities have multiple centres, thereby resulting in varying price gradients. Empirical evidence from Lagos supports these frameworks, showing that neighbourhood characteristics and proximity to key services significantly affect prices (Braithwaite, 2007; Aliu, 2014).

It is important to note that machine learning algorithms, as adopted in this study, are primarily instruments of mass valuation (also known as Automated Valuation Models, or AVMs), rather than tools for appraising individual properties in the manner of traditional single-property valuation. Numerous studies have established the applicability of ML in mass valuation systems. Antipov and Pokryshevskaya (2012), McCluskey et al. (2013), and Peterson and Flanagan (2023) demonstrated that ensemble and regression-based models are well-suited to large-scale, data-driven appraisal. This study is situated within a mass valuation framework, which is particularly relevant for policy-making, investment analysis, and taxation purposes in emerging markets like Nigeria.

2.2. Conventional Pricing Methodology and Valuation Inaccuracy

Traditional valuation methodologies will often be challenged by heterogeneous markets like Lagos. The effectiveness of the Comparative Method to leverage on the similarity of property variables is often compromised by the apparently subtle yet potent differences in property features within small geographic areas, and these often lead to valuation discrepancies (Jimoh, 2017). The income Capitalisation Method capitalises future income streams but struggles with the reliability of rental income and yield in areas with fluctuating demand, while the Cost Approach is limited by difficulties in estimating replacement costs and accounting for location-driven demand variations (Otegbulu, 2017).

These traditional methods frequently lead to valuation inconsistencies with different valuers providing varying estimates for the same property, thereby undermining trust in the valuation process. The result is a shift towards more data-driven approaches, such as machine learning algorithms believed to incorporate localised market conditions, yielding more accurate, consistent results across sub-markets (Jimoh, 2017).

2.3. Machine Learning Algorithms and Property Price Accuracy

Machine learning algorithms offer promising alternatives to traditional property valuation models by modelling complex, non-linear interactions among property features, socio-economic factors, and spatial location. Algorithms like Random Forest (RF), Bayesian Ridge Regression (BR), and LASSO Regression have demonstrated their effectiveness in property price prediction by capturing interactions among variables that traditional methods often overlook (Breiman, 2001; Zurada et al., 2011; Antipov and Pokryshevskaya, 2012; Abidoye and Chan, 2017; Hong et al., 2020; Chow and Leung, 2021; Park and Bae, 2022; Han and Hong, 2023; Raji et al., 2023). Therefore, they often perform better than conventional models in terms of predictive accuracy and capacity to manage the large dimensionality of real estate data. Also, ML methods will result in substantial advancements in valuation accuracy, which is essential to market transparency and investor confidence.

3. Methodology

3.1. Input Variables and Data Samples

The dataset used in this research included a total of 469 residential property transactions with conclusive history, from thirteen registered firms of Estate Surveyors and Valuers in Lagos Metropolis. The official directory of the Nigerian Institution of Estate Surveyors and Valuers (NIESV, 2024) was used to verify these firms, ensuring the data was authentic and reliable. Lagos was chosen as the study location because it is Nigeria's most active and heterogeneous property market, with a variety of socio-economic, infrastructural, and environmental characteristics that affect housing prices. The data set was rather broad in its property features – number of bedrooms, bathrooms, toilets, and floors; age and condition;

environmental and neighbourhood character; and proximity to facilities. These were important variables that determined residential property prices and were used as inputs to the machine-learning models.

To capture the heterogeneity in the market, three different sub-markets, with striking socio-economic and spatial settings, were identified within Lagos Metropolis, comprising Lekki, Ikeja, and Mushin-Agege. Lekki is a high-income waterfront corridor dominated by luxury housing developments. Ikeja is a typical mid-income mixed-use mainland district integrating commercial and residential functions, while Mushin–Agege represents the low-income, high-density zone characterised by informal housing and infrastructure deficits. The stratification enabled this study of algorithmic performance in residential settings to display the contrasts that highlight local dynamics in property valuation. Before analysis, all transaction prices were log-transformed to address data skewness and ensure normality of the distribution. Continuous-type variables were normalised using z-score normalisation to bring all variables to a comparable scale. Categorical variables were converted to numeric codes for model training, e.g., property type and finishing materials. Interquartile Range (IQR) and mean substitution were used to handle outliers and missing values, respectively, to maintain dataset integrity. Thereafter, the data were divided into sub-market-specific subsets of 182, 153, and 134 records from Lekki, Ikeja, and Mushin-Agege, respectively. This ensured that each segment of the housing market is sufficiently represented in the data for model calibration and comparison with other housing markets.

3.2. Operationalisation of Variables

To facilitate model development and ensure consistency in analysis, the study identified and operationalised the key variables influencing residential property prices across the selected sub-markets. The dependent variable in the analysis is the actual property selling price. This represents the response variable being predicted by the machine-learning algorithms. The independent variables comprise structural, locational, and environmental attributes commonly recognised in the valuation and hedonic modelling literature as significant determinants of housing value (Abidoye and Chan, 2017; Ajibola et al., 2022; Raji et al., 2023).

Each variable was assigned a unique code and unit of measurement to ensure uniformity across all sub-markets and facilitate efficient model training. Attributes like the number of bedrooms, bathrooms, toilets, floors, and property size described the physical structure of each residential unit. The accessibility advantages were measured by proximity to schools, hospitals, and shopping centres, while qualitative differences in property desirability were defined by environmental and neighbourhood indicators, including security features and the condition of facilities. Categorical variables were encoded numerically, whereas continuous attributes were measured using actual figures derived from the transaction data. The operationalised variables are presented in Table 1.

3.3. Machine Learning Algorithms

This research used three machine learning algorithms – Random Forest (RF), Bayesian Ridge Regression (BR), and Least Absolute Shrinkage and Selection Operator (LASSO)- to forecast the prices of residential properties in the sub-markets of the Lagos Metropolis. The algorithms were chosen because they have good balancing, predictive accuracy, interpretability, and robustness in modelling heterogeneous property markets (Breiman, 2001; MacKay, 1992; Tibshirani, 1996; Hong et al., 2020; Efron et al., 2004).

Table 1: Operationalisation of Variables

Variable	Variable Code	Measurement/Description
Dependent Variable		
Property Price	Pptyprice	Actual selling price of the property (₦, logtransformed)
Independent Variables		
Property Size	Pptysize	Floor area of the property (m ²)
Number of Bedrooms	No_bed	Actual number of bedrooms
Number of Bathrooms	No_bath	Actual number of bathrooms
Number of Toilets	No_toilet	Actual number of toilets
Number of Floors	No_floors	Actual number of floors
Property Type	Pptytype	1 = Detached, 2 = Semi-detached, 3 = Duplex, 4 = Flat
Age of Property	Pptyage	Age in years
Security Provision	Sect	1 = Electric Fence, 2 = CCTV, 3 = Gate
Living Room Size	Livngrm	1 = Large, 2 = Small
Condition of Property	Condt	1 = Poor, 2 = Fair, 3 = Good
Parking Space	Carpark	Number of available parking lots
Location Density	Lctn	1 = Low, 2 = Medium, 3 = High
Access to Shopping Malls	Accessshop	1 = Close, 2 = Distant
Access to Schools	Accessschool	1 = Close, 2 = Distant
Access to Hospitals	Accesshop	1 = Close, 2 = Distant
Access to Restaurants	Accessrest	1 = Close, 2 = Distant
Roof Type	Roof	1 = Gerrard, 2 = Long Span, 3 = Corrugated
Floor Finish	Floorfinish	1 = Ceramic Tiles, 2 = Wooden Floor, 3 = Granite/Marble
Ceiling Type	Ceilg	1 = POP, 2 = PVC, 3 = Asbestos
Type of Painting	Paintg	1 = Satin, 2 = Emulsion, 3 = Textcote
Type of Window	Windw	1 = Glazed Aluminum, 2 = Louvres
Boys' Quarters	Boysq	1 = Present, 0 = Not Present
Door Type	Door	1 = Panel, 2 = Metal, 3 = Flush
Condition of Facilities	Facit	1 = Poor, 2 = Fair, 3 = Good

Source: Field Survey, 2025

3.3.1. Random Forest (RF)

The Random Forest algorithm, proposed by Breiman (2001), is an ensemble learning method that builds several decision trees on bootstrap samples of the training data and randomly selects features at each split node. The average of the three outputs represents the final prediction, thereby minimising model variation and avoiding over-fitting. In real estate valuation, Random Forest is highly effective for modelling complex, nonlinear correlations among property characteristics, location, and market forces, without a rigid set of parametric assumptions (Hong, Kim, and Lee, 2020). Its internal feature-importance metric helps identify the most significant determinants of property prices, making it accurate and interpretable for practical valuation.

3.3.2. *Bayesian Ridge Regression (BR)*

Bayesian Ridge Regression was formulated by MacKay (1992) and subsequently broadened by Tipping and Bishop (2007). It is a linear regression method that uses a Bayesian prior over the regression coefficients, thus providing a built-in regularisation effect. This probabilistic framework estimates a posterior distribution over model parameters and incorporates uncertainty in coefficient estimation. For real-estate data—where multi-collinearity often arises among structural and neighbourhood features—Bayesian Ridge provides stable estimates and reduces over-fitting by penalising extreme coefficient values. It also generates predictive intervals that quantify the confidence level around price estimates, a quality particularly valuable in data-driven property appraisal (Tipping and Bishop, 2007).

3.3.3. *Least Absolute Shrinkage and Selection Operator (LASSO)*

The LASSO model, proposed by Tibshirani (1996), improves the traditional regression model by adding an L1-norm penalty to the regression coefficients. This constraint forces reduce influential variables toward zero, enabling automatic variable selection while controlling model complexity. LASSO has been popular in property valuation and spatial-econometric research for isolating the strongest predictors of housing prices, including building size, condition, and accessibility (Efron et al., 2004; Peterson and Flanagan, 2023). Although it assumes linear relationships between the predictors, it offers good interpretability and variable-selection ability, making it a robust tool for comparing nonlinear and ensemble models.

Despite Random Forest, Bayesian Ridge and LASSO methodological diversity, they are complementary modelling frameworks for use in property valuation. Random Forest can capture nonlinearities and complex interaction effects; Bayesian Ridge provides probabilistic regularisation and uncertainty quantification; while LASSO provides parsimony and interpretability through sparse coefficient estimation. Previous empirical studies supported this: Breiman (2001) and Hong et al. (2020) reported higher predictive accuracy of Random Forest model in a heterogeneous housing market; MacKay (1992) and Tipping and Bishop (2007) posited that Bayesian Ridge offers a good solution to over-fitting and multi-collinearity, while LASSO was demonstrated by Tibshirani (1996) and Efron et al. (2004) to be capable of identifying significant determinants of price among high-dimensional datasets. Integrating these algorithms allows this study to balance interpretability and predictive performance—ensuring both academic rigour and practical relevance in modelling real-estate market behaviour (Peterson and Flanagan, 2023).

3.4. *Performance Metrics*

The literature has many predictive accuracy measures. However, the suitability of each depends on the purpose at hand. To evaluate and compare the predictive performance of the chosen machine learning algorithms, four statistics were used in this paper. They are Coefficient of Determination (R^2), Mean Absolute Error (MAE), Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE). These performance measures have been widely used in previous valuation and predictive modelling studies (Zurada et al., 2011; McCluskey et al., 2013; Han and Hong, 2023; Raji et al., 2023), and are expressed in mathematical equations (1) to (4) below:

$$r^2 = 1 - \frac{\sum_{i=1}^n (P_i - P'_i)^2}{\sum_{i=1}^n (P_i - \bar{P})^2} \text{-----} (1)$$

$$MAE = \frac{1}{n} \sum_{i=1}^n (P_i - P'_i) \text{-----} (2)$$

$$MAPE = \frac{\sum_{i=1}^n \left(\frac{P_i - P'_i}{P_i} \right)}{n} \times 100 \quad \text{-----} \quad (3)$$

$$RMSE = \sqrt{\frac{1}{N} \sum_{i=1}^n (P_i - P'_i)^2} \quad \text{-----} \quad (4)$$

where (P_i) represents the actual market value of each property, (P'_i) is the predicted value obtained from the model, ($\bar{P}$) denotes the mean of the observed prices, and (n) is the number of observations. R^2 stands for the proportion of variance in property prices explained by the predictor model, MAE for the average and RMSE for the squared deviations between the predicted and observed prices. The MAPE is the mean absolute deviation, as a percentage of the actual price values. Hence, the higher the R^2 , the stronger the variance explained and the model reliability. A good predictive accuracy is indicated by lower values of MAE, RMSE, and MAPE. Combining these measures ensures that across the three sub-markets, there is effective comparative analysis of the accuracy and robustness of the four selected algorithms-Random Forest, XGBoost, SVR, and LASSO.

3.5. Model Development and Specification

3.5.1. Training Data

The model development stage used the pre-processed dataset of 469 residential property transactions across the Lekki, Ikeja, and Mushin-Agege sub-markets of Lagos Metropolis, as obtained from registered estate firms. Data was randomly split into training and testing subsets, with a typical 80/20 scale to achieve model generalisability and reduce over-fitting (Can et al., 2019; Kuhn and Johnson, 2013). Model training was allotted 80 per cent (80%) of the data, and the algorithms – Random Forest (RF), Bayesian Ridge Regression (BR), and LASSO – were trained to learn the intricate patterns and connections between the dependent variable (log-transformed property prices) and the independent variables (structural, locational, and neighbourhood characteristics). The other 20% of the data was set aside to test and validate the model, to avoid bias in performance analysis.

During training, hyperparameter tuning was performed to optimise each algorithm's performance using iterative search procedures. For Random Forest, the number of trees, depth, and minimum samples per split were optimised; for Bayesian Ridge, the priors and regularisation parameters were calibrated; while for LASSO, the alpha penalty term was selected using cross-validation. These adjustments improved the stability and predictive consistency of each model across all three sub-markets.

3.5.2. Test Data

To achieve generalisation without bias to the training sample, test data were used to assess model performance in actual predictive conditions. Like Can et al. (2019) and Kuhn and Johnson (2013), the model was evaluated by comparing the actual and predicted log-transformed market values. This step was necessary to measure the degree to which each algorithm could recreate observed price dynamics on unobservable property deals in the three market clusters – Lekki, Ikeja and Mushin-Agege.

4. Results and Discussion

4.1. Descriptive Statistics of Property Attributes

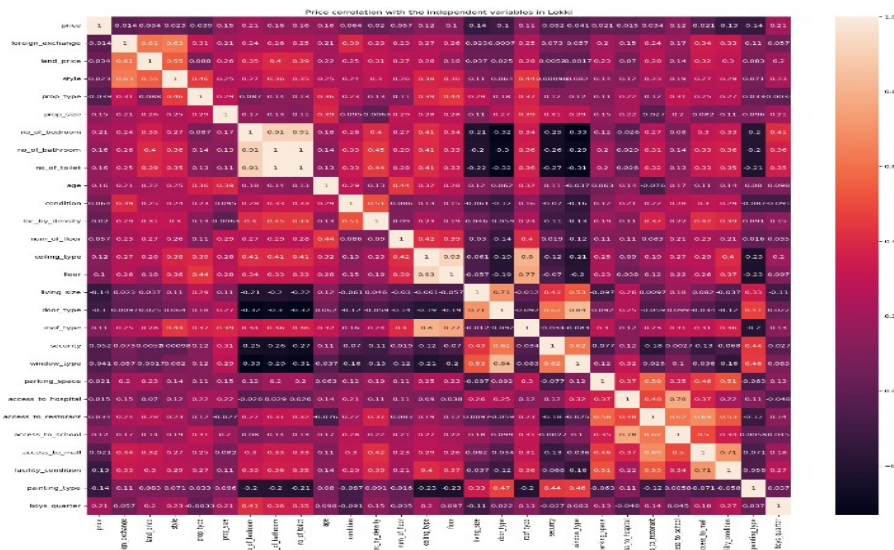
Table 2 (in the Appendix) summarises the descriptive statistics of major explanatory variables, including the number of bedrooms, bathrooms, property age, condition, parking availability, and market

value. Mean and percentile values reveal clear inter-sub-market contrasts: Lekki recorded the highest mean prices and variability, Ikeja reflected moderate diversity typical of mixed-use neighbourhoods, while Mushin–Agege displayed low mean values with minimal dispersion. The observed right-skewed price distribution prior to transformation corresponds with findings by McGreal et al. (1998) and Awais et al. (2025), who reported similar skewness in urban property markets. These results confirm Lagos’ market heterogeneity and justify the use of flexible machine-learning models capable of capturing nonlinear value relationships.

4.2. Correlation Structure among Variables

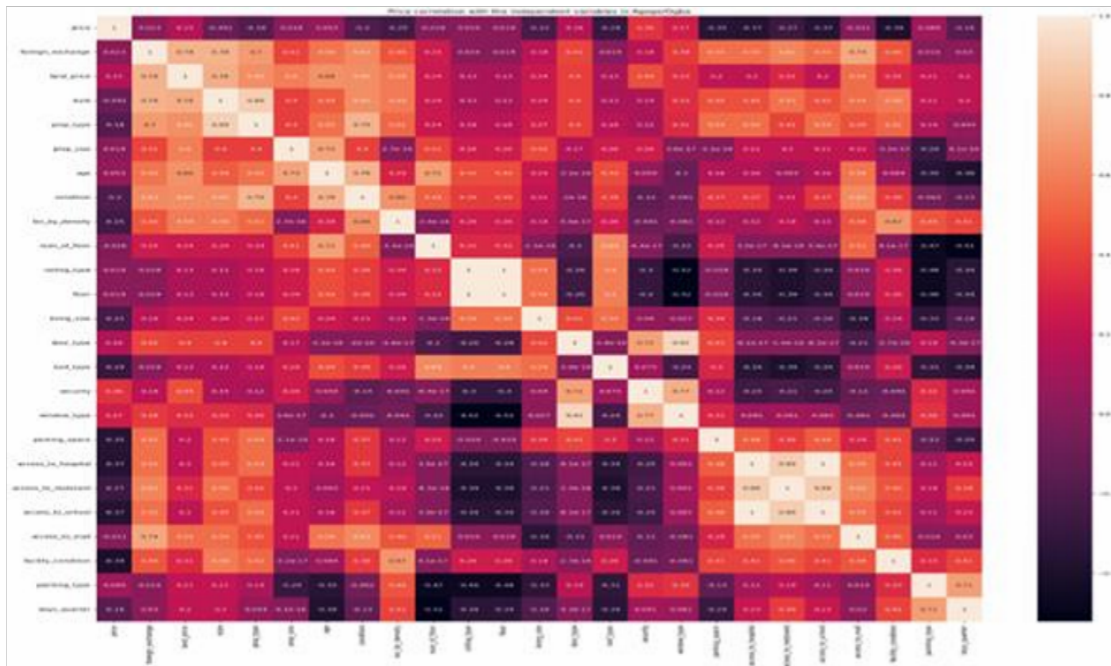
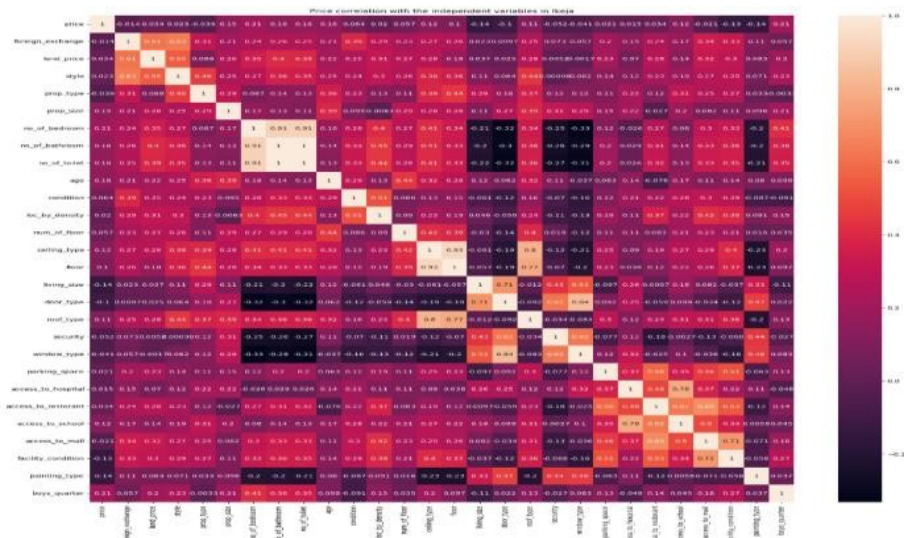
The correlation matrices (Figure 1a–c) illustrate the linear associations among property variables within each submarket. In Lekki, strong positive correlations were found between the number of bedrooms, toilets, and bathrooms, reflecting coherent housing design and scale. Property condition and accessibility also showed moderate positive correlations with market value, signifying the premium attached to infrastructural quality (See Figure 1a). Ikeja displayed moderate correlations between structural and environmental attributes, particularly between property condition, parking, and market value, as shown in Figure 1b. This highlights the balance between physical quality and locational convenience in determining prices. In Figure 1c for Mushin–Agege, correlations were generally weaker and more irregular, consistent with its informal housing structure and heterogeneous property characteristics.

Across all sub-markets, no correlation coefficient exceeded 0.80, confirming the absence of multicollinearity (Can et al., 2019; Kuhn and Johnson, 2013). This indicates that the predictor variables are statistically appropriate for the regression and ensemble learning procedures adopted in this study.



1a: Lekiki Sub-market

1b: Ikeja Sub-market



1c: Mushin-Age Submarket

Figure 1a-c: Variable correlation structure across the three Sub-markets

Source: Field Survey, 2025

4.3. Visual Assessment of Model Performance

The scatter plots of actual versus predicted prices were examined to provide a visual evaluation of model accuracy. Across the three sub-markets, as indicated in Figure 2a–c, the plots showed that Random Forest achieved the tightest alignment along the 45° reference line, indicating the highest correspondence between predicted and actual market values. Bayesian Ridge Regression produced balanced predictions with moderate residual spread, while LASSO showed slightly greater dispersion

at higher price levels, especially in the Mushin–Agege sub-market (Fig. 2c). These visual results collectively suggest that ensemble and regularised regression methods captured both the linear and nonlinear components of Lagos’ property market behaviour.

The scatter plots for the Lekki sub-market in Figure 2a illustrate a strong positive correlation between actual and predicted prices for all three algorithms. Random Forest exhibited the tightest alignment along the 45° line, indicating minimal residual dispersion.

