Acceptability of Laterite-Cement Brick for Housing Construction in Ede North Local Government Towards Designing Staff Low Income Housing

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Abstract-Against the backdrop of rising construction costs and the growing demand for affordable housing solutions, this study investigates the acceptability of lateritecement brick (LCB) as a sustainable alternative to conventional building materials for housing construction among the staff of Ede North Local government in Osun State, Southwestern Nigeria. Both Primary and secondary data were collected for the study. Multistage sampling techniques was employed to select two hundred and twenty eight (228) staff and a set of questionnaire was administered to them. Both descriptive and inferential statiscal analyses were used to analyse the data collected for the study. The findings revealed a generally high level of awareness of LCB among respondents, with professional exposure through workshops, formal education, and technical demonstrations contributing more positively to material acceptance than indigenous or informal sources of knowledge. The Chi-square test established a statistically significant association between source of awareness and likelihood of adopting LCB, confirming that awareness channels meaningfully influence material preferences. Ordinal regression analysis further demonstrated that affordability, perceived durability, material availability, and technical awareness were significant predictors of LCB acceptability, with durability perception exerting the strongest positive influence. In contrast, appearance preference and prior usage experience showed no statistically significant effect on acceptance levels. Challenges impeding LCB adoption included scarcity of skilled artisans, fluctuating material quality, limited awareness campaigns, and persistent conservative attitudes favoring conventional sandcrete blocks. The study concludes that while LCB holds substantial potential for promoting affordable and sustainable housing, its large-scale adoption is contingent upon enhanced professional training, public awareness campaigns, policy incentives, and practical demonstration projects. The study recommends among others that local authorities ,building professionals and policy-makers need strategic interventions to encourage the use of LCB in housing development initiatives as well as improves the availability of LCB at the local building material market.

Indexed Terms- Laterite-Cement Bricks, Building Material, Affordable Housing, Acceptability, Sustainable Construction.

I. INTRODUCTION

The global housing deficit, particularly in developing countries, continues to pose a significant socio-economic challenge, especially for low- and middle-income earners. Rapid urbanization, population growth, and economic disparities have intensified the demand for affordable housing, placing immense pressure on conventional building materials and construction methods (Afolami, and Oyebamiji, 2017; UN-Habitat, 2020). In Nigeria, the high cost of conventional building materials such as sandcrete blocks, cement, and concrete has hindered access to decent and affordable housing, particularly among government staff and civil servants in both urban and peri-urban centers (Olotuah, 2015; Adebayo, 2021).

In response to this growing concern, the exploration of alternative and locally available building materials has gained momentum as a sustainable strategy for addressing the housing deficit. One such alternative is the laterite-cement brick, a composite of laterite soil and cement, recognized for its cost-effectiveness, environmental sustainability, and adaptability to local

climatic conditions (Oyetola & Abdullahi, 2006; Amusan *et al.,* 2017). Laterite, abundantly available in many parts of Nigeria, Ede inclusive offers significant potential as a sustainable construction material capable of reducing dependence on imported and expensive materials (Babalola, Agboola, & Ogundipe, 2019).

Despite the growing advocacy for sustainable and affordable housing solutions in Nigeria, the adoption of laterite-cement bricks (LCBs) remains limited, particularly within institutional and staff housing schemes. Factors such as lack of awareness, perceived durability concerns, and socio-cultural preferences for conventional materials have hindered the widespread acceptance of laterite-cement bricks (Afonja, *et.al* 2023). In Ede North Local Government, where the demand for affordable staff housing is rising due to the increasing number of public sector workers and tertiary institutions, there is a noticeable gap in knowledge regarding the acceptance, perception, and practical adoption of alternative materials like laterite-cement bricks for official housing projects. Without empirical data on the local community's perception and willingness to adopt this material, policy interventions and construction innovations remain speculative and uncoordinated.