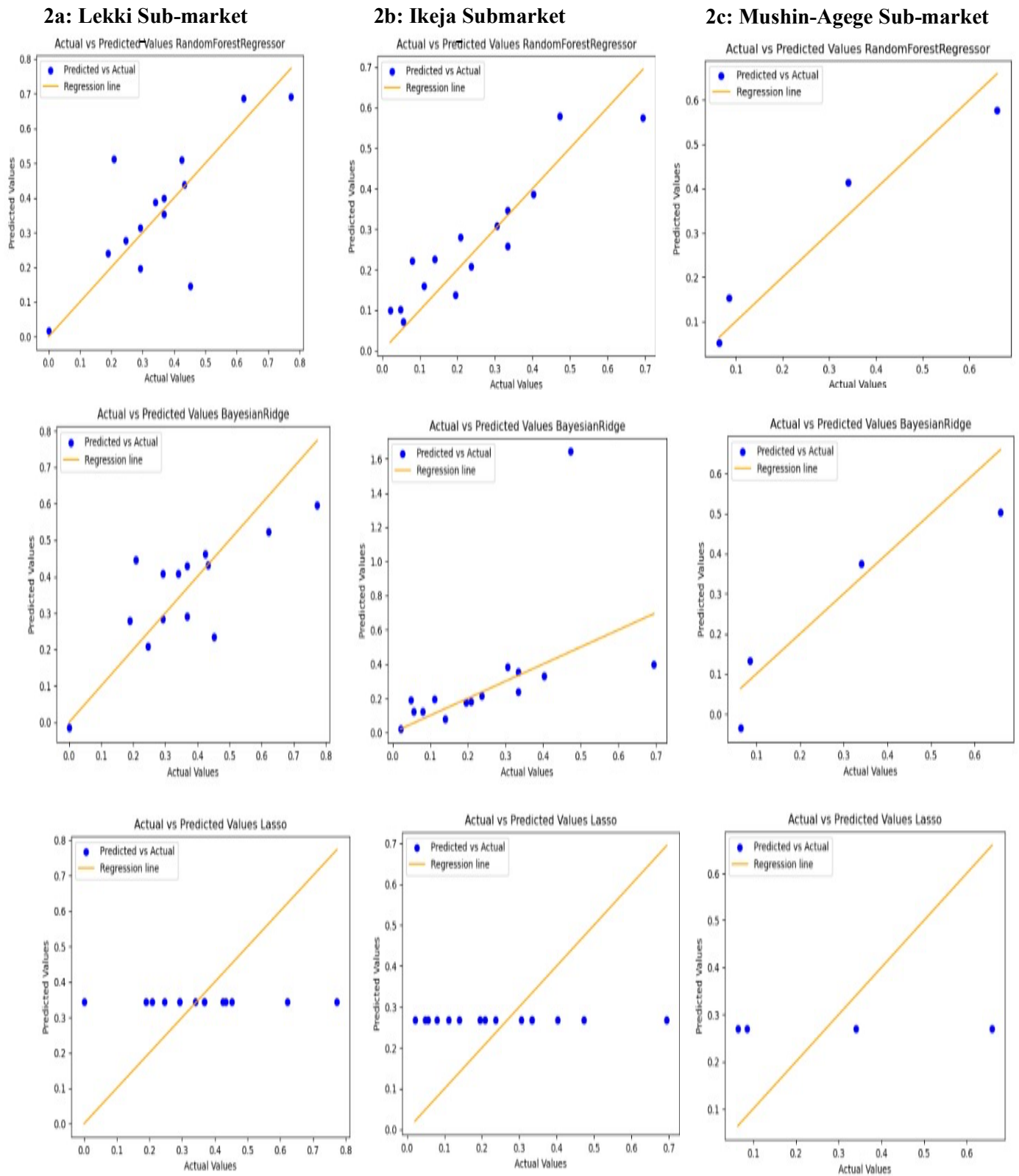


Fig. 2a–c: Scatter plots showing the relationship between actual and predicted log property prices for the three sub-markets and across the three models

Source: Field Survey, 2025

LASSO and Bayesian Ridge also performed consistently with moderate deviations at higher price ranges. The result confirms that ensemble and regularised linear models effectively capture price heterogeneity within Lekki's luxury residential market. In the Ikeja sub-market (Figure 2b), all models recorded strong predictive fits, though Random Forest again displayed superior consistency. Bayesian Ridge maintained a smooth prediction pattern with fewer outliers, while LASSO's performance was slightly constrained by its linear assumption. The plots demonstrate the models' ability to generalise across mid-income neighbourhoods that exhibit both residential and commercial property interactions. The Mushin–Agege sub-market (Figure 2c) exhibited greater price variability, as reflected by a wider spread of points around the regression line. Random Forest provided the most accurate estimates for this low-income, high-density zone, where irregular housing characteristics and infrastructure deficiencies tend to introduce data noise. LASSO and Bayesian Ridge under-predicted some outliers, suggesting limited adaptability to extreme values, yet still achieved acceptable correlation strength across the sample.

Across the three sub-markets, the scatter plot analysis confirms that the Random Forest algorithm consistently outperformed the linear-based models in reproducing market prices. This aligns with findings by Hong et al. (2020) and Peterson and Flanagan (2023), who reported that ensemble-based learners excelled in modelling complex housing attributes. Nonetheless, Bayesian Ridge and LASSO provided valuable interpretive power and computational efficiency, making them suitable for transparent appraisal contexts. The convergence observed across the models indicates a strong predictive relationship between the estimated and actual values, validating the reliability of the training and testing procedure.

4.4. Quantitative Model Evaluation and Comparison

Table 3 presents the comparative performance of the three algorithms across the three sub-markets. The performance was assessed using both training and testing results of the coefficient of determination (R^2), root mean square error (RMSE), mean absolute error (MAE), and mean absolute percentage error (MAPE). The inclusion of both training and testing phases provides a comprehensive insight into model generalisation, highlighting the ability of each algorithm to learn effectively without over-fitting or under-fitting the dataset.

Table 3: Quantitative Model Evaluation and Comparison

Algorithms	Sub-Market	R2	MAE	MAPE	RMSE	R^2	MAE	MAPE	RMSE
Random	Lekki	0.95	0.03	0.22	0.04	0.54	0.08	0.37	0.11
	Ikeja	0.93	0.03	0.19	0.04	0.74	0.06	0.29	0.07
	Muishin-Agege	0.95	0.04	0.86	0.05	0.90	0.06	0.25	0.06
Bayesian	Lekki	0.75	0.08	0.53	0.10	0.41	0.09	0.32	0.11
	Ikeja	0.61	0.07	0.84	0.10	0.27	0.15	0.37	0.31
	Mushin-Agege	0.76	0.09	0.77	0.12	0.78	0.08	0.89	0.09
LASSO	Lekki	0.01	0.17	0.38	0.09	0.10	0.13	0.39	0.18
	Ikeja	0.11	0.12	0.19	0.16	0.02	0.15	0.56	0.18
	Mushin-Agege	0.01	0.20	0.69	0.25	0.27	0.21	0.79	0.24

Source: Field Survey, 2025

As revealed in Table 3, Random Forest attained a training R^2 of 0.95 and a testing R^2 of 0.54 for Lekki, demonstrating a reasonable generalisation performance despite the high structural and price variability typical of luxury sub-markets. The relatively moderate test accuracy in Lekki can be attributed to the heterogeneous nature of the area, where property values vary sharply based on location, building style, and infrastructure development. Conversely, in Ikeja, Random Forest achieved a higher testing R^2 of 0.74, alongside lower RMSE (0.073) and MAPE (0.29), indicating greater model stability and predictive precision within this mid-income, mixed-use submarket. The algorithm recorded its best performance in Mushin–Agege, where both training and testing R^2 values reached 0.95 and 0.90, respectively, supported by the lowest RMSE (0.065) and MAPE (0.25). This superior accuracy can be attributed to the more uniform property characteristics in this low-income market segment, allowing the ensemble method to capture patterns effectively.

The Bayesian Ridge Regression model produced moderate results across the sub-markets, reflecting the strength of its probabilistic regularisation framework in handling collinear variables while maintaining computational simplicity. In Lekki, it achieved a training R^2 of 0.75 and a testing R^2 of 0.41, indicating a reasonable but less stable fit compared to Random Forest. In Ikeja, the testing R^2 declined further to 0.27, suggesting a limited ability to accommodate the nonlinear market relationships within this sub-market. However, in Mushin–Agege, the model showed improved adaptability with a testing R^2 of 0.78 and relatively low RMSE (0.098), confirming its potential efficiency in more homogeneous data environments. These outcomes align with MacKay (1992) and Tipping and Bishop (2007), who highlighted that Bayesian models tend to perform more reliably in structured and less complex datasets. LASSO Regression model, on the other hand, exhibited the weakest performance across all sub-markets, reflecting its sensitivity to feature-scarcity and linear assumptions. The testing R^2 values ranged from 0.10 in Lekki to 0.79 in Mushin–Agege, accompanied by higher RMSE and MAPE scores. This pattern suggests that while LASSO effectively performs variable selection and prevents overfitting through coefficient shrinkage, it may not sufficiently capture the nonlinear relationships inherent in property price dynamics, especially in submarkets characterised by luxury diversity and infrastructure-driven price fluctuations. Nevertheless, LASSO remains valuable for interpretability and feature reduction, making it useful in exploratory modelling and variable importance assessment, as supported by Tibshirani (1996) and Efron et al. (2004).

Overall, the results indicate that Random Forest produced the most accurate, consistent, and generalisable predictions across the study area. The model's ensemble learning mechanism, which aggregates multiple decision trees to reduce variance and bias, enables it to capture complex interactions between property attributes and market behaviour more effectively than linear-based models. The dominance of Random Forest in this analysis corroborates the findings of Breiman (2001), Hong et al. (2020), and Peterson and Flanagan (2023), who established that tree-based ensemble methods outperform single-estimator models in real estate valuation tasks. The relatively modest performance of Bayesian Ridge and LASSO further reinforces the notion that while regularisation-based methods enhance interpretability, their linear frameworks limit their ability to fully represent the nonlinear spatial and locational dynamics of property markets. Across sub-markets, predictive accuracy followed the order Mushin–Agege > Ikeja > Lekki. This progression reflects the interplay between data consistency and market complexity. Mushin–Agege's stable housing typologies allowed for stronger model learning, whereas Lekki's high-end, spatially diverse market introduced greater variability and potential noise in property prices. The findings affirm that integrating ensemble algorithms such as Random Forest with regularised regression models like Bayesian Ridge and LASSO provides a balanced methodological framework for achieving both predictive accuracy and model transparency in the valuation of residential properties across heterogeneous urban sub-markets, as no single algorithm

performs optimally across all contexts. Rather, model efficiency is inherently dependent on data quality and the structural composition of each market segment.

4.5. The Alignment Between Study Findings and Existing Literature

The findings of this study provide valuable insights into the comparative efficiency of different machine learning algorithms in predicting residential property prices across the heterogeneous sub-markets of Lagos Metropolis. The consistent superiority of the Random Forest algorithm across the three sub-markets highlights the effectiveness of ensemble learning techniques in handling nonlinear relationships, high-dimensional data, and multi-collinearity problems commonly encountered in property valuation datasets. The model's robust performance is in line with the works of Breiman (2001), Hong et al. (2020), and Peterson and Flanagan (2023), who observed that Random Forest and other ensemble-based models outperform conventional and single regressor techniques in housing market analysis due to their ability to model complex interactions among structural and location variables.

The relatively high predictive accuracy observed in the Mushin–Agege sub-market suggests that Random Forest performs particularly well in environments where property attributes exhibit less variability. This finding aligns with Han and Hong (2023), who observed that ensemble models achieve optimal generalisation in stable and structured housing datasets. Conversely, the slightly lower R^2 and higher error metrics obtained in Lekki reflect the challenges posed by heterogeneous and high-value sub-markets, where spatial differentiation, architectural diversity, and infrastructure disparities introduce additional prediction complexity. Such variability is consistent with Can et al. (2019), who emphasised that model performance declines in luxury property clusters characterised by market segmentation and price volatility.

The Bayesian Ridge Regression model exhibited moderate yet stable performance, demonstrating that probabilistic regularisation techniques remain valuable for ensuring model interpretability and controlling coefficient shrinkage. The findings correspond with those of MacKay (1992) and Tipping and Bishop (2007), who established that Bayesian frameworks improve estimation reliability, especially in datasets affected by multicollinearity. Its relatively lower predictive power in Lekki and Ikeja underscores the model's limitation in fully capturing nonlinear relationships, but its balanced trade-off between simplicity and robustness makes it suitable for structured valuation tasks and policy-oriented analyses.

The LASSO Regression model produced the weakest predictive outcomes, with significantly lower R^2 values and higher error rates across the sub-markets. This is consistent with Tibshirani (1996) and Efron et al. (2004), who observed that while LASSO performs effective variable selection and improves model parsimony, it tends to oversimplify relationships in datasets governed by complex interactions. Despite its lower predictive accuracy, the LASSO model's strength lies in its interpretability and ability to identify the most influential price determinants, thereby providing useful insights for market diagnostics and feature selection in valuation modelling. Generally, however, the higher performance of the models in Mushin–Agege may be attributed to the relatively homogeneous housing structures and limited price dispersion, while the greater variability in Lekki posed challenges for all three models. This finding corroborates McGreal et al. (1998) and Raji et al. (2023), who noted that market heterogeneity often reduces model efficiency by amplifying noise in training data. It also substantiates the growing consensus in literature that no single algorithm universally outperforms others across all market contexts, and that model choice should reflect the underlying structure and complexity of the data. In line with Peterson and Flanagan (2023), this study reaffirms that ensemble models such as Random

Forest are particularly suited for urban valuation studies, where property characteristics interact in nonlinear and spatially diverse ways.

4.6. Valuation Error-Margin

To further assess model reliability, the study evaluated the valuation error margin generated by the three machine learning algorithms. Error-margin measures how closely the predicted property values align with actual transaction prices. Classical benchmarks include $\pm 5\%$ to $\pm 15\%$ (Hager and Lord, 1986), while in the Nigerian context, Ogunba and Ajayi (1998) recommend $\pm 10\%$. This analysis focuses exclusively on Random Forest (RF), Bayesian Ridge (BR), and LASSO Regression, respectively, examining the proportion of predictions within specific error bands across the three sub-markets, as presented in Figure 3a–c.

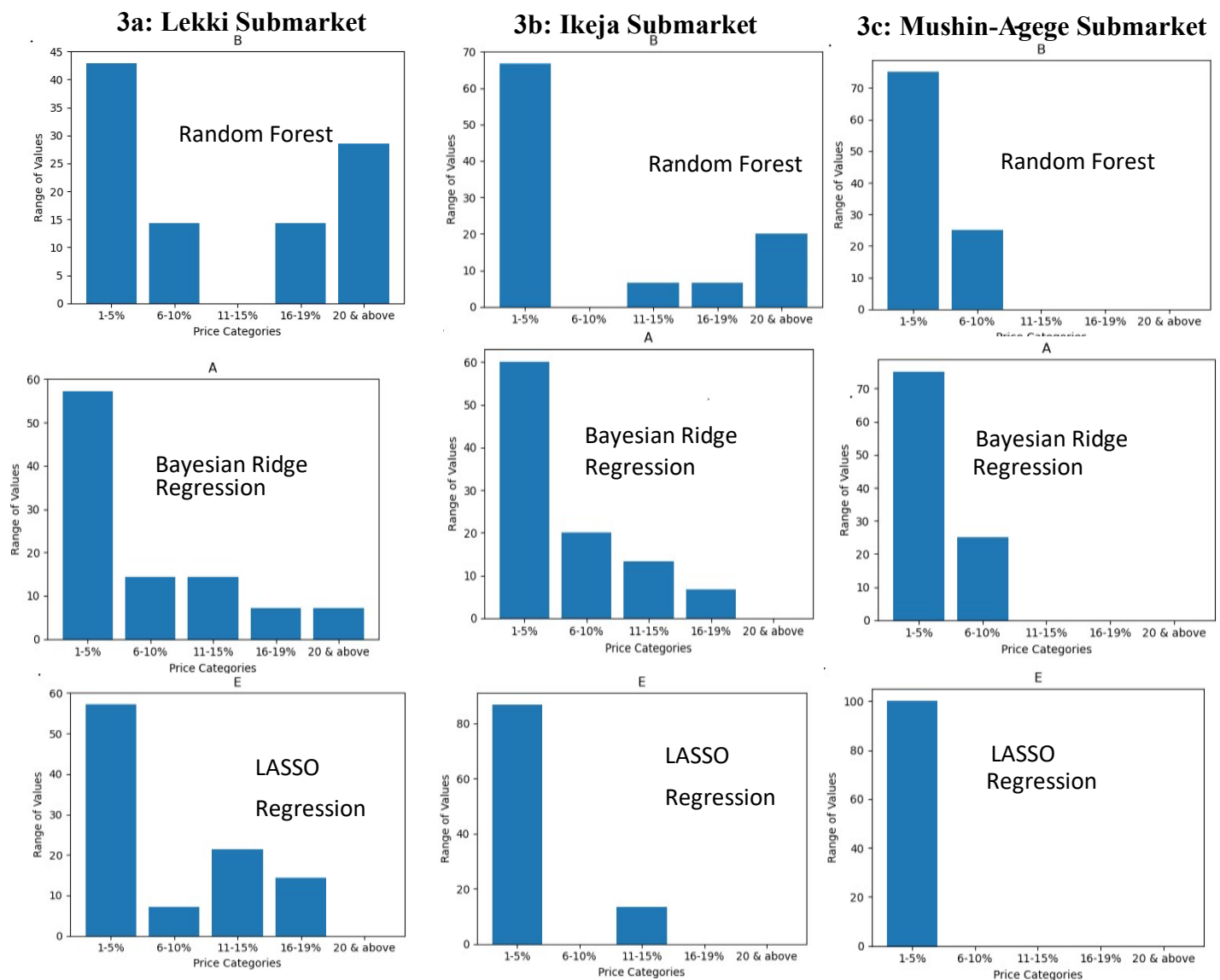


Fig 3a-c: Margin of Error of selected Machine Learning Algorithms across Three Residential Sub- Markets

Source: Field Survey, 2025

Figure 3a-c provides a comparative evaluation of the predictive performance of Random Forest, Bayesian Ridge, and LASSO regression models across the Lekki (Fig. 3a), Ikeja (Fig. 3b), and Mushin–Agege (Fig. 3c) sub-markets, using valuation error margin bands as the primary performance metric. In professional valuation practice, predictive reliability is assessed not merely by aggregate error statistics but by the proportion of estimates falling within acceptable tolerance thresholds—typically $\pm 5\%$ to $\pm 10\%$ —which reflect internationally recognised standards of valuation accuracy (Crosby, 2000; French, 2004; McCluskey et al., 2012).

Across all three sub-markets, Random Forest again demonstrates the strongest alignment with acceptable valuation error-margin thresholds, particularly in Lekki and Ikeja. In Lekki, a high concentration of predictions falls within the $\pm 5\%$ and $\pm 10\%$ bands (as shown in Fig. 3a), indicating that the algorithm effectively captures the non-linear relationships, interaction effects, and heterogeneity characteristic of premium urban housing markets. The result mirrors earlier studies on ensemble tree-based models performing better than linear and semi-parametric approaches in varied residential settings, as it accommodates complex attribute-capitalisation and spatial interactions (Antipov and Pokryshevskaya, 2012; Zurada et al., 2011; Kok et al., 2017). The strong performance observed in Ikeja further supports this alignment, as Random Forest maintains a relatively high proportion of predictions within acceptable margins despite the area’s mixed-use structure and institutional complexity. This corroborates McCluskey et al. (2013), who argue that machine-learning models perform well in heterogeneous sub-markets where sufficient structural variation enables attribute-driven price differentiation.

In Mushin–Agege, however, the predictive capacity of Random Forest weakens, with a larger share of estimates falling outside tolerance bands (See Fig. 3c). While it still outperforms Bayesian Ridge and LASSO, this decline reflects structural market constraints rather than algorithmic inadequacy. This outcome aligns with Bramley and Watkins (2015), who contend that in low-income or affordability-constrained sub-markets, price formation is weakly linked to formal property attributes and more influenced by income ceilings, informal transactions, and nonmarket adjustments. The finding, therefore, reinforces the argument that AVM accuracy is fundamentally mediated by sub-market price mechanisms.

The Bayesian Ridge regression model exhibits a more conservative predictive profile across all sub-markets. In Lekki, its predictions are more evenly distributed across valuation margin bands, with fewer estimates within the strict $\pm 5\%$ threshold compared to Random Forest. This reflects the bias–variance trade-off inherent in Bayesian shrinkage models, which stabilise predictions but limit responsiveness to sharp price gradients and luxury premiums (Pagourtzi et al., 2003; Hoesli and MacGregor, 2000). In Ikeja, Bayesian Ridge shows increasing dispersion into wider error bands, indicating under-fitting in the presence of mixed-use complexity, consistent with findings by McCord et al. (2014). In Mushin–Agege, it marginally outperforms LASSO but still fails to achieve acceptable valuation accuracy, supporting French and Gabrielli’s (2004) remark that linear models offer limited explanatory power in socio-economically constrained markets.

The LASSO regression model records the weakest predictive capacity across all sub-markets when evaluated against professional valuation tolerance thresholds. Although some Lekki predictions fall within moderate error bands, a substantial proportion lies outside $\pm 10\%$, reflecting LASSO’s aggressive coefficient shrinkage. Hence, as posited by Tibshirani (1996), LASSO is primarily a variable selection tool rather than a high-precision predictive model. Its deteriorating performance in Ikeja and near-collapse in Mushin–Agege align with empirical warnings that excessive regularisation can strip away

critical market signals, leading to mean-based and professionally unacceptable estimates (Kauko and d'Amato, 2008; McCluskey et al., 2013). The study aligns with valuation literature advocating non-linear and ensemble learning approaches for automated valuation modelling and extends existing knowledge by empirically demonstrating that algorithmic superiority is sub-market contingent. It also reinforces the position advanced by French (2004) and Crosby et al. (2010) that valuation accuracy must be interpreted within each market context.

5. Conclusion

This paper has discussed the predictive power of three machine learning models, namely Random Forest (RF), Bayesian Ridge (BR), and LASSO Regression, to predict residential property prices in three sub-markets of Lagos Metropolis. Random Forest was the most effective model, showing the highest testing R^2 values (0.74-0.90) and the lowest RMSE, MAE and MAPE scores in all sub-markets, which indicates its effectiveness in controlling nonlinear housing data and spatial heterogeneity. The Bayesian Ridge Regression model gave moderate findings when it comes to sub-markets with stable property forms, whereas LASSO Regression gave the worst results due to its sensitivity to linear assumptions and coefficient shrinkage. These findings are consistent with those of Breiman (2001) and Hong et al. (2020), who established that ensemble-based algorithms, particularly Random Forest, outperform traditional regression models in complex and heterogeneous housing markets.

The study also observed that predictive accuracy was highest in Mushin–Agege, followed by Ikeja and Lekki, indicating that simpler and more uniform markets allow for stronger model learning and generalisation. This pattern aligns with Can et al. (2019), who emphasised that algorithmic performance declines in luxury submarkets with high structural diversity and spatial heterogeneity. The findings validate the relevance of machine learning solutions and the prospects of integrating artificial intelligence into valuation practice to enhance accuracy, transparency and efficiency. For practitioners and policy-makers, the findings provide a framework within which automated valuation models (AVMs) can be developed to improve mass valuation/appraisal systems, guide investment decisions, and evidence-based planning in Nigeria's real estate sector. Further research could examine hybrid or deep learning architectures, such as gradient boosting or neural networks, including other socio-economic and spatial factors to improve the precision and scalability of the model across broader property markets.

References

- Abidoye, R. B. and Chan, A. P. C. (2017). Artificial neural network in property valuation: Application framework and research trends. *Property Management*, 35(5), pp. 554–571.
- Adewusi, A. O. (2024). Machine learning techniques in residential property valuation in Lagos metropolis. *Journal of African Real Estate Research*, 9(2), pp. 45–63.
- Ajayi, C. A. and Babawale, G. K. (2011). Valuation variance and reliability: A study of commercial properties in Lagos, Nigeria. *Journal of Property Research*, 28(2), pp. 121–138.
- Ajibola, M. O., Oloke, O. C. and Ogungbemi, A. O. (2022). Hedonic modelling and residential property values in Lagos metropolis. *International Journal of Housing Markets and Analysis*, 15(3), pp. 503–520.
- Aliu, I. R. (2014). Urban spatial structure and land values in Lagos. *Ethiopian Journal of Environmental Studies and Management*, 7(2), pp. 134–146.

- Alonso, W. (1964). *Location and land use: Toward a general theory of land rent*. Cambridge: Harvard University Press.
- Antipov, E. A. and Pokryshevskaya, E. B. (2012). Mass appraisal of residential apartments: An application of random forest for valuation and a CART-based approach for model diagnostics. *Expert Systems with Applications*, 39(2), pp. 1772–1778.
- Awais, A., Sakshi, R. and Shams, R. (2025). Predictive analytics for housing market trends and valuation. *Management*, 3, Article 115. <https://doi.org/10.62486/agma2025115>
- Babawale, G. K. and Ajayi, C. A. (2011). Variance in residential property valuation in Lagos, Nigeria. *International Journal of Economics and Management Sciences*, 1(6), pp. 45–54.
- Braimoh, A. K. (2007). Urban land use dynamics in Lagos, Nigeria. *Land Use Policy*, 24(2), pp. 502–515.
- Bramley, G. and Watkins, D. (2015). House-building, demographic change and affordability as outcomes of local planning decisions: Exploring interactions using a sub-regional model of housing markets in England. *Progress in Planning*, 104(2), pp. 1–35. <https://doi.org/10.1016/j.progress.2014.10.002>
- Breiman, L. (2001). Random forests. *Machine Learning*, 45(1), pp. 5–32.
- Can, A., Megbolugbe, I. and Ramaswamy, S. (2019). Statistical and machine learning approaches to housing market prediction. *Journal of Real Estate Research*, 41(4), pp. 567–590.
- Chow, C. C. and Leung, A. Y. T. (2021). Ensemble learning in housing price prediction: Evidence from Hong Kong. *Journal of Property Investment & Finance*, 39(6), pp. 589–607.
- Crosby, N. (2000). Valuation accuracy, variation and bias in the context of standards and expectations. *Journal of Property Investment & Finance*, 18(2), pp. 130–161.
- Crosby, N., Lizieri, C. and McAllister, P. (2010). Means, motive and opportunity? Disentangling client influence on performance measurement appraisals. *Journal of Property Research*, 27(2), pp. 181–201.
- Deng, L. and Zhang, X. (2025). Boosting the accuracy of property valuation with ensemble learning and explainable artificial intelligence: The case of Hong Kong. *The Annals of Regional Science*, 74(1), Article 32. <https://doi.org/10.1007/s00168-025-01365-7>
- Efron, B., Hastie, T., Johnstone, I. and Tibshirani, R. (2004). Least angle regression. *Annals of Statistics*, 32(2), pp. 407–499.
- French, N. (2004). The valuation of specialised property: A review of valuation methods. *Journal of Property Investment & Finance*, 22(6), pp. 533–541.
- French, N. and Gabrielli, L. (2004). The uncertainty of valuation. *Journal of Property Investment and Finance*, 22(6), pp. 484–500. <https://doi.org/10.1108/14635780410569470>
- Goodman, A. C. and Thibodeau, T. G. (2007). The spatial proximity of metropolitan area housing submarkets. *Real Estate Economics*, 35(2), 209–232.
- Han, H. and Hong, Y. (2023). Machine learning and housing price prediction: Evidence from Seoul. *International Journal of Housing Markets and Analysis*, 16(2), pp. 312–330.
- Harris, C. D. and Ullman, E. L. (1945). The nature of cities. *Annals of the American Academy of Political and Social Science*, 242(1), pp. 7–17.

- Hoesli, M. and MacGregor, B. D. (2000). *Property investment: Principles and practice of portfolio management*. London: Routledge. <https://doi.org/10.4324/9781315840482>
- Hong, J., Kim, H. and Lee, S. (2020). Random forest approach to housing price prediction. *Sustainability*, 12(3), pp. 1–15.
- Jimoh, R. A. (2017). Residential property market segmentation in Lagos metropolis. *Journal of African Real Estate Research*, 2(1), pp. 65–82.
- Kauko, T. and d’Amato, M. (2008). *Mass appraisal methods: An international perspective for property valuers*. New Jersey: Wiley-Blackwell.
- Kuhn, M. and Johnson, K. (2013). *Applied predictive modelling*. New York: Springer.
- MacKay, D. J. C. (1992). Bayesian interpolation. *Neural Computation*, 4(3), pp. 415–447.
- McCord, S. E., Buenenann, M., Jason, W. K. and Hadley, B. C. (2017). Integrating remotely sensed imagery and existing multiscale field data to derive rangeland indicators: Application of Bayesian Additive Regression Trees. *Rangeland Ecology & Management*, 70, pp. 644–655.
- McGreal, S., Adair, A., McBurney, D. and Patterson, D. (1998). Neural networks: the prediction of residential values. *Journal of Property Valuation and Investment*, 16(1), pp. 57–70.
- McCluskey, W. J., McCord, M., Davis, P., Haran, M. and McIlhatton, D. (2013). Prediction accuracy in mass appraisal: A comparison of modern approaches. *Journal of Property Research*, 30(4), pp. 239–265.
- Nigerian Institution of Estate Surveyors and Valuers (NIESV). (2024). Directory of registered estate surveying and valuation firms in Nigeria. Abuja, Nigeria.
- Ogunba, O. A. and Ajayi, C. A. (1998). An assessment of valuation accuracy in Nigeria. *The Estate Surveyor and Valuer*, 21(1), pp. 19–23.
- Orford, S. (2017). Housing submarkets and spatial variation in house prices in London. *Urban Studies*, 54(1), pp. 1–20.
- Oshodi, O., Ohiomah, I., Odubiyi, T., Aigbavboa, C. and Thwala, W. (2020). *Forecasting rental value of residential properties: A neural network model approach*. In: Collaboration and Integration in Construction Engineering/Management and Technology’ 22 December, pp. 309–313.
- Otegbulu, A. C. (2017). Standardization of plant and equipment in a developing country: Techno-economic considerations. *Covenant Journal of Research in the Built Environment*, 6(2), pp. 88–99.
- Oyedepi, J., Oshodi, O. and Oloke, O. (2018). Property rental value classification model: A case of Osogbo, Osun State, Nigeria. *Covenant Journal of Research in the Built Environment*, 6(1), pp. 52–64.
- Pagourtzi, E., Assimakopoulos, V., Hatzichristos, T. and French, N. (2003). Real estate appraisal: A review of valuation methods. *Journal of Property Investment & Finance*, 21(4), pp. 383–401.
- Park, S. and Bae, J. (2022). Housing price prediction using ensemble learning methods. *Sustainability*, 14(6), pp. 1–18.
- Peterson, S. and Flanagan, A. (2023). Automated valuation models and the future of real estate appraisal. *Journal of Property Investment & Finance*, 41(2), pp. 145–162.

- Raji, A. U., Babawale, G. K. and Adebayo, M. A. (2023). Machine learning application in Nigerian housing markets. *Journal of African Real Estate Research*, 8(1), pp. 88–104.
- Tibshirani, R. (1996). Regression shrinkage and selection via the LASSO. *Journal of the Royal Statistical Society: Series B*, 58(1), pp. 267–288.
- Tipping, M. E. and Bishop, C. M. (2007). Bayesian regression and classification. *Journal of the Royal Statistical Society: Series B*, 69(1), pp. 1–23.
- Zurada, J. M., Levitan, A. S. and Guan, J. (2011). A comparison of regression and artificial intelligence methods in property valuation. *Journal of Real Estate Research*, 33(3), pp. 349–387.

Appendix

Table 2: Descriptive statistics for the Submarkets –Lekki (Lkk), Ikeja (Ikj) and Mushin-Agege (Mu-A)

Variables	Mean			Standard Deviation			Min			25%			50%			75%			Max		
	Lkk	Ikj	Mu-	Lkk	Ikj		Lkk	Ikj		Lkk	Ikj	Mu-	Lkk	Ikj	Mu-	Lkk	Ikj	Mu-	Lkk	Ikj	
	A		Mu-A	Mu-A			Mu-A			A		A	A		A			Mu-A	Mu-A		
Price (N'000,000)	203.194	221.77	89.03	111.94	118.85	60.01	20	30	25	132.50	146.25	40	180	210	80	260	280	120	550	750	260
Size (sq. m)	236.82	259.82		46.6	58.8	55.78	145	145	108	193.5	235	146.5	240	257	185	264.5	300	235	330	450	324
Age (years)	2.59	4.6	7.23	2.48	4.52	5.42	0	0	0	1	1	4	2	2	7	3	6	9	12	17	27
Property type	1.66	2.2	2.18	0.89	1.18	1.34	1	1	1	1	1	1	1	2	1	2	3	4	4	4	4
Number of bedroom	4.48	5.6	4.9	1.12	2.7	2.88	2	2	2	4	4	4	4	5	4	5	6	5	8	15	18
Number of bathroom	5.36	6.4	5.56	1.28	2.53	2.73	2	3	3	5	5	4	5	6	5	6	7	6	9	15	18
Number of toilet	4.72	5.6	5.03	1.17	2.69	2.88	2	2	2	4	4	4	5	5	4	5	6	5	8	15	18
Location density	2.37	2.5	2.31	0.51	0.57	0.52	1	1	1	2	2	2	2	3	2	3	3	3	3	3	3
Number of floors	1.21	1.1	1.03	0.41	0.55	0.16	1	1	1	1	1	1	1	1	1	1	1	1	2	7	2
Ceiling type	1.19	1.5	2.00	0.39	0.73	0.83	1	1	1	1	1	1	1	1	2	1	2	3	2	3	3

Living room size	1.15	1.06	1.18	0.36	0.23	0.56	1	1	0	1	1	1	1	1	1	1	1	1.5	2	2	2
Door type	1.58	1.87	1.59	0.91	0.85	0.5	1	1	1	1	1	1	1	2	2	3	3	2	3	3	2
Roof type	1.4	1.62	1.95	0.49	0.71	0.72	1	1	1	1	1	1	1	1	2	2	2	2	2	3	3
Availability of BQ	0.93	0.95	0.59	0.26	0.22	0.5	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1
Parking space	3.99	4.56	4.59	1.14	1.2	1.07	2	2	2	4	4	4	4	4	4	4	6	6	6	6	6
Condition of facilities	2.73	2.61	2.36	0.44	0.61	0.58	2	1	1	2	2	2	3	3	2	3	3	3	3	3	3
Painting type	1.35	1.51	1.72	0.51	0.54	0.46	1	1	1	1	1	1	1	1	2	2	2	2	3	3	2

Source: Field Survey, 2025



Does Incremental Housing Finance Contribute to Sustainability for Africa's Green Affordable Housing? A Scoping Literature Review

Jonathan Oladeji^{1*} (<https://orcid.org/0000-0003-4073-0350>) and Chioma Okoro²
(<https://orcid.org/0000-0001-5377-6054>)

^{1,2} Department of Finance and Investment Management, University of Johannesburg,
Johannesburg, South Africa

To cite this article: Oladeji, J., and Okoro, C. (2026). Does Incremental Housing Finance Contribute to Sustainability for Africa's Green Affordable Housing? A Scoping Literature Review. *Journal of African Real Estate Research*, 11(2), pp. 101-120. DOI: 10.15641/jarer.v11i1.1913

Abstract

This study conducts a scoping literature review of the contribution of incremental housing finance to the adoption of green affordable housing in Africa, grounded in sustainable finance theory. The study synthesised evidence from 33 studies conducted between 2001 and 2025, identifying major themes such as housing microfinance (31%), sustainable housing (19%), and incremental housing finance (13%). The findings show that incremental housing finance (IHF) is a subset of housing microfinance that addresses affordability and sustainability, particularly by contributing to green building practices. This study's theoretical contribution entails situating IHF within sustainable finance theory, which is also significant in addressing affordable housing demand. It demonstrates the potential to align the provision of low-income housing with environmental objectives. This is important for banks, microlenders, and investors in the affordable housing market as a tool to understand developing market dynamics and opportunities to scale up sustainability through IHF. Without incorporating green practices in IHF, Africa's potential for climate-resilient affordable housing would remain significantly underdeveloped.

Keywords: *Incremental housing, finance, sustainable finance, sustainable development, green buildings, affordable housing*

*Corresponding author's email address: joladeji@uj.ac.za

©2026 The Author(s). Published by UCT Library. This is an open-access article under the CC BY 4.0 license.
<https://creativecommons.org/licenses/by/4>

1. Introduction

In many African cities, rapid urban population growth, underperforming mortgage lending institutions, and reliance on personal savings collectively inhibit housing affordability. (International Finance Corporation, 2024). Moreover, the high cost of construction has historically excluded the majority of citizens in African countries (Hlekane & Okoro, 2024). These challenges manifest as high cost of capital, exclusionary formal financing, and weak purchasing capacity for outright purchases. At the same time, construction constitutes one of the world's largest contributors to carbon emissions (UNEP, 2025). Therefore, sustainability and environmental consideration in housing development have become an increasing concern to housing policymakers, investors, and developers in the affordable housing market (Bashir et al., 2023), further limiting access and investment potential. Hence, the housing sector faces the dual challenge of affordability and sustainability. Developers in the affordable housing market are hesitant to adopt green or sustainable building designs due to the perceived higher initial cost (Akomea-Frimpong et al., 2022). Also, formal financing solutions are insufficient to address growing housing demand across the African continent and investors' appetite for sustainability. These realities drive the need for innovative financing options for Africa's affordable housing market.

Notably, most housing development in developing economies, including in Africa, adopts an incremental strategy (Egino, 2023). In this approach, housing is staged, financing is incremental, and development is adaptive to informal income. It is important to note that incremental housing is increasingly recognised in the literature as the most cost-effective housing supply option in Africa (Muller and Mitlin, 2007; Ferguson and Smets, 2010). However, incremental housing is not as profitable as standard credit-financed housing, even though it is most common in developing nations due to households' low economic standing and perceived risk (Teye, Teye, & Asiedu, 2013; Donkor-hyiaman, 2016; Iyandemye & Barayandema, 2018; Oladeji, Zulch, & Yacim, 2023). Mortgage financing, commonly referred to as bank loans, is frequently given for completely constructed homes and often at exclusionary interest rates that are out of reach. Therefore, the incremental housing finance (IHF) option offers a viable and affordable alternative (Oladeji, Zulch and Yacim, 2023).

While existing studies (Bondinuba & Adjei-Twum, 2016; Leal Filho et al., 2022) have separately examined affordability and sustainability, there are limited structured insights on how incremental housing contributes to sustainability outcomes. Despite the perceived cost of incorporating sustainability features, incremental development can potentially address the need for resource efficiency in energy, water, and materials through staged adoption. This paper situates IHF within the sustainable finance theory (World Commission on Environment and Development, 1987) as both a mechanism for affordability and sustainability. This scoping review seeks to synthesise the available knowledge on how IHF contributes to sustainability by facilitating financial inclusion in many African cities and informal settlements, and reducing housing inequality.

Therefore, the main research question that this study addresses is, "What is the contribution of IHF to the adoption and promotion of sustainable (green) building practices in African housing markets?" This question informs the following sub-questions:

1. What are the key barriers to sustainability adoption in African housing markets?
2. Through which mechanisms does IHF enable the adoption of sustainability?

This paper sought to demonstrate that IHF enables a phased adoption of sustainability in the urban African context through the combined interaction of three mechanisms: financial inclusion, staged adoption of sustainability, and adaptation to informality. This extends the sustainability theory through the context of housing markets and the unique development outcomes of incremental housing.

2. Literature Review

Housing demand and affordability challenges across African urban centres often overlap with environmental sustainability challenges—high carbon emissions, high energy costs, environmental hazards, and power shortages. Yet the extant literature on these twin challenges tends to treat them separately, leaving a limited, structured understanding of the opportunities for developers, lenders, and investors to address both. Widespread financial constraints further shape this problem, as the ability to meet housing needs is tied to broader economic development (UN-Habitat, 2005). In African cities, this ability is increasingly dependent on strategies that address financial inclusion, informality, and inequality together. Yet African city residents are unable to access financing options suited to doing that. In Kigali, mortgage products are available at outrageous conditions, making mortgage finance unaffordable (Iyandemye and Barayandema, 2018). At the same time, living conditions make adopting sustainability seem like an exclusionary move, driven largely by greater capital needs among developers and homeowners. Therefore, this section critically examines the literature on the incremental housing model. It further situates it within the African context, addressing the unique challenges of emerging financial inclusion, housing affordability, and sustainability gaps.

2.1. Incremental Housing Finance

IHF provides a unique opportunity to achieve greater inclusion in housing finance. Given that up to 90% of residential buildings in the developing world are constructed in a gradual or progressive manner, Habitat for Humanity (2014) recommends making housing microfinance available to support this approach.

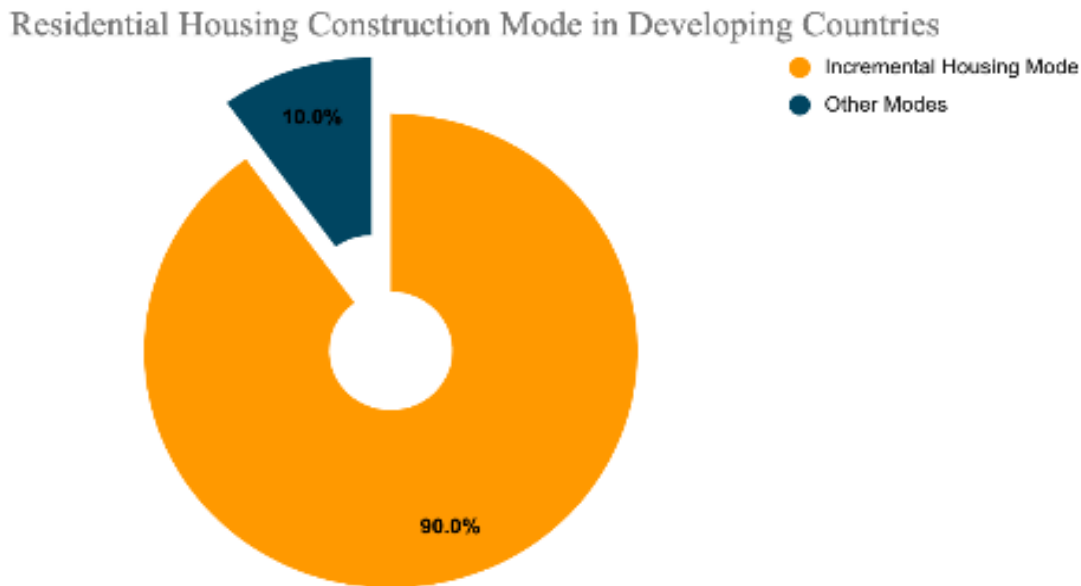


Figure 1: Residential Housing Construction Mode in Developing Countries (**Source:** Habitat for Humanity, 2014)

Considering the estimated size of the Incremental Housing Finance market in developing countries, as shown in Fig. 1, the construction of self-help or incremental housing facilitates access to financial services, inclusion, and long-term solutions for low- and middle-income populations throughout Africa.

However, there is no consensus in the literature on the adoption of IHF as a viable alternative to mortgages. Despite its widespread use, Kongoro and Owino (2016) contend that incremental housing is not the answer to Kenya's limited access to housing finance. According to Berge and Jing (2010), many low-income applicants for financing face exclusionary selection factors in addition to locational, urbanisation, and legal framework problems. This is amplified by the perception that low-income homeowners are high-risk and low-profit, which further inhibits private sector investment in incremental housing. The alternative of expanding mortgage finance has historically failed to address housing market demand. For example, the World Bank abandoned sites and services as well as slum-upgrading projects for two decades to finance national mortgage systems with loan terms typically 20 to 30 years for the middle and upper-middle classes (Hawtrey, 2009). The impact of this has been that the housing backlog across the continent has reached more than 50 million in recent years, with a \$1.4 trillion financing gap.

Another significant dimension of this financing gap is that housing's capital-intensive nature requires private investment and cannot rely solely on public funds (Madell, 2024). Without sufficient financing for the low- to mid-income market, issues of housing poverty, slum formation, and informal housing settlements continue to rise. In Africa, this problem is even more pronounced as millions live in housing that is less than ideal and lacks utilities, services, and infrastructure (Hlekane and Okoro, 2024; Madrazo et al., 2025). This poses a unique challenge, as the housing and construction industry is a leading contributor to global carbon emissions. Ahmad (2023) argues that developing a carbon-neutral building is possible, but developing it cheaply is an innovative frontier.

These studies disagreed on the appropriate alternative mechanism for mortgage finance in Africa. They also failed to identify how this gap potentially drives barriers to adopting sustainability. Furthermore, none of these studies has investigated the contributions of incremental housing to achieving sustainability in the housing sector. These make this present study a significant contribution to knowledge. By exploring the mechanisms through which IHF addresses sustainability barriers, this study offers a unique perspective on how this financing approach operates and its relevance to what seem like divergent objectives: sustainability and affordability.

2.2. Sustainable Adoption Barriers

While sustainability adoption barriers are a global reality, the African urban context is shaped by large-scale dependence on less formal financing options, informal income structures, and structural informality that are distinct from those in more developed nations. Therefore, conventional housing finance options further deepen the exclusion and economic inequalities that inhibit affordable and sustainable housing. These financial models, which focus largely on profit and economic efficiency, do not address the sustainability challenges posed by global poverty and the threat of climate change (Ryszawska Bożena, 2024). The bigger problem is that these conventional financial systems are rigid and ill-suited to less formal economic structures, such as those found across Africa. This means such financial structures do not create sufficient housing opportunities, nor can they provide many Africans with the capital needed to adopt sustainable housing practices in housing developments.