Considering the affordability, sustainability, and local availability of laterite, its potential role in reducing Nigeria's housing deficit cannot be overstated. While several technical studies have established the physical and mechanical suitability of laterite-cement bricks, limited research has focused on public acceptability and socio-economic factors influencing their adoption for staff housing projects. This study is therefore justified as it seeks to fill this gap by examining the level of awareness, acceptance, and perception of laterite-cement bricks among public sector staff and housing developers in Ede North Local Government, Osun State. The findings will not only inform local government authorities, builders, and housing policymakers, but also contribute to promoting sustainable and cost-effective building practices that are socially acceptable within the local context.

This study, therefore, aims to assess the acceptability of laterite-cement bricks for affordable staff housing in Ede North Local Government, Nigeria. It investigates staff awareness, willingness to adopt, and socio-economic factors influencing the use of laterite-cement bricks. By providing localized, empirical insights into alternative building materials for affordable housing in Nigeria, this research will contribute meaningfully to the discourse on sustainable urban development and practical housing solutions in the Sub-Saharan African context.

Study Area

The study is situated in Ede North Local Government Area, one of the key administrative divisions in Osun State, Southwestern Nigeria. Ede North is geographically located between latitudes 7° 45′ N and 7° 57′ N and longitudes 4° 24′ E and 4° 36′ E (Figure 1). The local government shares boundaries with Egbedore Local Government to the north and east, and Ede South Local Government to the south. Ede North local government serves as a growing peri-urban settlement, with rapid infrastructural development and increasing demand for staff housing due to the presence of government institutions, commercial activities, and tertiary educational establishments.

The topography of Ede North is predominantly characterized by gently undulating plains interspersed with scattered hills and rocky outcrops. The area experiences a tropical wet and dry climate, marked by two distinct seasons the rainy season from March to October, and the dry season from November to February. Average annual rainfall ranges between 1,200 mm and 1,500 mm, while mean daily temperatures typically vary between 25°C and 30°C (Osun State Government, 2022). The socio-economic activities within Ede North are diverse, encompassing civil service employment, farming, trading, and small-scale industries. Its proximity to the Osun State capital, Osogbo, further enhances its strategic importance as a residential hub for public servants and other formal sector employees. This dynamics make Ede North a suitable case study for examining the acceptability of alternative, cost-effective building materials such as laterite-cement bricks for affordable staff housing initiatives.

Figure 1.: Ede North Local Government within the Context of Osun state

Source: Osun State Ministry of Land and Physical Planning and Urban Development (2024)

II. CONCEPTUALIZATION AND REVIEW OF LITERATURE

The increasing demand for affordable housing has become a persistent challenge in both developed and developing nations, with urbanizing regions in sub-saharan africa experiencing some of the most severe housing deficits. Scholars such as UN-Habitat (2011) and Ogunlesi (2016) have observed that Nigeria faces a growing housing crisis exacerbated by population growth, urban migration, and escalating building material costs. Consequently, researchers have advocated for alternative building materials sourced locally and produced sustainably as potential solutions to alleviate this crisis (Oloyede *et al*., 2019).

Housing is universally recognized as a fundamental human need, transcending its role as mere shelter to encompass privacy, social security, psychological well-being, and access to essential services (Bonnefoy, 2007; UN-Habitat, 2013). In defining housing need, Aribigbola (2000) emphasized the gap between available accommodation and the standard necessary for health, safety, and social integration. This view aligns with the basic needs approach (Streeten *et al.,* 1981) and sen's (1999) capability approach, which argue that adequate housing is central to individual well-being and community development. In Nigeria however, the widening affordability gap has placed decent housing beyond the reach of many, particularly public sector staff, due to high construction costs driven by conventional materials such as sandcrete blocks and concrete (Adewale & Adebayo, 2018).

The concept of affordable housing, as discussed by UN-habitat (2011) and Hud (2020), refers to housing costs not exceeding a certain proportion of household income, typically pegged at 30%. However, Nigeria's urban centers, including Ede North, continue to grapple with supply constraints, rising land values, and infrastructural deficits that limit the provision of affordable housing (Srinivasan, Kumar, & Rao ,2017). Housing supply in such areas often lags behind demand due to economic fluctuations, complex regulatory frameworks, and prohibitive costs of conventional materials (Glaeser & Gyourko, 2018).