Affordability and purchasing power also tend to hinder the adoption of sustainable practices in housing developments across the globe, particularly in Africa. The literature reveals a wide disparity between developed and developing nations and their macroeconomic realities, impacting housing affordability and finance (Muellbauer and Murphy, 2008; Boshoff, 2010; and Bondinuba and Adjei-twum, 2016). These affordability barriers also directly or indirectly limit urban residents' capacity to access sustainable housing developments. The literature has also demonstrated that IHF is an adaptable strategy for addressing these affordability challenges. However, there is limited understanding of its role in achieving sustainability outcomes in housing projects.

This study contributes to sustainable finance theory by investigating the mechanisms by which incremental housing addresses the gap between sustainability and affordability. Traced back to the sustainable development concept developed in the 1987 Brundtland report (see World Commission on Environment and Development, 1987), sustainable finance theory addresses multiple facets of society, including housing in a broad sense. This paper grounds sustainable finance theory in the context of affordable housing finance in urban African cities. Within this framework, IHF is not just an affordability strategy but a tool for achieving sustainable urban development. IHF addresses several key Sustainable Development Goals, including SDGs 1, 3, 6, 7, 8, 10, 11, and 13. Particularly relevant to this study are SDG 7, 10, 11, and 13, which highlight the potential of IHF to reduce inequality, promote sustainable cities, advance climate action, and support energy-efficient buildings.

2.3. Incremental Housing Finance Mechanisms

IHF facilitates financial inclusion through staged financial contributions and its adaptability to the needs of informal housing development. While capital remains a challenge for housing stakeholders in developing nations across Africa, public and private sector entities in some countries, like South Africa, have succeeded in better lending terms through IHF (Marais, Ntema and Venter, 2008; Groves, 2004; Pugh, 2001; and Mehlomakulu and Marais, 1999). In South Africa, these collaborations with the government have lessened the risk that affordable housing poses to investors in the South African affordable housing market (Klug, Rubin and Todes, 2013). Since most African households rely on incremental housing development, the government's facilitating role encourages private sector investment, further strengthening the model (Groves, 2004).

The staged nature of IHF makes it well-suited to many African homeowners, who tend to turn to alternative forms of financing as they build incrementally. The literature highlights the value of financing sources that are suited to incremental housing development (Donkor-Hyiaman, 2016). However, the link to staged adoption of sustainability has not fully emerged. This study strengthens the insights into the IHF mechanism and the links to the staged adoption of sustainability.

By driving collaboration with MFIs, the government, and the private sector, IHF provides low-income housing, directly addressing informality and economic inequalities (Bondinuba and Adjei-Twum, 2016). Its adaptability to informal income and development facilitates housing improvements, including sustainability measures that are ordinarily inaccessible. The IHF mechanisms of financial inclusion, staged development, and adaptivity to informality have been extensively documented in the literature. However, this study's unique contribution is a structured investigation into how these mechanisms address barriers to sustainability adoption in developing African countries.

3. Methodology

This study adopts a pragmatist philosophical stance, recognising that knowledge in emerging fields, such as the convergence of housing affordability and sustainability, is often fragmented and contextual. Rather than focusing solely on empirical data, this approach allows the synthesis of multiple forms of knowledge to understand a phenomenon. The study employs an inductive approach, allowing patterns and trends to emerge in the literature. Aligned to this approach, a qualitative mono-method using a scoping review strategy is followed. According to Arksey and O'Malley (2005), a scoping review examines the extent, range, and nature of research activity, summarising and disseminating research findings. This study applied a scoping review, appropriate for an emerging phenomenon, and contributed a different approach to the emerging sustainability needs in affordable housing markets. The aim of the study, to investigate the extant literature on IHF and its potential for integrating sustainability into affordable housing, is aligned with the purposes of a scoping review. For this study, literature was selected from Google Scholar, Google Search, and Scispace, including journals and other grey literature. These sources were selected and are easy to access and considered sufficient for a scoping review. This study adopted the five-stage scoping review process developed by Arksey and O'Malley (2005). In summary, the scoping review was done in five steps:

1. Identifying the research question.
2. Identifying relevant studies.
3. Study selection.

4. Charting the data.
5. Collating, summarising, and reporting the data.

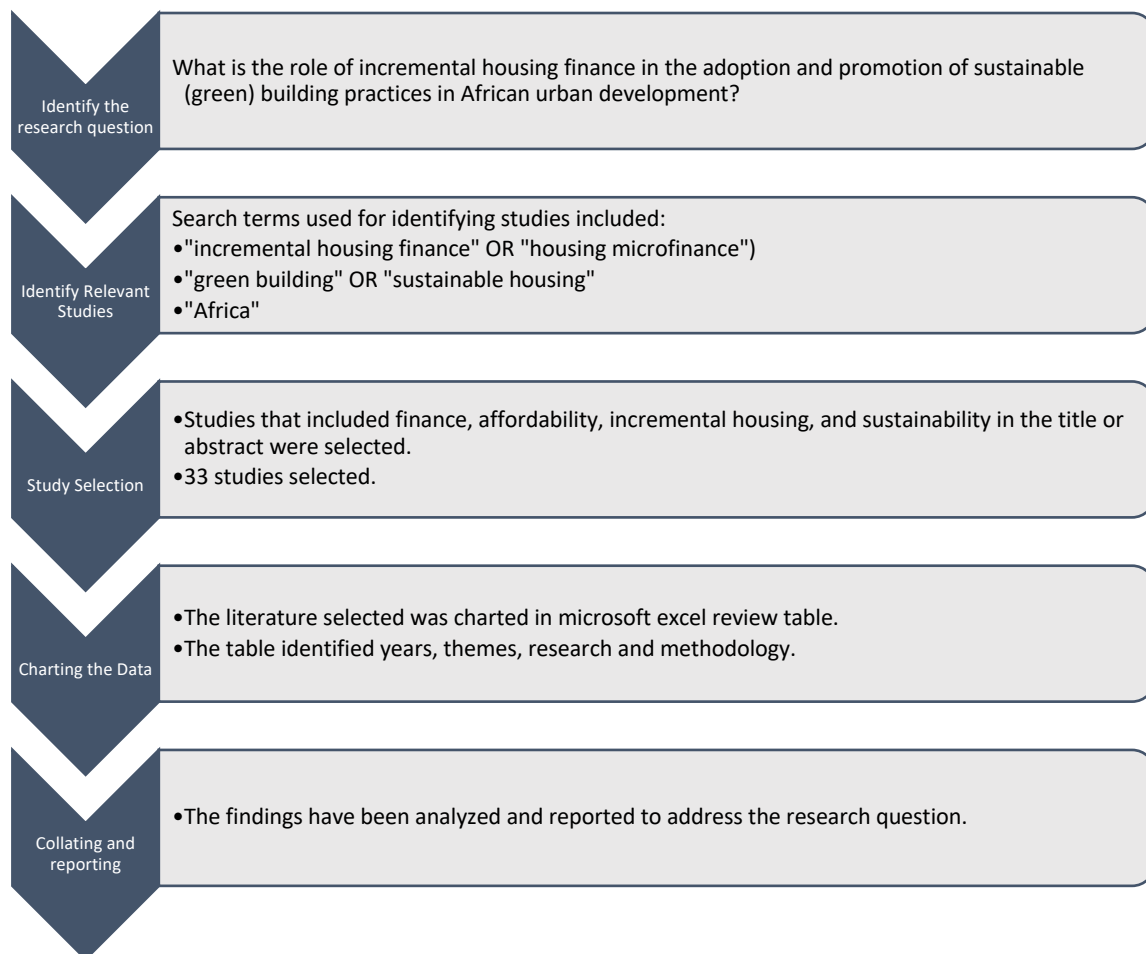


Figure 2: Literature Search and Selection Process (Adapted from PRISMA Framework) (...)

First, our research question was: What is the role of IHF in the adoption and promotion of sustainable (green) building practices in African urban development? The study considered a wide range of literature because sustainability and housing affordability approaches, such as incremental approaches, are emerging concepts and require careful identification of convergence.

As shown in Figure 2, the literature search was based on keywords such as incremental housing, macroeconomic indicators, developing economy, Africa, drivers, and housing finance. The search terms used included ("incremental housing finance" OR "housing microfinance") AND ("green building" OR "sustainable housing") AND ("Africa"). The literature search identified seventy-three studies in the affordable housing finance research space between 1992 and 2025. The exclusion criteria applied were studies not explicitly focused on incremental housing, housing finance, or affordability, and those lacking a geographic focus on Africa. The studies selected, totalling thirty-three (33), specifically mentioned finance, affordability, incremental housing, and sustainability. The data charting was done using Microsoft Excel. The kind of

data to be extracted was predetermined. Some of these were the title, authors, study type, methodology, theme, and year.

4. Results and Analysis

The results, as shown in descriptive table 1, illustrate the recurring themes and patterns in the selected literature. The key themes demonstrate the recurrence and overlap among incremental housing, financial inclusion, sustainable housing, and affordable housing in the African urban context. The selected studies, as shown in Table 1, span the period between 2001 and 2025, with an outlier from 1994, which is among the earliest studies on IHF that address developing-economy needs. There is a total of 33 studies with varying themes and methodologies within the incremental housing literature.

Table 1: Selected Literature for The Scoping Review

Authors	Theme	Location	Methods
Swilling et al. (2018)	Incremental housing concept	South Africa	Mixed
World Bank (2025)	Financial inclusion	West Africa	Mixed
Mokgadiye et al. (2012)	Incremental housing policy	South Africa	Mixed
Madell (2024)	Financial inclusion	South Africa	Qualitative
Egino (2023)	Financial inclusion	Tanzania	Mixed
Kroeker-Falconi and Canclini (2021)	Incremental housing policy	Africa and the Caribbean	Qualitative
Banleman (2008)	Housing microfinance	Ghana	Mixed
Hlekane and Okoro (2024)	Sustainable housing finance	Africa	Qualitative
Kongoro and Owino (2016)	Housing microfinance	Kenya	Quantitative
Ojo-Aromokudu and Loggia (2017)	Incremental housing concept	South Africa	Qualitative
Jones and Stead (2020)	Sustainable housing finance	Africa and Asia	Mixed
Adade et al. (2022)	Incremental housing concept	Ghana	Qualitative
Jumbe and Manya (2020)	Housing Finance	Malawi	Qualitative
Habitat For Humanity (2014)	Sustainable housing finance	Malawi	Mixed
BoP Learning Lab and Dalberg Research (2014)	Affordable housing	Cross-country	Mixed
Van Noorloos et al. (2020)	Incremental housing finance	Cross-country	Qualitative
Doling, Vandenberg and Tolentino (2013)	Housing Finance	Cross-country	Qualitative

Berge and Jing (2010)	Housing microfinance	Botswana	Mixed
Bah, Faye and Geh (2018)	Housing microfinance	Africa	Mixed
World Bank (2015)	Housing microfinance	Africa	Mixed
Tomlinson (2007)	Housing microfinance	Africa	Qualitative
Ferguson and Smets (2010)	Housing microfinance	Cross-country	Qualitative
Prime-Stat PVC Ltd (2018)	Affordable housing	Ghana	Qualitative
Gardner (2008)	Housing microfinance	South Africa	Qualitative
Merrett and Russell (1994)	Incremental housing finance	Cross-country	Qualitative
Amoako and Frimpong (2017)	Affordable housing	Ghana	Qualitative
World Bank (2011)	Sustainable housing finance	Kenya	Quantitative
Oladeji, B. Zulch and Yacim (2023)	Incremental housing finance	South Africa	Mixed
Asibey et al. (2023)	Sustainable housing finance	Ghana	Mixed
Groves (2004)	Housing microfinance	Africa	Qualitative
Datta and Jones (2001)	Incremental housing finance	South Africa	Qualitative

4.1. Research Methodology Trends

Figure 3 illustrates the methodology adopted for the studies in the incremental housing literature. Across the selected literature, the majority (54%) use mixed methods, including literature reviews, case studies, surveys, and interviews. The second most common methodology is qualitative (43%). Meanwhile, the quantitative approach is the least used methodology (3%). The trend illustrates the dominance of the mixed and qualitative research methodology within the incremental housing and sustainability discourse.

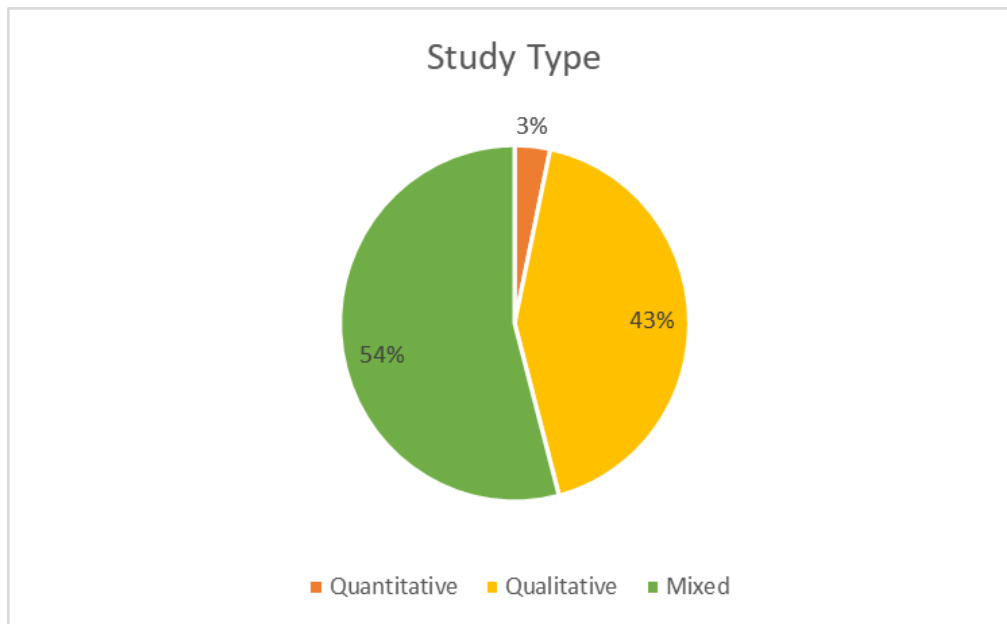


Figure 3: Pie Chart of the Research Methodologies Identified

4.2. Geographical Focus of the Scoping Review

Research on incremental housing has been published in all 54 of Africa's nations. Figure 4 illustrates some of the leading geographic foci of the literature. There are 5 broad continental studies, 2 others with overlaps with Asia and the Caribbean, and 1 focused on West Africa, Tanzania, South Africa, Malawi, Kenya, Ghana, and Botswana. The two leading countries identified in the literature are South Africa and Ghana.

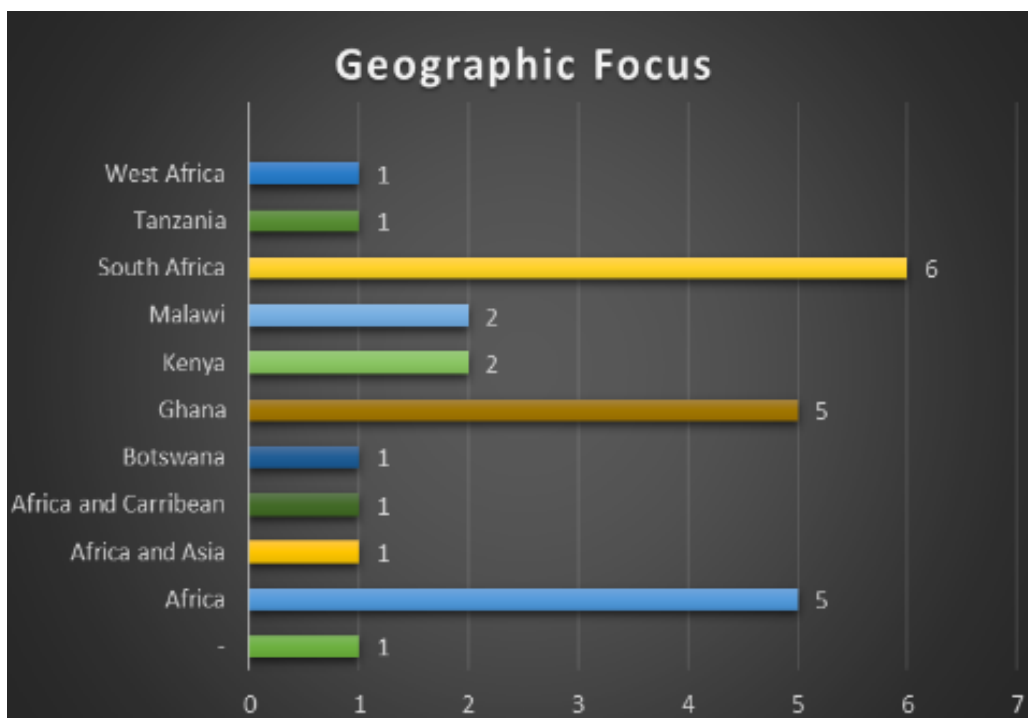


Figure 4: Bar Chart of the Geographic Focus in the Incremental Housing Literature

4.3. Thematic Focus of the Literature Review

As seen in Figure 5, the reviewed literature could be categorised into themes including affordable housing, financial inclusion, housing finance, housing microfinance, incremental housing concept, incremental housing finance, incremental housing policy, and sustainable housing. The top three themes are Housing microfinance (31%), Sustainable housing (19%), and Incremental housing finance (13%).

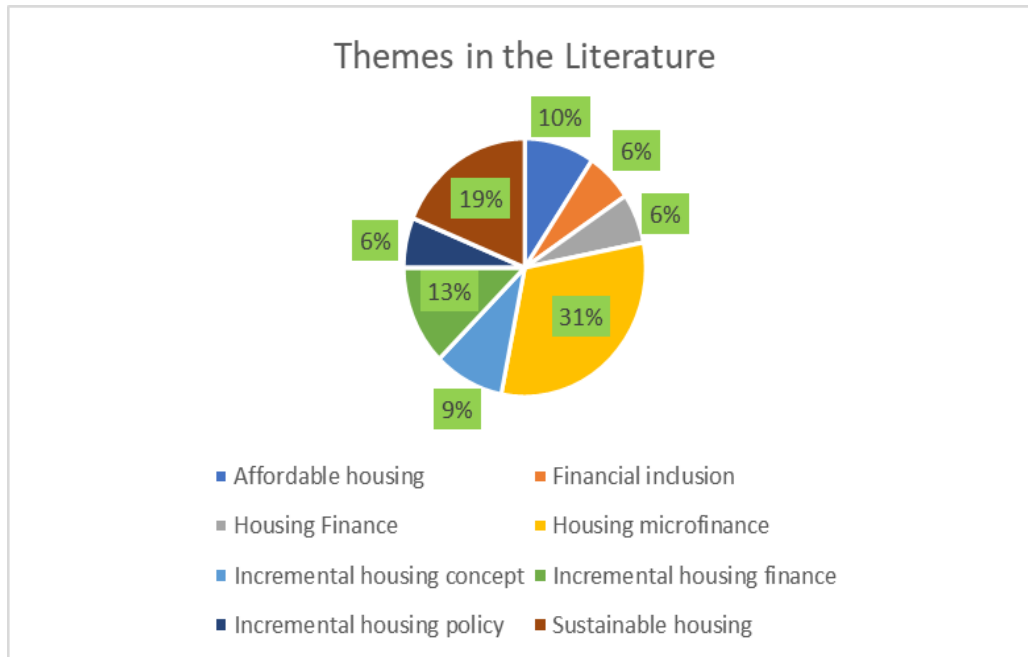


Figure 5: Pie Chart of Themes in the Incremental Housing Finance Literature

4.4. IHF Facilitates Financial Inclusion through Housing Microfinance (HMF) Mechanisms

The review reveals that housing microfinance institutions provide IHF products to low-income households as their development needs evolve. This highlights the role of IHF in improving housing quality and expanding financial inclusion. As Banleman (2008) demonstrated, the IHF, as a microfinance instrument, prioritises financial sustainability. Moreover, the model incorporates public-private partnerships and technical support that are critical for minimising risks and improving the quality of the housing developments. IHF provides access to financing while monitoring household income levels and repayment risk through HMF. Some studies, such as Bah et al. (2018), also highlighted the role of incremental housing as a financing mechanism to improve technical know-how, mitigate risk, and ensure best practices. The World Bank (2015) also recommended that incremental housing through housing microfinance is a valuable strategy for providing quality and disaster-resistant housing. It facilitates the hiring of skilled labour for development that would otherwise be inaccessible. Similarly, Kongoro and Owino (2016) reported that incremental housing offers a viable financing alternative for Kenyans through staged development. The authors put it concisely as:

“Given the limited supply of housing credit, Kenyans have had to resort to incremental housing by depending on microfinance loans to improve or construct their homes gradually” (Kongoro & Owino, 2016).

Incremental housing finance addresses the huge capital outlay that construction requires through micro-lending. Where households run out of cash during construction and are further affected by rising interest and inflation rates, they can access financing to continue development (Berge & Jing, 2010). These studies also highlight the value of IHF as a subset of HMF that addresses affordability and sustainability concerns in Africa by providing the financial resources to incorporate sustainability features. Studies like Tomlinson (2007) and Ferguson and Smets (2010) also report that IHF contributes to financial inclusion through the involvement of multi-stakeholders—communities, businesses/private entities, government, and HMF. This collaborative system makes it attractive to investors in the low- to mid-income housing market.

4.5. Incremental Sustainability Adoption

Incremental housing enables the gradual improvement of living conditions, offering low-income earners the option to adopt sustainability practices (Kroecker-Falconi & Canclini, 2021). These short-term loans for housing projects can include improvements in energy and water management. These types of loans or credit provided for the gradual improvement of living conditions are what is termed IHF. Their report highlights the potential to finance green and sustainable housing in stages, addressing challenges relating to water and sanitation. This agrees with what some describe as a move from commoditised housing delivery to a demand-responsive mechanism (Swilling et al., 2018).

Across the literature, case studies demonstrate the incremental contribution of housing to sustainability through a staged adoption mechanism (Mokgadiye et al., 2012; Ojo-Aromokudu & Loggia, 2017; Swilling Mark et al., 2018). In some countries, such as South Africa, the Green Fund facilitates the provision of solar systems, trains solar operators, drives community-led environmental sanitation, and provides an anaerobic digester for on-site wastewater treatment (Swilling et al., 2018). This financing model emphasised individual participation, community engagement, electrification projects, and environmental or green practices as development proceeds. Mokgadiye et al. (2012) also highlight the value of IHF in reducing overdependence on government subsidies while allowing for gradual improvements in living conditions. Other studies, such as Ojo-Aromokudu and Loggia (2017), Van Noorloos et al. (2020), Adade et al. (2022), and Oladeji et al. (2023), identify sustainability and green improvements as elements of the IHF model. Due to the staged nature of this financing, it is appropriate for low-income households adopting green practices like solar systems, wastewater recycling, and other sustainable improvements.

4.6. Sustainable Housing in Informality

A study on the factors influencing the adoption of green or sustainable practices, using an incremental model, highlights adaptivity to informality as a critical mechanism (Aliyari, 2024). The study reported that the need to enhance environmental sustainability in housing minimise ecological footprint reduce waste and resource consumption and provide financial incentives, influences the adoption of green building practices. Other studies also identify the link between incremental housing and sustainable housing finance as the direct outcome of trends in sustainable housing conversion (Hlekane & Okoro, 2024). This approach involves inclusive housing finance and the use of innovative technology to gradually improve the quality and safety of housing in African urban contexts. They also posited that green building concepts promote affordability through sustainable housing finance targeted at building conversion for low-income groups that dominate informal economies. This model is also influenced by

housing delivery and affordability challenges faced by low-income groups, government interest, community engagement, and the improvement of slum living conditions.

An important case study for sustainable housing finance is found in Reall's Africa operation, as described in Jones and Stead (2020). The Reall model entails sustainable mixed-tenure housing with emphasis on green spaces, community-led development, incremental housing, and HMF. Studies such as Asibey et al. (2023) and the World Bank (2011) similarly highlight the influence of staged housing needs, sustainable city growth, and financial constraints on the adoption of green practices in affordable housing markets.

4.7. Conceptual Framework

The results of this study inform the development of a conceptual framework that can be further validated through other empirical analyses. In Figure 6, this framework extends sustainable finance theory by directly linking IHF to green development outcomes. By incorporating housing microfinance, technical assistance, and public-private partnerships, this framework extends the theory of sustainable finance, offering low-income housing markets an approach that connects sustainability to affordability. This framework positions IHF as a central piece in the convergence of sustainability and affordability.

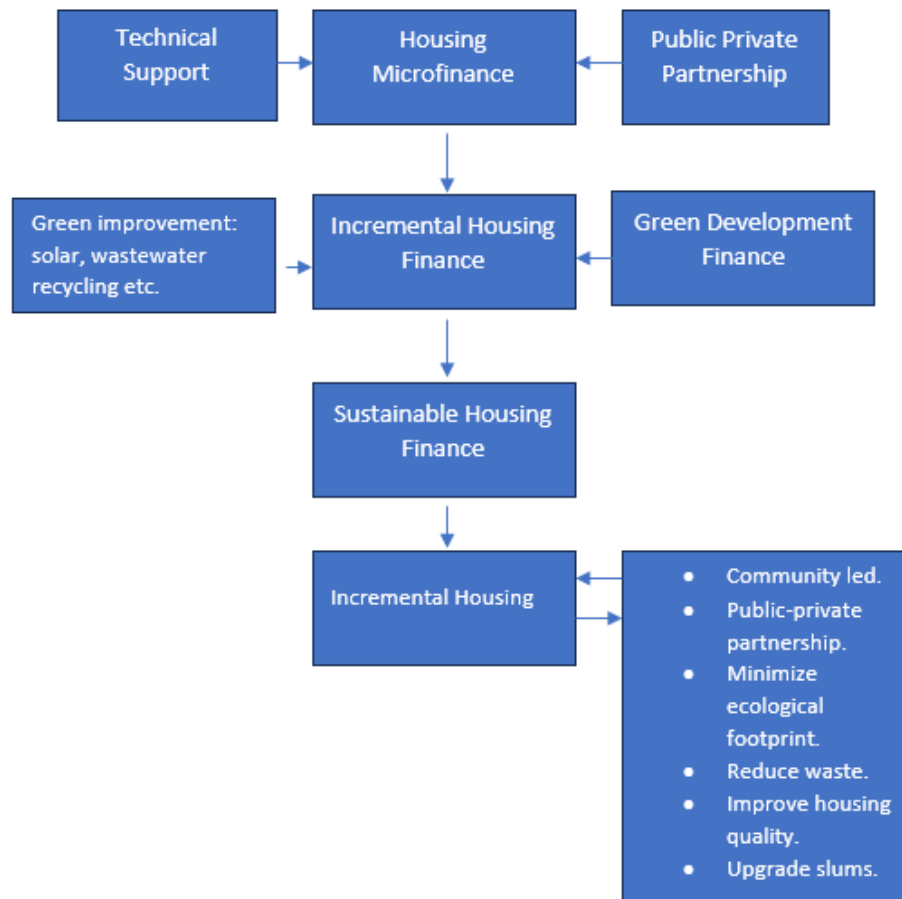


Figure 6: Conceptual Framework for Green IHF

As seen in Figure 6, incremental housing finance interacts with three core input mechanisms – housing microfinance, public-private partnership, and technical support at the first layer. These three inputs are the local interactions with the model. Housing microfinance forms the primary financing framework by which incremental housing finance is advanced to end users. Typically, these financing options are provided in partnership with relevant technical experts, material suppliers, and developers to ensure quality control and standards. Furthermore, the partnership between public and private institutions, like the case of the NHFC in South Africa, also derisks this form of financing. (Oladeji et al., 2023).

The HMF achieves affordability by relying on strong technical support and a public-private partnership. Building on sustainable finance theory, it provides an integrative model of financial inputs (e.g., housing microfinance, green development finance, public-private partnerships, and technical support) and socio-environmental outputs (e.g., quality affordable housing, slum upgrades, and reduced ecological footprint). This framework incorporates

iterative and mutually reinforcing linkages: technical support for HMF recipients mitigates risks, attracting private investment, while public-private partnerships bridge financing and infrastructure gaps, further strengthening interest in and the viability of green improvements in affordable housing.

At the second layer, this framework provides an interactive and connected model for interventions that are typically siloed. Based on the literature reviewed, this study proposes integrating green practices in the incremental delivery method for low-income households in African urban contexts (Ojo-Aromokudu & Loggia, 2017; Van Noorloos et al., 2020; Adade et al., 2022). International development financiers play an important role by contributing to incremental housing financing with sustainability outcomes clearly defined. Green finance for green improvements and housing upgrades potentially offers improved living conditions at scale. This drives the creation of sustainable housing finance and incremental housing, which in turn minimises the ecological footprint, reduces waste, drives slum upgrades, and integrates community participation. This framework synthesises the literature on incremental housing finance and the potential for sustainability in African urban housing. It offers policymakers and practitioners a viable approach to financing green affordable housing across the continent. It also illustrates the opportunities to overcome financing barriers to sustainability in the low-income housing market.

These insights are essential for developing policies and strategies that provide optimal financing options with utility and value for low-income households in emerging African economies. The results of this study also suggest that without embedding sustainability in IHF, Africa risks perpetuating housing poverty, financial exclusion for the majority, and environmental degradation. Government institutions and housing policymakers should prioritise incentives for green development, such as tax rebates, green subsidies, and priority access to land, which will align investors' objectives with sustainability outcomes. For developers and property practitioners, HMF partnerships and community involvement provide channels for mainstreaming green practices in the affordable housing sector.

This framework further contributes to the theory of sustainability by identifying core attributes of the model within the African urban housing context. It further leads to some observable hypotheses, such as the following:

1. Sustainability within the IHF framework is driven by technical support for low-income housing development.
2. The growth of IHF is directly correlated with growing access to green and sustainable financing and the demand for green improvements in low-income housing markets.
3. Green and sustainable financing supply drives the growth of sustainability in the incremental housing market.

Further empirical studies that test these hypotheses would strengthen the theoretical contributions by examining these relationships within the proposed framework. Through the literature scoping review, this study demonstrated IHF's contribution to sustainability adoption through 3 mechanisms: financial inclusion, staged development, and adaptation to informality. By situating it within the sustainable finance theory, this paper extends the theory, illustrating how financially inclusive mechanisms can balance profitability, equity, and environmental responsibility in emerging markets.

5. Conclusions

This study conducted a scoping review of 33 studies within the African context to critically examine the contribution of IHF to the adoption and promotion of sustainable (green) building practices in African housing markets. The results demonstrated that the staged nature of IHF aligns with the African urban housing needs and contributes to the adoption of green or sustainable practices. This finding is evidenced by the growing inclusion of environmental and green strategies in slum upgrades, building conversions, and housing unit improvements. The studies report that the adoption of sustainability in the African urban context is limited by the high cost of formalised capital, such as loans, the exclusionary requirements for accessing these loans, and the economic realities of developing nations relative to developed ones. The lack of a structured understanding of how housing affordability in the literature overlaps with sustainability has further contributed to these barriers.

The main contribution of this study is that it demonstrates that IHF offers a market-based and socially inclusive mechanism for green affordable housing in Africa. The results offered a unique perspective on sustainable finance theory, providing specific context for how IHF contributes to sustainable housing in Africa. IHF underscores the value of community engagement, individual participation, and public/government participation in driving a sustainability agenda within affordable housing markets in African cities. This scoping review demonstrates that within low-income housing markets, development relies on the three IHF mechanisms of financial inclusion, staged financing, and informal adaptation to drive sustainable outcomes. This study also proposes an IHF framework that integrates IHF with the sustainability measures identified in African markets. Building on sustainable finance theory, this study proposes the first integrative framework that combines the affordability and sustainability literatures. This model demonstrates how financial inputs (e.g., housing microfinance, green development finance, public–private partnerships, and technical support) can contribute to socio-environmental outputs (e.g., quality affordable housing, slum upgrades, and reduced ecological footprint).

It is recommended that a savings, community, and cooperative model be adopted as a form of financial intermediation for sustainability adoption. This allows loan security to be handled differently under non-traditional contexts. Combining community-led sustainability with short payback periods and modest advances reduces the lender's risk while providing homeowners with ongoing financial resources to stage their development and adopt sustainability practices. The ability to pay may vary from one nation to another and even between regions within the same nation. Consequently, the study anticipates distinct interactions between different economies and the housing finance sector. Further research on these connections, or the role that certain social, political, and economic circumstances play in attaining housing finance affordability and sustainability throughout Africa, can be examined in future research. Measuring and improving home finance affordability is a challenge, particularly in developing nations, where monitoring consumer behaviour and data can be difficult. Therefore, further studies measuring the market's readiness for sustainability adoption are important areas for contribution, worth investigating. Further empirical studies can also test the proposed framework across various African contexts to demonstrate its validity and practical applications, thereby informing policy interventions.

Declaration:

There are no conflicts of interest to declare.

Use of Generative AI:

The use of tools includes: Quillbot (for editing statements and paraphrasing other literature), Grammarly (for editing and proofreading text for grammar and vocabulary correctness), and ChatGPT (for preliminary search and fact-checking of the study focus). We declare that the full content and ideas in the article are fully representative of our work and not generated from AI.

6. References

- Adade, D. *et al.* (2022) “Housing Finance Strategies for Low-Income Households in Secondary Cities: Contextualization Under Customary Tenure in Ghana,” *Housing Policy Debate*, 32(3), pp. 549–572. Available at: <https://doi.org/10.1080/10511482.2021.1905026>.
- Ahmad, T. (2023) “Innovation in Green Building Projects: An Exploratory Inquiry,” *Buildings*, 13(9). Available at: <https://doi.org/10.3390/buildings13092359>.
- Akomea-Frimpong, I. *et al.* (2022) “Green Finance for Green Buildings: A Systematic Review and Conceptual Foundation,” *Journal of Cleaner Production*, 356(October 2021), p. 131869. Available at: <https://doi.org/10.1016/j.jclepro.2022.131869>.
- Aliyari, M. (2024) “Improving Housing Sustainability Through an Innovative Approach,” *International Journal of Modern Achievement in Science, Engineering and Technology*, 1(4), pp. 98–105. Available at: <https://doi.org/10.63053/ijset.50>.
- Amoako, C. and Frimpong, B.E. (2017) “Build as You Earn and Learn: Informal Urbanism and Incremental Housing Financing in Kumasi, Ghana,” *Journal of Housing and the Built Environment*, 32(3), pp. 429–448. Available at: <https://doi.org/10.1007/S10901-016-9519-0/>.
- Arksey, H. and O’Malley, L. (2005) “Scoping Studies: Towards a Methodological Framework,” *International Journal of Social Research Methodology: Theory & Practice*, 8(1), pp. 19–32. Available at: <https://doi.org/10.1017/S0922156508005621>.
- Asibey, M.O. *et al.* (2023) “Incremental Housing and Compliance with Development Control in Urban Ghana,” *Journal of Urban Affairs*, 47(1), pp. 177–194. Available at: <https://doi.org/10.1080/07352166.2022.2160337>.
- Bah, E.M., Faye, I. and Geh, Z.F. (2018) “Housing Finance in Africa,” *Housing Market Dynamics in Africa*, pp. 57–108. Available at: https://doi.org/10.1057/978-1-137-59792-2_3.
- Banleman, B.S. (2008) *Beacon of Hope: The Impact of Housing Microfinance on Housing Improvement and Construction for Low-Income Households in Accra. Institute for Housing and Urban Development Studies (IHS)*.
- Bashir, S. *et al.* (2023) “Financing Options for Green and Affordable Housing (GAH): an Exploratory Study of South Asian Economies,” *Sustainability (Switzerland)*, 15(15), pp. 1–20. Available at: <https://doi.org/10.3390/su151511645>.
- Berge, C. and Jing, F.-F. (2010) *Housing Finance: The Case of Botswana*. Stockholm School of Economics. Available at: [http://www.hofinet.org/upload_docs/Housing_Finance - The case of Botswana.pdf](http://www.hofinet.org/upload_docs/Housing_Finance_-_The_case_of_Botswana.pdf).
- Bondinuba, F.K. and Adjei-Twum, A. (2016) “Assessing the Role of Housing Microfinance in the Low-income Housing Market in Ghana,” *Journal of Poverty, Investment and Development*, Vol. 28, pp. 44–54.
- BoP Learning Lab and Dalberg Research (2014) *My Home, Your Business: A Guide to Affordable Housing Solutions for Low-Income Communities*.

- Boshoff, D. (2010) “The Impact of Affordability on House Price Dynamics In South Africa,” *Acta Structilia*, Vol. 17 No. 2.
- Doling, J., Vandenberg, P. and Tolentino, J. (2013) *Housing and Housing Finance—A Review of the Links to Economic Development and Poverty Reduction*. 362. Available at: www.adb.org/ (Accessed: June 19, 2025).
- Donkor-hyiaman, K.A. (2016) “Another Look at Housing Finance in Africa Housing Financing,” *International Journal of Housing Markets and Analysis*, Vol. 9(No. 1), pp. 20–46. Available at: <https://doi.org/10.1108/IJHMA-11-2014-0048>.
- Egino, M. (2023) *Housing finance methods in urban Tanzania: The case of households in Kinondoni Municipality, Dar es Salaam, Tanzania*. KTH Royal Institute of Technology and Ardhi University.
- Ferguson, B. and Smets, P. (2010) “Finance for Incremental Housing; Current Status and Prospects for Expansion,” *Habitat International*, 34(3), pp. 288–298. Available at: <https://doi.org/10.1016/j.habitatint.2009.11.008>.
- Gardner, D. (2008) *Housing Microfinance in South Africa: Status, Challenges and Prospects*. Available at: <http://www.finmark.org.za/pages/Research-and-Publications/Research-Reports.aspx?>
- Groves, R. (2004) “Challenges Facing the Provision of Affordable Housing in African Cities,” *Housing Finance International*, 18(4), p. 26.
- Habitat For Humanity (2014) *Step by Step: Supporting Incremental Building Through Housing Microfinance*.
- Hawtrey, K. (2009) “Affordable Housing Finance,” in B. Jan, van L. Paul, and S. Peer (eds.) *Affordable Housing in the Urban Global South: Seeking Sustainable Solutions*. Earthscan/Routledge, pp. 40–54. Available at: <https://doi.org/10.1057/9780230244368>.
- Hlekane, N. and Okoro, C. (2024) “Sustainable Financing of Housing Conversions for Low-income Earners: A Review of selected African Countries,” *AfRES 2024 Conference Proceedings*. Livingstone, Zambia.
- International Finance Corporation (2024) *IFC Scaling Housing Finance in Africa*. Available at: <https://www.ifc.org/en/insights-reports/2023/ifc-scaling-housing-finance-in-africa> (Accessed: April 2, 2026).
- Iyandemye, S. and Barayandema, J. (2018) “Mortgage Finance Market and Housing Affordability in Urban Areas in Rwanda: A Case of Kigali City.” Available at: <https://doi.org/10.32873/unl.dc.jade7.1.4>.
- Jones, A. and Stead, L. (2020) “Can People on Low Incomes Access Affordable Housing Loans in Urban Africa and Asia? Examples of Innovative Housing Finance Models from Reall’s Global Network,” *Environment and Urbanization*, 32(1), pp. 155–174. Available at: <https://doi.org/10.1177/0956247819899557>.
- Jumbe, C.W. and Manya, M. (2020) “Challenges and Opportunities of Housing Finance in Sub-Saharan Africa. A Literature Review on Urban High-Rise Residential Housing Name Address Email Phone Number.” 21st Annual African Real Estate Society Conference.
- Klug, N., Rubin, M., & Todes, A. (2013). Inclusionary housing policy: a tool for re-shaping South Africa’s spatial legacy?. *Journal of Housing and the Built Environment*, 28(4), 667-678. Available at: <https://doi.org/10.1007/s10901-013-9351-8>.

- Kongoro, E. and Owino, B. (2016) "Factors Affecting the Supply of Housing Credit in Kenya: A Study of Financial Institutions," *International Journal of Economics and Finance*, 5(3), pp. 1–13.
- Kroeker-Falconi, C., & Kettle, R. C. (2021). Compendium of best practices for housing in Africa. *Habitat for Humanity*, 2021-03.
- Leal Filho, W. *et al.* (2022) "Social Innovation for Sustainable Development: Assessing Current Trends," *International Journal of Sustainable Development & World Ecology*, 29(4), pp. 311–322. Available at: <https://doi.org/10.1080/13504509.2021.2013974>.
- Madell, C. (2024) "Inclusionary Housing Policy and Practice in South African Cities: Planning as a Spatial Transformation Tool," *Journal of Housing and the Built Environment*, 40(2), pp. 741–766. Available at: <https://doi.org/10.1007/S10901-024-10149-Y/FIGURES/3>.
- Madrazo, F. *et al.* (2025) "Trends, Methods, Drivers, and Impacts of Housing Informalities (HI): A Systematic Literature Review," *Urban Science* 2025, Vol. 9, Page 101, 9(4), p. 101. Available at: <https://doi.org/10.3390/URBANSI9040101>.
- Marais, L., Ntema, J. and Venter, A. (2008) "State Control in Self-Help Housing: Evidence From South Africa State Control in Self-help Housing: Evidence from South Africa Bloemfontein 9300: Centre for Development Support.
- Mehlomakulu, T. and Marais, L. (1999) "Dweller Perceptions of Public and Self-Built Houses: Some Evidence from Mangaung (Bloemfontein)," *Journal of Consumer Sciences*, 27(2), pp. 92–102.
- Merrett, S. and Russell, K. (1994) "Non-Conventional Finance for Self-Help Housing," *Habitat International*, 18(2), pp. 57–69. Available at: [https://doi.org/10.1016/0197-3975\(94\)90050-7](https://doi.org/10.1016/0197-3975(94)90050-7).
- Mokgadinye, S.A. *et al.* (2012) "Incremental Housing Process: A Viable Option for South Africa?," *Journal of Public Administration*, 47(2).
- Muellbauer, J. and Murphy, A. (2008) "Housing Markets and the Economy: the Assessment," 24(1), pp. 1–33. Available at: <https://doi.org/10.1093/oxrep/grn011>.
- Muller, A. and Mitlin, D. (2007) "Securing Inclusion: Strategies for Community Empowerment and State Redistribution, Environment and Urbanisation," 19(March), pp. 425–439. Available at: <https://doi.org/10.1177/0956247807082822>.
- Ojo-Aromokudu, J.T. and Loggia, C. (2017) "Self-Help Consolidation Challenges in Low-Income Housing in South Africa," *Journal of Construction Project Management and Innovation*, 7(1), pp. 1954–1967.
- Oladeji, J. D., Zulch, B., & Yacim, J. A. (2023). Implications of macroeconomic risks on NHFC'S incremental housing finance in South Africa. *International Journal of Housing Markets and Analysis*, 16(7), 80-102..
- Prime-Stat PVC Ltd (2018) Access to long-term capital: The Case of Ghana Home Loans.
- Pugh, C. (2001) "The Theory and Practice of Housing Sector Development for Developing Countries, 1950-99," *Housing Studies*, 16(4), pp. 399–423. Available at: <https://doi.org/10.1080/02673030120066527>.
- Ryszawska Bożena (2024) *Financing | Germany | Global Sustainable Buildings Guide*|. Available at: <https://resourcehub.bakermckenzie.com/en/resources/global-sustainable-buildings/europe-middle-east-and-africa/germany/topics/financing> (Accessed: September 16, 2025).

- Swilling Mark *et al.* (2018) “Rethinking Incremental Urbanism: co-production of incremental informal settlement upgrading strategies,” *Research for Development*. Springer, pp. 449–461. Available at: https://doi.org/10.1007/978-3-319-61988-0_34.
- Teye, J.K., Teye, I. and Asiedu, M.O. (2013) “Financing Housing in Ghana: Challenges to the Development of a Formal Mortgage System,” *Journal of Housing and the Built Environment*, 30(1), pp. 1–16. Available at: <https://doi.org/10.1007/s10901-013-9376-z>.
- Van Noorloos, F. *et al.* (2020) “Incremental Housing as A Node for Intersecting Flows of City-Making: Rethinking the Housing Shortage in the Global South,” *Environment and Urbanization*, 32(1), pp. 37–54. Available at: <https://doi.org/10.1177/0956247819887679>.
- World Bank (2011). *Developing Kenya’s Mortgage Market*.
- Tomlinson, M.R. (2007) “A Literature Review Sub-Saharan Africa Commissioned by FinMark Trust,” *Finance* [Preprint].
- UNEP (2025) *Not Just Another Brick in The Wall: The Solutions Exist - Scaling Them Will Build on Progress and Cut Emissions Fast. Global Status Report for Buildings and Construction 2024/2025*. United Nations Environment Programme. Available at: <https://doi.org/10.59117/20.500.11822/47214>.
- UN-Habitat (2005) *Financing urban shelter: Global report on human settlements 2005, United Nations Human Settlements Programme (UN-Habitat)*. Available at: <https://doi.org/10.4324/9781849771337>.
- World Bank (2025) *The World Bank Financial Inclusion For Households And Msmes In The Waemu (P181251)*.
- World Bank (2015) *Stocktaking of the Housing Sector in Sub-Saharan Africa Summary Report*. Available at: <https://www.worldbank.org/content/dam/Worldbank/document/Africa/Report/stocktaking-of-the-housing-sector-in-sub-saharan-africa-full-report.pdf>
- World Commission on Environment and Development (1987) *Report of the World Commission on Environment and Development: Our Common Future*.