However, building materials play a pivotal role in shaping housing affordability, sustainability, and quality. Ayoade *et al.* (2016) categorized building materials into natural and synthetic types, each influencing durability, safety, aesthetics, and environmental performance. while concrete, steel, and fired clay bricks have dominated modern construction, their production is energy-intensive and contributes significantly to environmental degradation (Liu *et al.,* 2021; Sharma *et al.,* 2020). This has intensified the search for alternative, eco-friendly materials suitable for low-cost housing (Srinivasan *et al.,* 2017). Among these alternatives, laterite-cement bricks have attracted scholarly and practical attention for their affordability, availability, and environmental benefits. comprising laterite soil mixed with cement and water, these bricks are molded and cured without the need for firing, reducing carbon emissions and energy consumption (Odunjo, O., Okanlawon, Ayinla, & Ayanda, 2015). Musa *et al.* (2019) and Nwaubani *et al.* (2021) highlighted their economic viability, as local sourcing minimizes material and transportation costs. their thermal insulation properties (Khan *et al.,* 2019) and durability (Zhao *et al.,* 2020) make them well-suited to the nigerian climate; though,nconcerns persist regarding moisture sensitivity and strength consistency (Mohan *et al.,* 2018; Afolabi *et al.,* 2021). The composition of laterite-cement bricks typically includes 70–80% laterite and 20–30% cement, with water added to achieve workable consistency before molding and curing (Srinivasan *et al.,* 2017; Gao *et al.,*

2021). Comparative studies by Nwaubani *et al.* (2021) demonstrated that laterite-cement bricks require less embodied energy and emit fewer greenhouse gases than conventional sandcrete blocks, making them a sustainable option for affordable housing. Economically, their low production costs, coupled with reduced operational expenses due to good thermal properties, offer long-term savings for residents and developers alike (Ibrahim *et al.,* 2022). Environmental assessments further endorse their suitability, as laterite is abundant in osun state, reducing transportation emissions and supporting local industries (Ibitoye et al., 2020; Akinola *et al.,* 2021). Studies by Babalola *et al.* (2019) confirmed the presence of quality lateritic soil deposits in Ede North local government, emphasizing the region's potential for promoting laterite-cement bricks in affordable housing schemes. Yet, despite these advantages, adoption rates remain low, largely due to public skepticism about durability, quality control issues, and entrenched preferences for conventional materials (Musa *et al.,* 2019; Adedeji *et al.,* 2020).

Though –outdated existing studies have established the technical and economic feasibility of laterite-cement bricks, research examining their social acceptability, particularly for staff housing in regions like Ede North local government, is scarce. However understanding the perceptions, awareness, and preferences of local stakeholders is essential for crafting effective housing policies and construction guidelines (Nguyen *et al.,* 2020).

III. METHODOLOGY OF THE RESEARCH

Both primary and secondary data were used for the study. The primary data were obtained through a multistage sampling technique. In the first stage, Ede North local government area in Osun state was purposively selected due to its accessibility, availability of reliable administrative records, the relevance of the staff population to the study on housing material acceptability. In the second stage, all the ten departments within the local government were identified as well as availability of laterite in the area from the official staff list obtained from the administrative department, which served as the sampling frame for the study.

A total of 240 staff members were officially recorded across the ten departments and were used for the study. Hence due to the relatively small and manageable population size, total enumeration technique was employed, involving the distribution of a set of questionnaires to all consenting staff members . This decision was made to capture a broad, inclusive, and representative perspective of all employment categories within the local government, as differences in socio-economic status and professional responsibilities could influence preferences and willingness to adopt alternative building materials such as laterite-cement bricks. The primary data collected focused on Two key areas: (i) awareness and willingness to use laterite-cement bricks; (ii) factors influencing the acceptability of the material; and a set of structured questionnaire was designed for this purpose and personally administered to staff members during working hours at their respective offices.