Understanding Financing and Decision-Making of Small-Scale Property Developers: The Case of South Africa

Carsten Lausberg^{1*} (<https://orcid.org/0000-0003-1936-2039>), François Viruly² (<https://orcid.org/0000-0003-0361-0309>), Björn-Martin Kurzrock³ (<https://orcid.org/0000-0001-5176-9862>), Dayni Sanderson⁴ (<https://orcid.org/0000-0001-6066-6574>) and Max Hammer⁵ (<https://orcid.org/0009-0003-5898-003X>)

¹ Campus of Real Estate, Nürtingen-Geislingen University, Geislingen, Germany

^{2,4} Urban Real Estate Research Unit, Department of Construction Economics and Management, University of Cape Town, Cape Town, South Africa

³ Real Estate Studies, RPTU University Kaiserslautern-Landau, Kaiserslautern, Germany

⁵ Carinthia University of Applied Sciences, Spittal an der Drau, Austria

To cite this article: Lausberg, C., Viruly, F., Kurzrock, B.M., Sanderson, D. and Hammer, M. (2026) Understanding Financing and Decision-Making of Small-Scale Property Developers: The Case of South Africa, *Journal of African Real Estate Research*, 11(2), pp. 121-145. DOI: 10.15641/jarer.v11i1.2077

Abstract

There is growing evidence that small-scale property developers play an important role in delivering affordable housing units globally and especially in emerging economies such as South Africa. These developers are typically entrepreneurs who develop a few housing units to create income and wealth for themselves. The success of their projects is, however, constrained by the availability of finance, the institutional environment in which these developers operate and the products offered by the financial market. While financing for end-users is increasingly being addressed, developer finance has received less attention in emerging countries and is often unavailable. The objective of this research is to understand how small-scale property developers in South Africa make financing and other decisions, so that more effective financial instruments, support programmes and policy interventions can be designed. Our study employed a mixed-methods design based on two surveys: First, developers were interviewed, for example, about which financial instruments they use. Bankers and other market experts were then asked, for example, which financial instruments they consider suitable. The eleven interviews with the developers were analysed qualitatively, whilst the seven questionnaires completed by the experts were analysed quantitatively. The result suggests that the decision processes of small-scale developers are simpler than recommended in the literature and that they use fewer financial instruments than recommended by experts. The findings highlight the need for more accessible, context-appropriate development finance mechanisms, as well as supportive regulatory frameworks and trustworthy planning environments, to enable small-scale developers to contribute more effectively to affordable housing delivery.

*Corresponding author's email address: carsten.lausberg@hfwu.de

©2026 The Author(s). Published by UCT Library. This is an open-access article under the CC BY 4.0 license. <https://creativecommons.org/licenses/by/4>

Keywords: *South Africa, housing finance, property development, decision-making*

1. Introduction

South African cities continue to experience rapid population growth and rising housing demand (City of Cape Town, n.d.). At the same time, the public sector is no longer able to deliver or subsidise affordable housing units at its previous scale (Department of Human Settlements, 2020), deepening the country's housing crisis. A constrained fiscal environment and the absence of large and medium-sized developers have exacerbated the situation and increased opportunities for smaller property developers. Small-scale development, although crucial in many countries, is still under-researched. It can be considered as a form of entrepreneurship, but the literature has hardly addressed small-scale developers yet, either in developed or in developing countries. Existing studies on small-scale property developers largely focus on their contribution to affordable housing delivery and the regulatory constraints they face, while comparatively little attention is being paid to how they make investment and financing decisions (McGaffin et al., 2019; Scheba et al., 2022). Given the growing reliance on these developers to expand affordable housing supply in South Africa, understanding the factors that shape their decision-making is essential for designing effective financial instruments and policy interventions.

This article examines the role of small-scale property developers in addressing South Africa's affordable housing backlog. These developers are distinguished by the chosen market segments, the size and structure of their organisations, the types of development they undertake, and their financing options (Scheba et al., 2022). As larger actors have withdrawn, small-scale developers have stepped in, but their efforts are hindered by complex, opaque and costly regulatory barriers (Turok, 2025). Navigating these requires professional intermediaries, raising project risks, threatening financial viability, and limiting access to funding.

Our objective was to understand how small-scale developers in South Africa make financing and other decisions, for example, regarding the development process. We analysed their characteristics, decision-making processes and relationships with financial institutions. We also examined whether public policy has framed the concept of "developer" in ways that misrepresent reality.

It should be underlined that the terminology is inconsistent. Small-scale developers are sometimes referred to as micro developers (McGaffin et al., 2019; Scheba et al., 2022), emerging developers (NHFC National Housing Finance Corporation, 2025), or self-builders (Bredenoord & van Lindert, 2014). We adopted Özogul & Tasan-Kok's (2020) investor classification, which considers spatial scale, size, and social composition; investment objects and finance; and investment and social behaviour. Applied to property development and the case of South Africa, we defined small-scale developers as private individuals who develop a small number of affordable housing units for rent or for sale in their own communities, employing few or no employees, with the intention of creating income and wealth for themselves. This definition excludes, among others, private homeowners who add a shack to their backyard at one end of the spectrum and large property development companies with hundreds of employees who build large numbers of houses in several locations at the other end.

The article proceeds as follows: Section 2 reviews the literature and develops a theoretical framework. Section 3 outlines the methodology, Section 4 presents empirical findings, Section 5 discusses results in light of the theory and Section 6 concludes with policy recommendations.

2. Theoretical framework and literature review

This section reviews studies on small-scale property developers in South Africa and internationally and introduces theoretical frameworks relevant to their decision-making. While no framework directly addresses small-scale developers in emerging economies, insights can be drawn from systems theory, decision theory and financial theory.

2.1. *Small-scale developers*

Apartheid's legacy shapes South Africa's housing system: segregated "townships" distant from economic centres, limited entrepreneurship in housing and concentrated lending (Mahajan, 2014). Despite post-apartheid policies aimed at providing public housing for lower-income groups (e.g., Massyn et al., 2015), migration and urbanisation have outpaced new supply. Informal dwellings remain widespread, with residents facing poor services, insecure tenure and restricted access to finance (Marais & Cloete, 2017).

Small-scale developers—especially in townships—are increasingly vital to addressing the housing deficit. They are mainly homeowner-developers, who build on their own property with personal resources or second mortgages, and enterprise-developers, who pursue profit and replication with external funding (McGaffin et al., 2019). The main barrier for both is raising capital for property acquisition and upfront building costs (Chiwetu, 2019; Scheba & Turok, 2020). Traditional banks have lending criteria that favour established developers with proven track records, high equity and perceived lower-risk projects, and alternative lenders charge extremely high interest rates (Scheba & Turok, 2020; Spiropoulos, 2019). Only a few development finance institutions, such as Trust for Urban Housing Finance (TUHF), have created alternative financing models (Scheba & Turok, 2020).

Regulatory and administrative processes—such as land-use approvals—are often ill-suited to township contexts, adding costs and delays (Scheba et al., 2022; Turok, 2025). Small-scale developers, who typically have not received formal training, lack construction management and other skills and cannot afford to hire specialists, and therefore suffer more than professionals (McGaffin et al., 2019). In recent years, this problem has been addressed by NGOs such as Development Action Group (DAG) through training, advice, and direct support (Turok, 2025). Developers face relatively high property, location, market and management risks, which are heightened by social tensions, personal financial risk and unreliable building contractors (McGaffin et al., 2019; Spiropoulos, 2019).

Even though they may take different forms, small-scale developers exist in many countries (Kavaarpuo et al., 2023; Osunsan et al., 2024; Haas, 2021). Even in highly developed countries, they help to provide affordable housing (Goodyear, 2019).

2.2. *Systems approach*

Developers are embedded in a complex web of relationships with their environments. A systems approach can capture these relationships. Graaskamp (1972, p. 515) states that sustainable property development is not only about economic feasibility but about fitting "the project to the land and the irrational needs of man". Trevillion (2002) expands this to a systems perspective: he argues that although new developments begin only when a project promises a profit, there are other elements to consider, both inside and outside the system. For example, investor preferences and occupier requirements must be considered. As shown in Figure 1, this can involve causal loops that eventually affect the original cause, creating feedback mechanisms that drive the system's behaviour, either reinforcing or balancing previous outcomes.

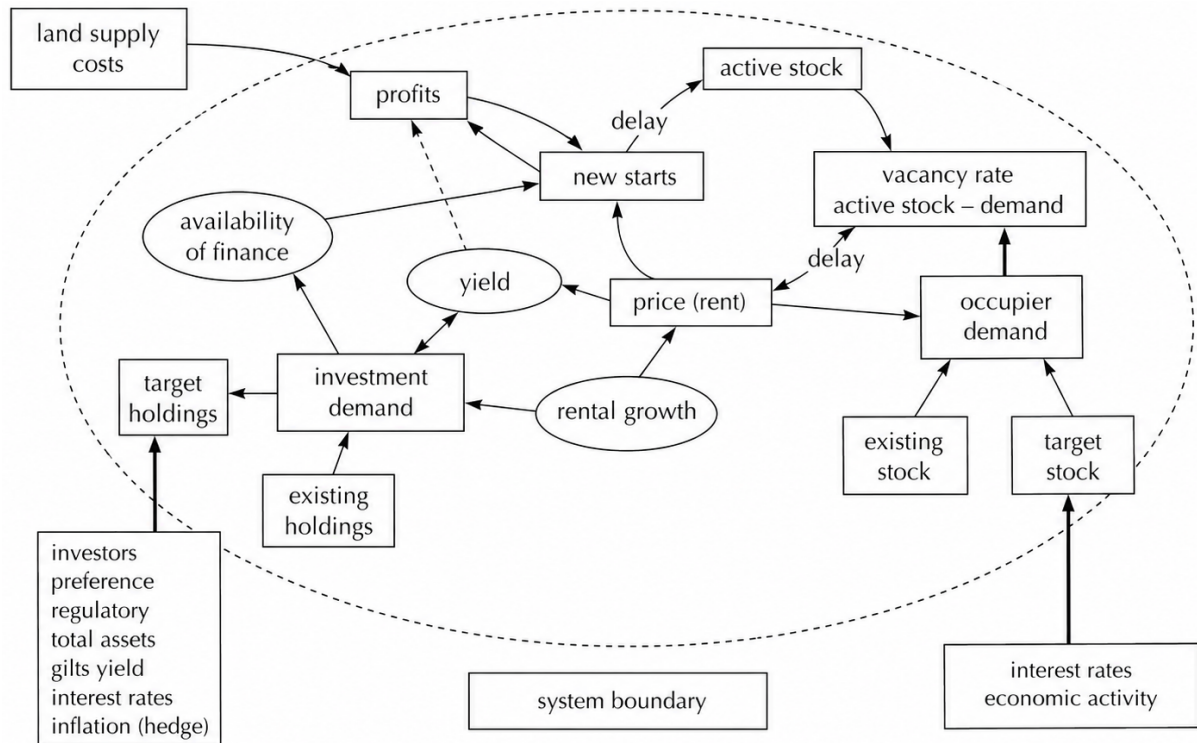


Figure 1: The development, ownership and occupation system.

Source: Trevillion, 2002, p. 184

Developers are at the centre of the real estate game and interact with all actors and subsystems, such as suppliers and employees (Figure 2). The system comprises a technological sphere (e.g., construction), an economic sphere (e.g., feasibility) and a social sphere (e.g., affordability) and is embedded in the natural environment. These can vary according to place, time and culture. Furthermore, the system can adapt through self-organisation and evolution, and individual stakeholders may enter and leave over time (Trevillion, 2002, pp. 188–191; referring to Allen, 1997).

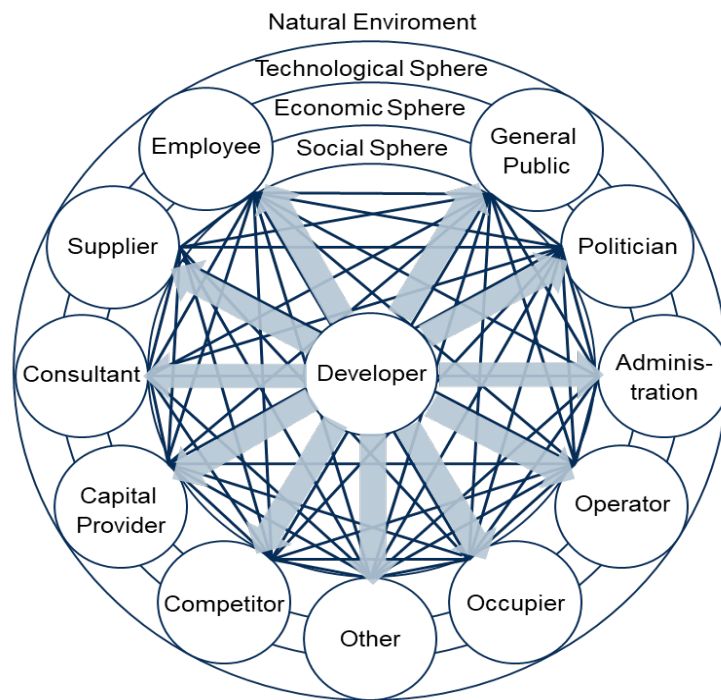


Figure 2: The Developer's Environment.

Source: Own illustration based on Ulrich, 2001, p. 48; cf. Robin, 2022, p. 21

The role small-scale developers can play in a property market (and ultimately the system's outcome) depends on competition from larger developers and on links to other elements, such as the banking sector.

There are common themes and issues typically associated with developments. Property developers constantly face the challenge of meeting urban planning requirements without jeopardising the economic viability and financing of their project. There is a complex interplay between institutional factors (i.e., norms, regulations and routines) and agential factors (i.e., understandings, values, resources and relationships) in planning processes due to inherent tensions between individual and collective interest (Calderon & Westin, 2019, p. 24; Tait, 2011, p. 168). Property developments, the more of them there are, require a great deal of knowledge and involve many stakeholders and experts who connect to the different spheres and the environment (Robin, 2022, p. 206; compare Figure 2). Developers are sometimes criticised for using informal power strategies to circumvent local planning systems (Fox-Rogers & Murphy, 2014). While adherence to accepted procedural standards and norms is important, a coherent and trustworthy system must be established based on intersubjective understanding and shared values (Tait, 2011, p. 169). Given the long-term nature of property, there are also growing concerns about architectural quality and, more broadly, about Environmental, Social, and Governance (ESG) compliance (van der Kuil & Kurzrock, 2026).

2.3. Decision theory

Decision theory comprises normative (ideal rational behaviour), descriptive (actual behaviour) and prescriptive (practical improvements) approaches. Most property research takes a *normative approach*, particularly in investment (e.g., Farragher and Kleiman, 1996; Parker, 2014). Literature on property development decisions is scarce. Examples include timing models (Capozza & Li, 2002), evaluation procedures (Liapis et al., 2011), shareholder models (Caputo, 2013) and decision support systems (Montibeller et al., 2006). Apart from that, there are several

texts on the different decisions along the development process. These range from textbooks based on serious research (e.g., Peiser et al., 2022; Reed, 2021) to “how-to-get-rich” guides (e.g., Child & Clapson, 2022; Leeds, 2021), which are not considered in this article.

Descriptive decision theory shows that decision-makers behave differently from what is suggested by normative (neoclassical) theory. Most papers address investment decisions (e.g., Adair et al., 1994; French, 2001; MacCowan & Orr, 2008), but some of their insights are nevertheless valuable for our research. One example is Gallimore et al. (2000), who interviewed 13 British “small” property companies. Although the smallest of these companies was bigger than a typical South African small-scale developer, some of the findings may be transferable:

Smaller companies [...] concentrate on local demographic and economic data that help with their active management strategies [...] and focus on one investment opportunity, as it becomes more viable, rather than continually seeking better opportunities. [...] Investors also place heavy weight on private information passed on through market contacts, potentially leading to availability bias and overreaction. (Gallimore et al., 2000, pp. 610–611)

The authors conclude that small companies do not follow normative models when making investment decisions. Similarly, Roberts and Henneberry (2007) find that the investment process in practice is much simpler than proposed by normative theory. The problem is that using shortcuts and heuristics instead of detailed processes and rational thinking “can lead to biased or inefficient outcomes” (Roberts & Henneberry, 2007, p. 302).

Examples for specific property development research include Healey (1991, 1992), who studied projects in Venezuela and England, and Zöllig and Axhausen (2012), who interviewed property developers in Switzerland. One interesting finding is that Swiss developers’ decision-making is heavily influenced by their purpose and professionalism, for example, in selecting information sources. Robson and Greenhalgh (2023) conclude, based on interviews with seasoned UK developers, that their decision-making is often biased and intuitive, even though the interviewees claimed to make rational, evidence-based decisions. Heurkens and Hobma (2014) report that informal cooperation between developers and town planners is crucial in the Netherlands and in the UK. Together, these descriptive studies emphasise that development processes require an understanding of the complex interplay of actors, institutions, markets and structural forces that cannot be captured in a purely economic model (Section 2.2).

Another example is the assessment of risk and return. Returns are often measured using simple indicators, such as development margins; advanced indicators, such as the internal rate of return, are rare (Crosby et al., 2020; Moorhead et al., 2024). The same is true for risk measures. This is partly because developments carry less risk (= known probability of an uncertain event) and more uncertainty (= unknown probability) compared to other property investments, which means that subjective assessments and rules of thumb are more justified.

Prescriptive models combine normative ideals with observed practice. Parker (2014), for example, first establishes a normative model for property investment decisions based on the literature, then constructs a descriptive model based on expert interviews, and finally proposes a prescriptive model informed by both. Major contributors in this field are Diaz (1990) and French and French (1997), but several of the aforementioned authors also fall into this category. Most of the literature focuses on particular decisions, such as location (Mwando et al., 2024) while only a few authors study decision-making as a whole. Pommer (2007) shows that decision support tools can help to make decisions more rational and less intuitive. Atherton et al. (2008) developed a tool based on knowledge of decision-making deficits in practice to improve the

user's understanding of possible outcomes. Lastly, Gehner (2008) designs an investment decision process based on an in-depth analysis of three property development companies.

Understanding how different types of developers make decisions is important if policy formulation is to be effective. Adams et al. (2012) critique policy reliance on the “notional property developer”—a rational, profit-driven actor who behaves predictably in response to planning rules and incentives. This concept, often used to design interventions, overlooks real-world diversity and constraints, including the specific issues that small-scale developers face. In practice, property developers come in many shapes, with different goals, risk appetites, constraints and behavioural characteristics shaped by local market conditions and personal experience.

2.4. Financial theory

Financial theory deals with decisions around the uses of capital (= investment, covered in Section 2.3) and the sources of capital (= finance). The main decisions in finance concern the capital structure and the types of capital. The optimal *capital structure* is more important for large than for small firms. This is also true for property developers. Squires et al. (2016) find a tendency towards a greater blend of financial instruments in large-scale projects by large developers. Unlike them, small-scale developers have few options: their internal financing is often limited to the profits from the last project, they cannot obtain bank loans because few banks serve this market segment, and they lack access to the capital market. According to the pecking order model, firms prefer internal financing over debt and equity, whereas the trade-off model weighs the costs and benefits of the financing alternatives. International empirical evidence appears mixed (e.g., Echeboba & Ananwude, 2016; Sharma, 2018), largely because context matters (Beck et al., 2008). As a result, Max and Spolander (2021) reject both models, arguing that developers cannot reach the optimal capital structure due to banks' high pre-sales requirements and their preference for low leverage. In their study, Swedish property developers named the capital needed to start the project and the lack of bridging loans as their biggest financial problems (Max & Spolander, 2021, p. 46). In the same vein, Gallimore et al. (2000, p. 609f.) argue that, contrary to normative models, developers are usually forced to secure the investment before the financing.

The *types of capital* are more relevant for small firms. Several textbooks on property development and property finance (e.g., Peca, 2009; Long, 2011; Squires et al., 2021; Peiser et al., 2022; Rowley & Roche, 2024; Brueggeman & Fisher, 2024) deal with this subject. They tend to focus on conventional financing, such as construction loans from banks. However, forms of finance, especially important for very small enterprises in developing countries, such as peer-to-peer lending and loans from family or friends, are under-researched (Nguyen et al., 2021, p. 22). In particular, informal financing, including crowdfunding, could be an alternative (Lee & Persson, 2015; Chikalipah & Makina, 2019; Mago & Modiba, 2022; Baldwin, 2017).

The same is true for microfinance, which addresses financial services for low-income individuals and small businesses. It can take several forms, for example, “housing microfinance” (mostly non-mortgage loans for low-income households to build or improve homes) and “backyarding” (microloans to enable homeowners to build additional rental units, creating both housing and income) (Brueckner et al., 2018; Grubbauer & Mader, 2021). Some forms involve public-private collaboration, for example, when local governments support community initiatives in informal settlements or partner with microfinance institutions to provide loans. This connects to the entrepreneurial finance literature, which has not yet focused on small-scale developers.

There are many more ways to finance sustainable property development in South Africa. Some of them are well-established, for example, loans from development finance institutions (DFI), while others work well in other countries but are rarely used there, for example, cooperative banks (Mushonga et al., 2019), revolving funds (Wasser et al., 2020), or land-based financing (Berrisford et al., 2018).

A comprehensive list of the most common financing options, as reported in the academic and practical literature, is included in Appendix 1. Bonds, stocks, and other capital market instruments that are unsuitable for small companies are not listed.

Determinants of *financing decisions* extend beyond costs and other hard facts to institutional context, behavioural factors, organisational characteristics and other soft factors. There are indications in the literature on small and medium-sized enterprises (SMEs) that intangible factors may be more important. Rao and Kumar (2018) show that in SMEs, financing choices are strongly shaped by the personal traits and attitudes of owners or managers. These factors include the owner's ethnic background (Nguyen & Canh, 2021), gender (Osunsan et al., 2024), age, level of education and the emotional costs associated with bankruptcy (Briozzo et al., 2016). Furthermore, Nguyen and Canh (2021) show that location-specific factors, such as the quality of local governance, and firm-level characteristics, including social capital, influence the financing decisions of small businesses. Other firm-specific characteristics include growth opportunities, internal resources and the firm's age (López-Gracia & Sogorb-Mira, 2008).

In summary, significant knowledge gaps exist regarding the behaviour of property developers, as research often prioritises normative investment theory over the diverse goals and constraints that challenge the "notional property developer" assumption. Empirical evidence remains sparse regarding the direct outcomes of localised training initiatives and the transferability of international development models to the unique South African context. Within a systems framework, the specific "compromise" dynamics between regulatory planning requirements and economic viability require deeper investigation. The applicability of traditional capital structure models is further limited by institutional requirements that prevent developers from reaching a theoretically optimal financing mix. Finally, despite their practical importance, informal and micro-financing mechanisms remain significantly under-researched in the context of property development.

3. Methodology

This study employed a mixed-methods design to combine the strengths of qualitative and quantitative research and thus provide a more comprehensive understanding of social phenomena (Bryman, 2016). In-depth interviews with small-scale developers and consultants in this field were used to uncover key factors influencing developers' decisions. The qualitative survey was supplemented by a quantitative survey of financial experts, who were asked to assess the prevalence and suitability of various financial instruments. It was hypothesised that small developers are not fully aware of the available tools that are suitable for them.

Guideline-based expert interviews were selected as the qualitative research method. This approach enabled an analysis of how small-scale developers make decisions regarding new projects. It had the advantage of obtaining expert opinions and experiences that were difficult to gather from other data sources (Starr, 2014). The semi-structured interview format ensured consistency while allowing for flexibility in discussions (Bryman, 2016; Starr, 2014).

The study population comprised small-scale property developers active in South Africa's affordable housing sector. Participants were selected from a group of former students of TUHF's property development training programme. The selection criteria included:

- Experience with small-scale property development projects in South Africa.
- Involvement in securing financing for projects.
- A willingness to share professional experiences and insights.

To reduce sampling bias, participants were drawn from different regions, backgrounds and levels of experience. The survey was concluded once a satisfactory level of data saturation had been reached, and further interviews were expected to yield only marginal improvements in the information level. The sample size of eleven interviewees, while relatively small, was consistent with qualitative research practice, where the objective is to obtain rich and detailed insights rather than statistical representativeness. For example, Guest et al. (2006) find that thematic saturation often occurs within the first twelve interviews, while Patton (2015) argues that the quality of qualitative findings depends primarily on the information richness of the selected cases.

Data was collected between 17 April and 17 May 2024⁶. A pilot interview was conducted to ensure comprehension and alignment with the research objectives. Ten interviews were conducted via Microsoft Teams, one in person. Interviews averaged 35 minutes. The interviewees were encouraged to engage in open discussions, allowing for a richer exploration of relevant topics. Interviews were recorded, transcribed, anonymised and reviewed for completeness and consistency (Starr, 2014). Transcriptions were analysed using thematic analysis, employing deductive and inductive coding (Bryman, 2016). This ensured a comprehensive understanding of financing strategies and decision-making processes. Ethical guidelines were followed throughout the research. Ethical clearance was secured from the University of Cape Town before the interviews, and the participants were fully informed about the study's objectives, confidentiality measures and their right to withdraw at any time.

For the quantitative survey, the list of financing options in Appendix 1 was transformed into an online questionnaire. These financing options were drawn from the literature and largely reflected the financing instruments generally available in South Africa and internationally. It contained two questions: (1) Which of these financing options are used by and suitable for small-scale developers in South Africa? (2) Are you aware of other financing options that are currently used by or could be suitable for small-scale developers in South Africa? The target group was experts in property development finance in South Africa. A social media and general internet search was conducted to identify suitable individuals who, for example, had published on this topic, were cited as experts in press articles, or worked at banks and other institutions. The link to the survey platform was sent by email to about 200 experts, with a request to forward it to other experts. Due to this snowball sampling, the response rate was unknown.

4. Empirical findings

Following a description of the sample, this section primarily presents the results of the qualitative survey, broken down along the lines of the interview guide, such as the development process and sources of capital. In section 4.3, these are compared with the quantitative study's results.

⁶ The interviews were conducted in 2024. The interval between data collection and publication reflects the time required for data transcription, analysis, interpretation, manuscript preparation, and peer review. The overall conditions for small-scale developers in South Africa have not changed significantly in the meantime.

4.1 Sample description

Table 1 presents an anonymised summary of participant backgrounds and experience. Usually, small-scale developers also had other occupations and the potential to turn their careers into property. The interviewees' experience ranged from 2 to 22 developed housing units.

Table 1: Characteristics of interviewees; source: authors' survey

Interviewee	Personal Background	Experience	Development Type
I1	Travel and tourism	18 units	New construction
I2	Real estate agent	3 units	Renovation
I3	Finance	2 units	New construction
I4	Sports career	(not disclosed)	(not disclosed)
I5	(not disclosed)	20 units	Renovation
I6	Quantity surveying	18 units	Renovation
I7	City municipal	22 units	Renovation
I8	Property manager (before: security and cleaning)	8 units	Renovation
I9	Detective	7 units	Renovation
I10	(not disclosed)	(not disclosed)	(not disclosed)
I11	(not disclosed)	(not disclosed)	(not disclosed)

4.2 Development process

One of the first steps in the development process is usually the analysis of a target property's market and location. The research suggests that small-scale property developers employed various methods to do so (Figure 3). Some relied on property agents for insights, as noted by interviewees I2, I6, and I7, while others preferred to conduct their own analyses by visiting sites in person (I5, I9). Developers also used online resources (I4) and, in some cases, surveyed residents to gather relevant information (I1). Those with prior professional experience in property or finance, such as I3 and I8, tended to incorporate advanced considerations, such as market trends and migration patterns, into their analyses.

The proximity of a development to familiar areas is a significant factor for many developers. Interviewees I4, I5, and I7 highlighted that selecting a location close to their residence or workplace enabled easier oversight and enhanced their confidence in managing the project.

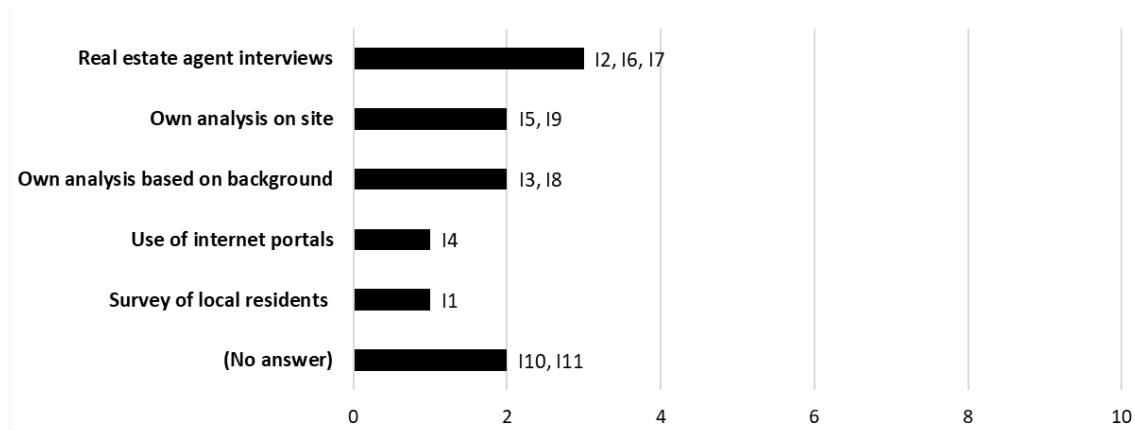


Figure 3: Market and location analysis types used by interviewees (n=11); source: authors' survey

Property analysis played a crucial role in the decision-making process, with developers assessing risks, renovation needs and the overall feasibility of a project. The majority of small-scale developers prioritised renovations over new builds, as renovations were perceived to entail lower financial risk and to allow for incremental project development (see Table 1). Six of eight small-scale developers reported pursuing renovations, while only two opted to develop from scratch.

When selecting properties for renovation, interviewees used various approaches. For example, I7 explicitly stated that renovating existing properties is a more manageable approach for less-experienced developers, thereby reducing complexity and financial exposure. Some, like I6, worked closely with architects to identify opportunities for value appreciation, while others, such as I8, compared multiple properties before making a decision. Additionally, feasibility studies helped developers evaluate factors such as the condition, age and potential uses of a property, minimising risks (I3, I7).

Developers also differed in their long-term strategies. Some aimed to use the properties as stable income streams that could be passed down to their children, while others planned to sell soon after completion and reinvest the profits elsewhere. The diversity of strategic approaches highlights the absence of a standardised investment model. However, strategic planning remained essential, ensuring project sustainability and profitability. Many developers strived to balance financial success with social impact, emphasising the need to create affordable, safe and high-quality housing within their communities.

4.3 Sources of funding

Limited support from traditional banks presented a major obstacle to small-scale property developers operating in informal township markets. Banks frequently refused to grant loans due to the perceived high risks associated with these markets and developers' insufficient financial track records. Many developers also lacked sufficient equity to secure financing through traditional channels. However, private institutions in South Africa have begun offering tailored financing solutions, training and support to address these challenges. Unlike banks, these institutions often prioritised project feasibility over the borrower's financial background and offered more flexible credit terms.

Nevertheless, these programmes required developers to raise at least 20% in equity, which was a significant challenge for many. Interviewees I2, I6, I7 and I9 reported struggling to meet this requirement. To do so, some developers sold existing assets (I6), utilised personal savings (I9),

borrowed from friends and family (I4, I9), or even withdrew from their pensions (I3, I6). As I9 explained, “the skin in the game [equity] was also a bit of a challenge” because developers needed substantial capital available to contribute to a project. To proceed, he scaled down the project and contributed approximately R150,000 of his own funds before obtaining third-party finance. Similarly, I6 explained that they met the equity requirement by drawing on personal retirement savings: “I took my equity from my pension ... So, my development is my pension.”

Mezzanine financing served as an alternative when the required equity could not be fully raised. However, such financing options came with significantly higher interest rates, further increasing the financial burden on developers.

One notable programme was uMaStandi, a division of TUHF, which provided tailored financing solutions that prioritised project feasibility over the developer’s financial background. In addition to financing, uMaStandi offered coaching to help developers navigate regulations and improve project management skills. The programme also provided support to ensure compliance with municipal regulations, helping inexperienced developers complete their projects more efficiently and legally.

Some of the insights from the interviews corresponded to the results of the quantitative survey of finance experts. Seven questionnaires were completed (see Appendix 2). Of course, it is not possible to statistically test the hypotheses with such a small number of responses. But at least the results showed a fairly clear trend: The financing options most frequently mentioned were mortgage loans as debt instruments, profit-sharing agreements as mezzanine instruments, joint ventures, and investments from family and friends as equity instruments. The interviewees mentioned none of these. Among the least frequently ticked items of the questionnaire were crowdfunding and crowdlending. Interestingly, the correlation between the financing options in use and believed to be suitable was close to zero (Spearman's rank correlation coefficient = 0.09). Joint ventures, for example, are both common and appropriate—according to the experts—whereas the dissolution of retirement assets was regarded as common but unsuitable. The survey also revealed evidence of other financial options that could be useful in the future. Apart from loans from credit cards and telephone companies, which fall under the broader category of credit lines, new internet-based businesses that provide loans to SMEs and offer revolving credit facilities were mentioned.

4.4 Rationale Behind Financing Choices

The choice of financing method was largely shaped by the limitations of traditional banking systems and the flexibility offered by specialised programmes such as uMaStandi. Developers appreciated the tailored support provided by these programmes, particularly their emphasis on project feasibility and advisory services. For inexperienced developers, the “advice and handholding” (I8) offered by uMaStandi is crucial in navigating the complexities of property development. This was alluded to by interviewees I1, I4, I7 and I8. As interviewee I4 noted,

If there's one thing about uMaStandi, it's not just about getting the finance; it's the support. Because with all the challenges that I was going through, they were there, they were assisting me. I mean, if you have a delay, they would give you a payment break. They would review the financial structure and try to restructure it so you'd be able to pay. [...] If you need an engineer, they have people that they work with [...].

Developers’ financing choices were also influenced by the need for flexibility and the desire to avoid bureaucratic hurdles (I1, I4, I6, I7). As I1 remarked, TUHF considered applicants as individuals and had more flexible criteria, making financing more accessible. Therefore,

alternative financing programmes, despite higher interest rates and equity requirements, may provide a practical and viable option better suited to the realities of South African township developers.

4.5 Risks

Small-scale property developers faced a variety of risks. Some of them were unique to township property investment and required careful consideration by the developers before they committed to a new project. The main risk categories included financial risks, lack of knowledge, crime, unreliable project participants, and political risks.

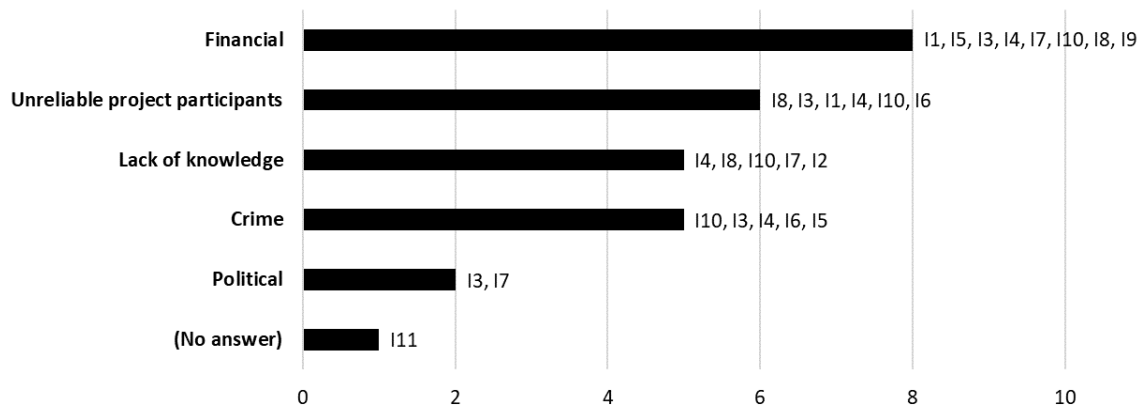


Figure 4: Risk categories mentioned by interviewees (n=11); source: authors' survey

- Financial risks were the most significant concern among developers, with eight of the interviewees stating that financial uncertainty was a major issue affecting their projects (I1, I3, I4, I5, I7, I8, I9, I10). Developers risked running out of funds mid-project due to a lack of access to financing, which could lead to delays or abandonment. Additionally, non-payment of rent by tenants post-completion threatened loan repayment and the project's overall viability.
- Many developers lacked technical expertise, property management experience and an understanding of municipal approval processes. This was noted by five of the interviewees (I2, I4, I7, I8, I10). As interviewee 8 noted, “knowledge is the biggest barrier for those without a property background”. These knowledge gaps led to inefficiencies, additional costs and project delays. Poor planning and execution frequently resulted in projects taking longer and costing more than initially anticipated.
- High crime rates in townships necessitated additional security measures, increasing development costs. Developers also faced risks of theft, vandalism and extortion from local gangs during construction (I3, I4, I5, I6, I10). Interviewee 6 raised concerns about extortion threats, describing how criminals operating in the townships often demanded “protection fees” in exchange for not interfering with construction projects.
- Developers with limited construction experience often struggled with unreliable contractors, leading to substandard workmanship, project delays, and cost overruns. Poor-quality materials and non-compliance with building regulations further complicated projects, creating long-term structural and legal issues. Developers also encountered difficulties with tenants who failed to honour rental agreements or damaged properties. This was mentioned by interviewees 1, 3, 4, 6, 8 and 10.
- Broader systemic risks, such as political instability or unfavourable economic conditions, can negatively impact project feasibility and profitability. Two interviewees (I3, I7) raised concerns about the impact of fluctuating economic conditions on property values and rental income.

4.6 Obstacles and Challenges

The financing process presented numerous challenges for small-scale property developers. One of the primary obstacles was the difficulty in accessing traditional funding, as banks frequently rejected loan applications due to the high risks associated with township markets and developers' limited financial records. This made it difficult for developers to secure affordable financing options.

A significant challenge was the high equity requirements imposed by alternative funding programmes such as uMaStandi, which demanded a minimum 20% equity contribution. Raising this amount was a considerable hurdle for many developers, forcing them to rely on personal savings, asset sales, or mezzanine financing.

High interest rates further complicated financing. Loans from microfinance institutions typically carried interest rates much higher than those offered by traditional banks, which were generally close to the prime lending rate in South Africa (10.5% as of June 2026). Another issue was that microfinance loan periods were shorter. A traditional bank in South Africa, for example, typically offers loan terms of 20 to 30 years. As interviewee I4 noted, uMaStandi offered them a high rate of prime + 4.5% over 15 years. These elevated costs reduce project profitability and place additional financial strain on developers.

Additionally, developers encountered complex bureaucratic processes, particularly lengthy and complicated building plan approvals. Many were unfamiliar with these regulatory procedures, making navigation difficult and leading to costly delays.

4.7 Impact of Financing on Business Success

The financing provided by TUHF and uMaStandi played a pivotal role in enabling several developers (I1, I4, I7 and I8) to succeed in ways that may not have been possible through traditional banks. For example, interviewee 4 described how uMaStandi provided not only construction funding but also essential non-financial support, including feasibility assessments, professional referrals, assistance with municipal bureaucratic requirements and payment flexibility during project delays. Similarly, interviewee 1 highlighted that TUHF was more lenient than commercial banks and took a more personalised approach to funding, thereby easing his access to capital and enabling him to complete his project. Interviewee 7 noted that uMaStandi assessed developers holistically, considering their skills and potential to complete projects rather than requiring formal qualifications and extensive financial documentation. Interviewee 8 also acknowledged that uMaStandi's "hand-holding" support was valuable to many developers with knowledge gaps navigating early-stage projects. These accounts demonstrate how microfinance programmes such as TUHF and uMaStandi have filled critical gaps left by conventional banking institutions, empowering small-scale property developers to achieve business success despite the adverse conditions in the townships where they operate.

5. Discussion

The comparison of the empirical findings with the literature reveals similarities and differences. All respondents broadly adhered to the normative development procedure, with market and location analysis among the first steps, but the analysis often relies on local knowledge and is incomplete. This is consistent with descriptive decision theory and the works of Gallimore et al. (2000) and Robson and Greenhalgh (2023). Decision-making is heavily influenced by experience, with more seasoned developers employing more sophisticated market and risk analysis (e.g., Zöllig & Axhausen, 2012), although the experience level in our study was rather low. While local networks are generally important for property development (Section 2.2), the developers in our sample remained local to leverage these relationships.

The preference of small-scale developers for renovations over new builds differs from that of professional developers in developed countries. It contradicts the findings of McGaffin et al. (2019), who reported that their interviewees did not mention renovations. Renovations often carry significant risks, which small-scale developers may underestimate. The lack of a standardised investment model suggests a need for further skills training. Idealistic motives, such as community support or intergenerational wealth creation—normally not mentioned in the literature—are valuable but would benefit from a more strategic approach to maximise the fit of a project with the land and the developer's needs (Graaskamp, 1972, p. 515).

Small-scale developers face substantial entry barriers. One of those is financing, with traditional sources largely inaccessible and alternative programmes requiring high equity contributions and charging high interest rates, consistent with the literature (Section 2.1). Evidence was found for individual, organisational and contextual factors as determinants of financial choices (Nguyen and Canh, 2021). Traditional financial theory, designed primarily for large companies in highly developed countries, is hardly applicable here; the needs of small-scale developers are more fundamental—some are simply seeking any capital, regardless of capital structure. Our surveys also revealed that developers are unaware of available capital sources and sometimes assess known sources differently from experts, suggesting that educational and informational efforts could be helpful.

Financial uncertainty, unreliable contractors, crime, planning complexities and knowledge gaps complicate the development process, as anticipated from the literature (Section 2.1). These findings highlight the need for support, financial reform and regulatory improvements. The coaching provided by uMaStandi, together with tailored financing solutions, exemplifies a positive impact for sustainable growth. Traditional banks are unlikely to fill the financing and support gap in the foreseeable future without government incentives.

Recent policy initiatives in Cape Town aim to reduce planning requirements for small-scale developers (Turok 2025), but many issues remain. Individual constraints include expertise, attention, reliability, and access to financing; long-term success requires stronger knowledge in building regulations, financing, taxation, budgeting, and project management. A systemic approach, as presented in Section 2.2, is beneficial.

The study has several limitations: The relatively small sample does not fully reflect developer diversity, and generalisation is questionable. Hence, it should be seen as an exploratory study requiring verification. Participant recruitment may have introduced sampling bias, for example, in respondents' levels of education. Repeating the study to collect out-of-sample and out-of-time data, and employing different methods such as observation, would be valuable. Furthermore, the research captures a specific point in time rather than changes in decision-making as developer experience grows. Finally, the insights may not be transferable to other countries. Nevertheless, the gap between demand and supply of affordable housing is a global phenomenon, and small-scale developers exist in many other countries (Section 2.1), so our study adds another perspective to the growing literature on affordable housing and the informal housing sector.

6. Conclusion and Outlook

The key finding of this study is that smaller developers exhibit characteristics that have rarely been described in the literature. Experience level influences how far developers can follow a normative development process. Interviewees showed a preference for renovations over new builds, highlighting a need for further training as risks are often underestimated. Financing presents a major barrier, as traditional banking options are largely inaccessible and alternative programmes are costly and require equity. Other challenges include crime, unreliable

contractors, planning complexities and knowledge gaps in building regulations and project management.

This study contributes to the literature in two ways: it provides empirical insights into the decision-making and financing of property developers, and it reveals differences from and similarities with existing findings, opening avenues for further research. Although the sample is small and specific, the results are assumed to be transferable to other African housing markets.

Our findings suggest that planning interventions alone is insufficient; equal consideration should be given to funding interventions. We discovered a discrepancy between financing instruments used in practice and those considered suitable by experts. Available instruments, such as local development funds, should replace unsuitable ones, such as informal loans or the release of retirement savings. Local governments and financial institutions should also reduce the need for upfront capital. Beyond financing, systemic reforms—including streamlined regulatory processes—are necessary for long-term success.

Traditional theories on financing, decision-making and property development are hardly applicable to small-scale developers. This creates a need to investigate this target group in greater detail and develop a prescriptive theory. Future research could focus on particular development decisions or examine the target group from an entrepreneurship or microfinance perspective. Other relevant issues include obstacles to acquiring building rights, skills acquisition, cooperation and partnerships, sociological and psychological factors, power relations and stakeholder networking—investigated with regard to the duration and performance of developments and their impact on the local economy. Inter- and cross-disciplinary approaches are advisable given the complexity of the subject.

To unlock the potential of small-scale developers, interventions should integrate financial and non-financial measures that reduce transaction costs, recognise the diversity of market players, and account for varying capacities to engage with regulatory systems and financial institutions. Local governments need to reassess planning regulations, reduce administrative delays and costs, and thereby create an environment conducive to financing small-scale developers and attracting more financial intermediaries to the affordable housing sector.