Secondary data was sourced from academic publications, government reports and administrative records. These sources supported the interpretation of primary data and helped frame the discussion within broader policy and planning contexts. For data analysis, the study employed the Statistical Package for the Social Sciences (SPSS, Version 25). Descriptive statistics such as percentages, frequency counts, and cross-tabulations were used to analyze the quantitative data on socio-economic characteristics and material preferences. Furthermore, chi-square tests was conducted to examine associations between categorical variables, such as socio-economic attributes and willingness to use laterite-cement bricks.

IV. RESULTS AND DISCUSSION

Out of a total of 240 questionnaires sent out only 228 was retrieved accounting for 95% which is sufficient for assessing the situation under study. The assessment of awareness levels among staff revealed a generally high level of recognition of Laterite-Cement Bricks as a building material. Specifically, it was observed that 96.9% of respondents were aware of LCB's use for brick-making, while only 3.1% were not. Awareness regarding its application for full housing construction was slightly lower, with 92.9% indicating awareness and 7.1% remaining unaware. This pattern suggests

that while LCB is well-known within the local construction sector, its application in complete residential housing projects is marginally less familiar. This gap may be due to limited public exposure to completed housing projects utilizing LCB, lingering scepticism regarding its long-term durability, or a lack of technical experience in its large-scale application.

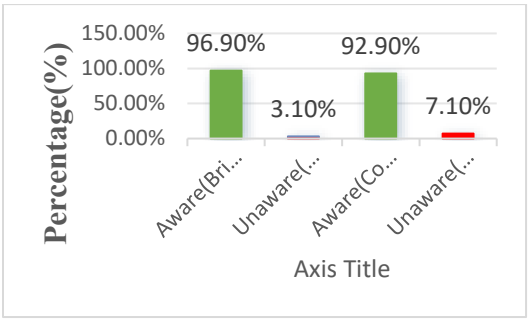

Figure 1: Awareness of LCB for Brick-Making and Housing Construction

Source: Authors field survey (2025)

Further analysis explored the sources through which staff became aware of LCB and how this affected their willingness to adopt the material. It was observed that among respondents likely to use LCB, 61.5% became aware through professional avenues such as formal education, technical workshops, and training sessions. A smaller segment, 34.9%, acquired their awareness through indigenous knowledge systems, encompassing informal community learning and local builder practices. An additional 3.65% gained awareness through alternative means, including media exposure and personal observation. Among those who expressed indifference, 75.00% cited professional exposure, while 25.00% attributed their awareness to indigenous knowledge. Notably, within the group unlikely to adopt LCB, the majority (68.8%) were informed through indigenous knowledge, while 31.3% had professional exposure.

This distribution highlights a clear trend where professional awareness sources are generally associated with a higher likelihood of adoption. Conversely, reliance on indigenous knowledge alone tends to correspond with reluctance or resistance to alternative materials like LCB. This could reflect enduring traditional preferences, fears about material reliability, or resistance to deviating from widely accepted construction norms. However, it is important to note that while professional exposure tends to enhance acceptance, it does not entirely guarantee adoption, underscoring the need for practical demonstrations and supportive policy initiatives to bridge the gap between awareness and action.

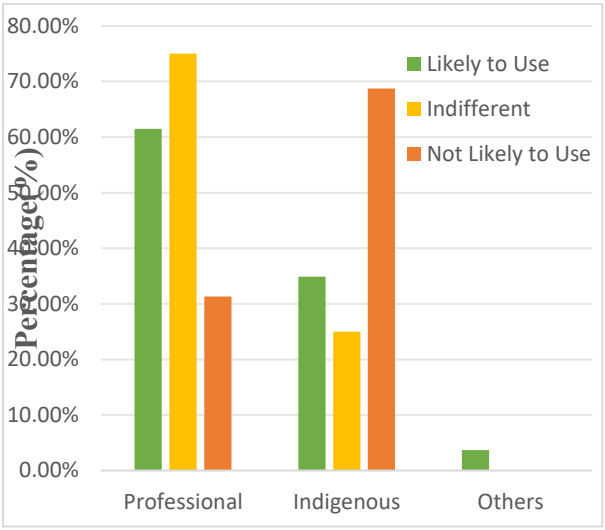

Figure 2: Sources of Awareness of LCB and willingness to use use

Source : Author's Field Survey (2025)