References

- Adair, A.S., Berry, J.N. and McGreal, W.S. (1994). Investment decision making: A behavioural perspective. *Journal of Property Finance*, 5 (4), pp. 32–42. <https://doi.org/10.1108/09588689410080275>
- Adams, D., Croudace, R. and Tiesdell, S. (2012). Exploring the ‘notional property developer’ as a policy construct. *Urban Studies*, 49, pp. 2577–2596. <https://doi.org/10.1177/0042098011431283>
- Allen, P.M. (1997). Cities and regions as evolutionary, complex systems. *Geographical Systems*, 4, pp. 103–130.
- Atherton, E., French, N. and Gabrielli, L. (2008). Decision theory and real estate development: A note on uncertainty. *Journal of European Real Estate Research*, 1, pp. 162–182. <https://doi.org/10.1108/17539260810918730>
- Baldwin, A. (2017). New developments in real estate financing. *Economic Affairs*, 37, pp. 141–145. <https://doi.org/10.1111/ecaf.12212>
- Beck, T., Demirgüç-Kunt, A. and Maksimovic, V. (2008). Financing patterns around the world: Are small firms different? *Journal of Financial Economics*, 89, pp. 467–487. <https://doi.org/10.1016/j.jfineco.2007.10.005>
- Berrisford, S., Cirolia, L.R. and Palmer, I. (2018). Land-based financing in sub-Saharan African cities. *Environment & Urbanization*, 30, pp. 35–52. <https://doi.org/10.1177/0956247817753525>
- Bredenoord, J. and van Lindert, P. (2014). Backing the self-builders: Assisted self-help housing as a sustainable housing provision strategy, in Bredenoord, J., van Lindert, P. and Smets, P. (eds.) *Affordable housing in the urban global south*. London: Routledge, pp. 55–72.
- Briozzo, A., Vigier, H. and Martinez, L.B. (2016). Firm-level determinants of the financing decisions of small and medium enterprises: Evidence from Argentina. *Latin American Business Review*, 17, pp. 245–268. <https://doi.org/10.1080/10978526.2016.1209081>
- Brueckner, J.K., Rabe, C. and Selod, H. (2018). *Backyarding: Theory and evidence for South Africa* (Policy Research Working Paper No. WPS8636). Washington: World Bank Group.
- Brueggeman, W. and Fisher, J. (2024). *Real estate finance & investments* (5th ed.). New York: McGraw-Hill Education.
- Bryman, A. (2016). *Social research methods* (5th ed.). Oxford: Oxford University Press.
- Calderon, C., and Westin, M. (2019). Understanding context and its influence on collaborative planning processes: a contribution to communicative planning theory. In: *International Planning Studies* 26 (1), S. 14–27. <https://doi.org/10.1080/13563475.2019.1674639>
- Capozza, D.R. and Li, Y. (2002). Optimal land development decisions. *Journal of Urban Economics*, 51, pp. 123–142. <https://doi.org/10.1006/juec.2001.2240>
- Caputo, A. (2013). Systemic stakeholders’ management for real estate development projects. *Global Business and Management Research: An International Journal*, 5, pp. 66–82. <https://gbmrjournal.com/pdf/vol.%205%20no.%201/6-Caputo,%202013.pdf>
- Chikalipah, S. and Makina, D. (2019). A survey of microfinance institutions and informal finance in Africa, in Makina, D. (ed.) *Extending financial inclusion in Africa*. London: Academic Press, pp. 113–135. <https://doi.org/10.1016/B978-0-12-814164-9.00006-2>
- Child, I. and Clapson, R. (2022). *Guide to small-scale property development: And the rise of the landlord developer*. Hampshire: property CEO.
- Chiwetu, D.N. (2019). Harnessing small-scale developers in the development of the inner city of Johannesburg (Research Report submitted to the School of Architecture and Planning, University of the Witwatersrand).
- City of Cape Town. (n.d.). Integrated human settlements five-year sector plan 2022/23 - 2026/27: 2025/26 review. City of Cape Town.

- Crosby, N., Devaney, S. and Wyatt, P. (2020). Performance metrics and required returns for UK real estate development schemes. *Journal of Property Research*, 37, pp. 171–193. <https://doi.org/10.1080/09599916.2020.1720269>
- Department of Human Settlements (2020). *Reprioritisation of the Draft Human Settlement Development Grant (HSDG) Business Plan Targets and Budgets for the 2021/22 Financial Year*. Pretoria: DHS.
- Diaz, J. (1990). How appraisers do their work: A test of the appraisal process and the development of a descriptive model. *Journal of Real Estate Research*, 5, pp. 1–15. <https://doi.org/10.1080/10835547.1990.12090601>
- Echekoba, F.N. and Ananwude, A.C. (2016). The relationship between corporate performance and financial structure: An empirical study of construction and real estate firms in Nigeria. *British Journal of Economics, Management & Trade*, 12, pp. 1–17. <https://doi.org/10.9734/BJEMT/2016/24754>
- Farragher, E.J. and Kleiman, R.T. (1996). A re-examination of real estate investment decisionmaking practices. *Journal of Real Estate Portfolio Management*, 2, pp. 31–39. <https://doi.org/10.1080/10835547.1996.12089521>
- Fox-Rogers, Linda; Murphy, Enda (2014). Informal strategies of power in the local planning system. *Planning Theory*, 13 (3), pp. 244–268.
- French, N. (2001). Decision theory and real estate investment: An analysis of the decision-making processes of real estate investment fund managers. *Managerial and Decision Economics*, 22, pp. 399–410. <https://doi.org/10.1002/mde.1029>
- French, N. and French, S. (1997). Decision theory and real estate investment. *Journal of Property Valuation and Investment*, 15, pp. 226–232. <https://doi.org/10.1108/14635789710184943>
- Gallimore, P., Hansz, J.A. and Gray, A. (2000). Decision making in small property companies. *Journal of Property Investment & Finance*, 18, pp. 602–612. <https://doi.org/10.1108/14635780010357569>
- Gehner, E. (2008). Knowingly taking risk: Investment decision making in real estate development, Doctoral Dissertation, University of Delft. Eburon Uitgeverij, Delft.
- Goodyear, D. (2019, March 6). Can micro-real-estate developers help solve the homelessness crisis? *The New Yorker*. <https://www.newyorker.com/news/california-chronicles/can-micro-real-estate-developers-help-solve-the-homelessness-crisis> (Accessed 26 June 2025).
- Graaskamp, J.A. (1972). A rational approach to feasibility analysis. *Appraisal Journal*, 40, pp. 513–522.
- Grubbauer, M. and Mader, P. (2021). Housing microfinance and housing financialisation in a global perspective. *International Journal of Housing Policy*, 21, pp. 465–483. <https://doi.org/10.1080/19491247.2021.1922165>
- Guest, G., Bunce, A. & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59–82.
- Haas, A.R.N. (2021). Can we do informal housing better? [Research Paper] New York: Pathfinders.
- Healey, P. (1992). An institutional model of the development process. *Journal of Property Research*, 9, pp. 33–44. <https://doi.org/10.1080/09599919208724049>
- Healey, P. (1991). Models of the development process: A review. *Journal of Property Research*, 8, pp. 219–238. <https://doi.org/10.1080/09599919108724039>
- Heurkens, E. and Hobma, F. (2014). Private sector-led urban development projects: Comparative insights from planning practices in the Netherlands and the UK. *Planning Practice & Research*, 29, pp. 350–369. <https://doi.org/10.1080/02697459.2014.932196>
- Kavaarpuo, G., Mintah, K. and Donkor-Hyiaman, K.A. (2023). Financing housing development in an underdeveloped financial market: Learning from developers’

- financing adaptations? *Housing Policy Debate*, 34, pp. 918–945.
<https://doi.org/10.1080/10511482.2023.2237004>
- Lee, S. and Persson, P. (2015). *Financing from family and friends* (IFN Working Paper No. 933). <https://doi.org/10.2139/ssrn.2086625>
- Leeds, S. (2021). The secrets of property development: How to make six figure profits every time you do a property deal. Independently published.
- Liapis, K.J., Christofakis, M.S. and Papacharalampous, H.G. (2011). A new evaluation procedure in real estate projects. *Journal of Property Investment & Finance*, 29, pp. 280–296. <https://doi.org/10.1108/14635781111138091>
- Long, C. (2011). Finance for real estate development. Washington: Urban Land Institute.
- MacCowan, R.J. and Orr, A.M. (2008). A behavioural study of the decision processes underpinning disposals by property fund managers. *Journal of Property Investment & Finance*, 26, pp. 342–361. <https://doi.org/10.1108/14635780810886645>
- Mago, S. and Modiba, F.S. (2022). Does informal finance matter for micro and small businesses in Africa? *Small Business International Review*, 6, Article e415.
<https://doi.org/10.26784/sbir.v6i1.415>
- Mahajan, S. (2014). Economics of South African townships - special focus on Diepsloot. Washington: World Bank Group.
- Marais, L. and Cloete, J. (2017). Housing policy and private sector housing finance: Policy intent and market directions in South Africa. *Habitat International*, 61, pp. 22–30.
<https://doi.org/10.1016/j.habitatint.2017.01.004>
- Massyn, M.W., McGaffin, R., Viruly, F. and Hopkins, N. (2015). The challenge of developing higher density, affordable housing in the inner city of Cape Town. *International Journal of Housing Markets and Analysis*, 8, pp. 412–428.
<https://doi.org/10.1108/IJHMA-11-2014-0049>
- Max, D. and Spolander, V. (2021). The precarious issue of residential development financing - A medium sized developer's troublesome reality (Master's Thesis). KTH Royal Institute of Technology, Stockholm.
- McGaffin, R., Spiropoulous, J. and Boyle, L. (2019). Micro-developers in South Africa: A case study of micro-property developers in Delft South and Ilitha Park, Cape Town. *Urban Forum*, 30, pp. 153–169. <https://doi.org/10.1007/s12132-018-9347-2>
- Montibeller, G., Gummer, H. and Tumidei, D. (2006). Combining scenario planning and multi-criteria decision analysis in practice. *Journal of Multi-Criteria Decision Analysis*, 14, pp. 5–20. <https://doi.org/10.1002/mcda.403>
- Moorhead, M., Armitage, L. and Skitmore, M. (2024). Real estate development feasibility and hurdle rate selection. *Buildings*, 14, Article 1045.
<https://doi.org/10.3390/buildings14041045>
- Moritz, A., Block, J.H. and Heinz, A. (2016). Financing patterns of European SMEs: An empirical taxonomy. *Venture Capital*, 18, pp. 115–148.
<https://doi.org/10.1080/13691066.2016.1145900>
- Mushonga, M., Arun, T.G. and Marwa, N.W. (2019). The cooperative movement in South Africa: Can financial cooperatives become sustainable enterprises? *Strategic Change*, 28, pp. 259–271. <https://doi.org/10.1002/jsc.2268>
- Mwando, S.M., Mooya, M.M. and Musvoto, E. (2024). A systematic review of locational decisions of property developers. AfRES 2024 Conference Proceedings, 10-13 September, Livingstone. <https://doi.org/10.15396/afres2024-024>
- Nguyen, B. and Canh, N.P. (2021). Formal and informal financing decisions of small businesses. *Small Business Economics*, 57, pp. 1545–1567.
<https://doi.org/10.1007/s11187-020-00361-9>
- Nguyen, M-H., Pham, T-H., Ho, M-T., Nguyen, H.T.T. and Vuong, Q-H. (2021). On the social and conceptual structure of the 50-year research landscape in entrepreneurial

- finance. *SN Business & Economics*, 1, pp. 1–29. <https://doi.org/10.1007/s43546-020-00002-z>
- NHFC National Housing Finance Corporation. (2025). Emerging developer incubator and post investment support programme. NHFC. https://www.nhfc.co.za/empowering_emerging_developers/ (Accessed 26 June 2025).
- Osunsan, O.K., Alinitwe, J., Naiga, S., Tindimwebwa, J., Namirembe, I. and Muguluma, H. (2024). Financing decisions of small and medium-sized enterprises. *International Journal of Management Studies and Social Science Research*, 6, pp. 134–146. <https://doi.org/10.56293/IJMSSSR.2024.5320>
- Özogul, S. and Tasan-Kok, T. (2020). One and the same? A systematic literature review of residential property investor types. *Journal of Planning Literature*, 35, pp. 475–494. <https://doi.org/10.1177/0885412220944919>
- Parker, D. (2014). Property investment decision making by Australian REITs. *Journal of Property Investment & Finance*, 32, pp. 456–473. <https://doi.org/10.1108/JPIF-04-2014-0025>
- Patton, M.Q. (2015). *Qualitative Research & Evaluation Methods* (4th ed.). Sage.
- Peca, S.P. (2009). *Real estate development and investment: A comprehensive approach*. Hoboken: John Wiley & Sons.
- Peiser, R.B., Charles, S.L., Egelanian, N., Dermisi, S. and Hamilton, D.A. (2022). *Professional real estate development: The Uli guide to the business* (4th ed.). Washington: Urban Land Institute.
- Pommer, A. (2007). *Entscheidungsunterstützung in der projektentwicklung*. VDG Weimar - Verlag und Datenbank für Geisteswissenschaften, Kromsdorf.
- Rao, P. and Kumar, S. (2018). Reflection of owner’s attributes in financing decisions of SMEs. *Small Enterprise Research*, 25, pp. 52–68. <https://doi.org/10.1080/13215906.2018.1428908>
- Reed, R. (2021). *Property development* (7th ed.). New York: Routledge.
- Roberts, C. and Henneberry, J. (2007). Exploring office investment decision-making in different European contexts. *Journal of Property Investment & Finance*, 25, pp. 289–305. <https://doi.org/10.1108/14635780710746939>
- Robin, E. (2022). Performing real estate value(s): real estate developers, systems of expertise and the production of space. *Geoforum*, 134, pp. 205–215. <https://doi.org/10.1016/j.geoforum.2018.05.006>
- Robson, S. and Greenhalgh, P. (2023). Exploring the use of dual-processing in commercial property development decision-making under conditions of risk and uncertainty. *Property Management*, 41, pp. 601–617. <https://doi.org/10.1108/PM-11-2022-0084>
- Rowley, S. and Roche, J. (2024). The financing of residential development, in Gibb, K., Leishman, C., Marsh, A., Meen, G., Ong ViforJ, R. and Watkins, C. (eds.) *The Routledge handbook of housing economics*. London: Routledge.
- Scheba, A. and Turok, I. (2020). Informal rental housing in the South: Dynamic but neglected. *Environment and Urbanization*, 32, pp. 109–132. <https://doi.org/10.1177/0956247819895958>
- Scheba, A., Turok, I. and du Trevou, C. (2022). *Small-scale rental housing: moving from the low to the high road*. Cape Town: Development Action Group.
- Sharma, R.K. (2018). Factors affecting financial leveraging for BSE listed real estate development companies in India. *Journal of Financial Management of Property and Construction*, 23, pp. 274–294. <https://doi.org/10.1108/JFMPC-01-2017-0002>
- Spiropoulos, J. (2019). Financing micro-developments of residential rental stock: Case studies of seven small-scale landlords in Cape Town (Case Study Series 14). Parkview: Centre for Affordable Housing Finance in Africa.
- Squires, G., Heurkens, E. and Peiser, R. (2021). *Routledge companion to real estate development*. London: Routledge.

- Squires, G., Hutchison, N., Adair, A., Berry, J., McGreal, S. and Organ, S. (2016). Innovative real estate development finance – Evidence from Europe. *Journal of Financial Management of Property and Construction*, 21, pp. 54–72.
<https://doi.org/10.1108/JFMPC-09-2015-0036>
- Starr, M.A. (2014). Qualitative and mixed-methods research in economics: Surprising growth, promising future. *Journal of Economic Surveys*, 28, pp. 238–264.
<https://doi.org/10.1111/joes.12004>
- Tait, M. (2011). Trust and the Public Interest in the Micropolitics of Planning Practice. *Journal of Planning Education and Research*, 31(2), pp. 157–171.
<https://doi.org/10.1177/0739456X114026>
- Trevillion, E. (2002). Systems theory and the commercial development process - Towards an understanding of complex behaviour and change, in Guy, S. and Henneberry, J. (eds.) *Development and developers: Perspectives on property*. Oxford: Blackwell Science, pp. 181–203.
- Turok, I. (2025). Anatomy of an alliance for affordable urban housing. *Environment & Urbanization*, 37, pp. 21–38. <https://doi.org/10.1177/09562478241300227>
- Ulrich, H. (2001). Systemorientiertes Management: Das Werk von Hans Ulrich. Bern: Haupt.
- van der Kuil, P. and Kurzrock, B. M. (2026). Embedding Architectural and Urban Quality in ESG-Driven Real Estate Management and Development. *Journal of Sustainable Real Estate*, 18(1), 2651574. <https://doi.org/10.1080/19498276.2026.2651574>
- Wasser, N-M., Ruhstorfer, P. and Kurzrock, B-M. (2020). Advancing revolving funds for the sustainable development of rural regions. *Sustainability*, 12, Article 8455.
<https://doi.org/10.3390/su12208455>
- Zöllig, C. and Axhausen, K.W. (2012). Heterogeneity of real estate developers in Canton Zurich. Presented at the 12th Swiss Transport Research Conference (STRC 2012), STRC. <https://doi.org/10.3929/ethz-a-007300678>

Appendix 1: Financing Options for Developers

Table 2: List of common financing options for property developers according to the literature; source: authors' definitions

Debt financing	
Microloan	Small unsecured loan, often from a microfinance institution or other specialized lender.
Family/friends loan	A loan from personal connections, usually unsecured.
Informal loan ("mashonisa loan")	Short-term, high-interest loan from an unregulated lender; often illegal and secured by ID, bank card etc.
Access bond	Home loan that allows borrowers to withdraw extra money paid into their bond.
Mortgage loan	Long-term loan, secured by a first mortgage (senior loan) or a second mortgage (junior loan).
Community/cooperative bank loan	Relationship-based loan by a local bank/stokvel.
Pre-development/ acquisition loan	Short-term loan to cover soft costs in the first development phase.
Construction loan	Short-term loan, often secured by personal guarantees.
Bridging loan	Short-term loan for flipping houses or bridging the gap between short-term and long-term financing.
Supplier credit	Agreement with a supplier to provide building materials etc. on credit terms.
Government-backed loan	Loan as part of a housing development program by a local/regional/national government entity.
DFI/NGO loan	Loan as part of a program by a development finance institution (DFI) or non-governmental organisation (NGO)
Crowdlending/peer-to-peer lending	Borrowing from individuals via online lending platforms.
Credit line/overdraft	Flexible financing option from banks for small amounts.
Mezzanine financing	
Loan with equity kicker	A loan from personal connections with profit-sharing arrangements.
Revenue-based financing	Repaying investors with a percentage of project revenue or rents rather than fixed interest.
Profit-sharing agreement	Offering builders or formal/informal lenders a stake in profits instead of full upfront payments.
Convertible debt	Raising funds with an option for investors to convert loans into equity.
Equity financing	
Joint venture	Partnering with local business owners, building contractors, banks or property investors.
Local development funds	Venture capital as part of a program for small-scale urban development by government entities, DFIs or NGOs.
Cooperative investment	Collaborative property ownership structures with shared investment.
Family/friends investment	Direct capital contributions from personal network.
Crowdinvesting/peer-to-peer investing	Raising equity via online crowdfunding platforms or local initiatives.
Syndication of small Investors	Pooling funds from multiple small investors to finance a project.
Angel investors	Individual investors looking to support small-scale developments.
Sweat equity	Trading work, expertise, or other contributions for a stake in the project.
Public-private-partnerships	Government and private firms share risks and resources to develop housing and infrastructure projects.
Private equity/venture capital	Investment from private investors or banks into property projects in exchange for high returns and ownership stakes.
Releasing long-term savings	Cashing-in long-term savings from retirement funds or life insurance.
Forward sale	Selling a property before it is finished, either as a whole or in units.

Appendix 2: Expert Survey on The Usage and Suitability of Financing Options

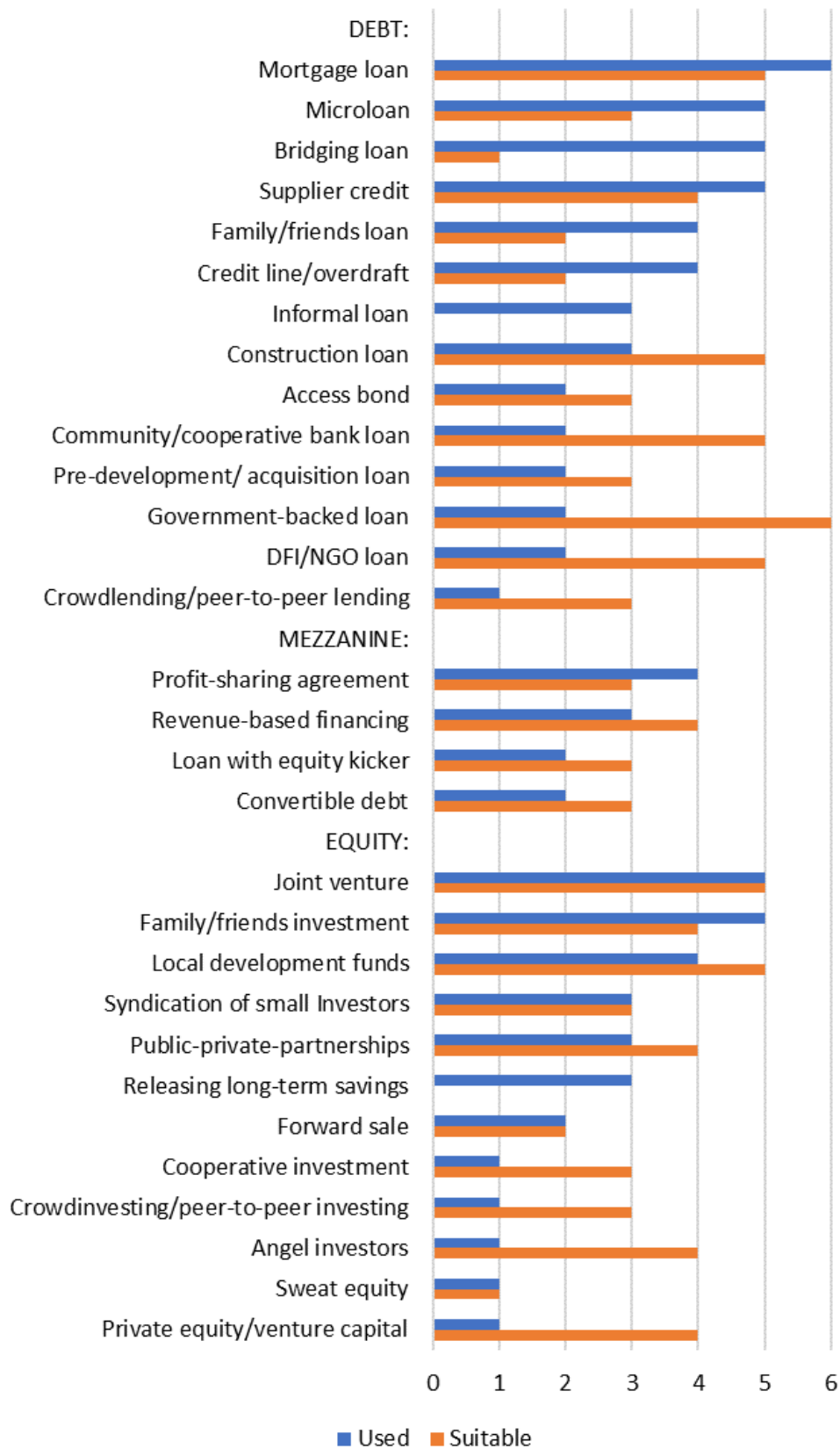


Figure 5: Number of mentions of the use (blue) and suitability (orange) of financing options for developers, sorted by usage (n=7); source: authors' survey