In order statistically confirm the relationship between source of awareness and the likelihood of adopting LCB, a Chi-square test of independence was sources conducted. The test evaluated whether the observed association between how respondents became aware of LCB and their expressed willingness to adopt it was significant. The results indicated a Chi-square value of 22.47 with a p-value of 0.00016, well below the conventional 0.05 threshold. This led to the rejection of the null hypothesis, confirming a statistically significant association between sources of awareness and willingness to use LCB. Specifically, the results reaffirmed that professional exposure positively influences acceptance, while indigenous knowledge often correlates with scepticism.

Source of Awareness	Likely to Use	Indifferent	Not Likely to Use	Total
Professional Sources	62	56	17	135
Indigenous Knowledge	35	19	36	90
Other Sources	3	0	0	3
Total	100	75	53	228

Table 1: Cross-tabulation of Source of Awareness and Likelihood of Using LCB

The implications of these findings are substantial. While general awareness of LCB is high among staff, its practical acceptance is largely contingent on the source of that awareness. Professional education, technical workshops, structured demonstrations, and policy-driven promotional programs are therefore pivotal in promoting confidence in the material's suitability for modern housing. It is recommended that Ede North Local Government, in collaboration with construction experts and urban planners, initiate formal awareness campaigns and demonstration projects showcasing successful LCB-based housing. Such initiatives could help dispel lingering doubts and improve adoption rates.

The Chi-square test result was as follows:

Table 1 : Chi-square Test of Awareness and Likelihood of using LCB and willingness to adopt

Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.47	4

Source : Authors' Field Study (2025)

Further inquiry into the factors influencing the acceptability of LCB revealed that a combination of socio-technical and perceptual variables shaped staff decisions. The fieldwork highlighted six primary factors: affordability, durability, availability, aesthetic preference, technical awareness, and prior experience with LCB. Among these, cost perception and durability emerged as the most significant considerations. A considerable number of respondents identified LCB as a more affordable alternative to conventional sandcrete blocks, citing reduced cement requirements and locally sourced laterite as major cost-saving elements. Durability was similarly crucial, with those confident in LCB's strength and longevity demonstrating a higher willingness to adopt it. In contrast, factors such as aesthetic appearance and prior personal experience played a less decisive role in influencing material acceptability.

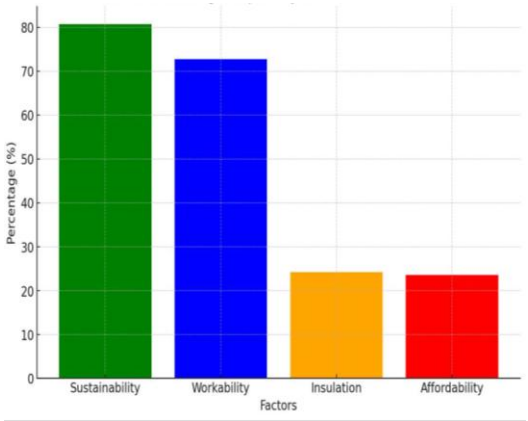

Figure 3: Factors Influencing Acceptability

Source: Author's Field Survey (2025)

Respondents also identified several practical and perceptual challenges hindering the widespread use of LCB. Chief among these were the limited number of skilled artisans proficient in LCB construction techniques, inconsistent quality of materials produced by local suppliers, and weak promotional campaigns that failed to adequately inform the public about LCB's benefits. Additionally, conservative attitudes rooted in indigenous knowledge systems perpetuate scepticism towards alternative materials, further stalling broader adoption.

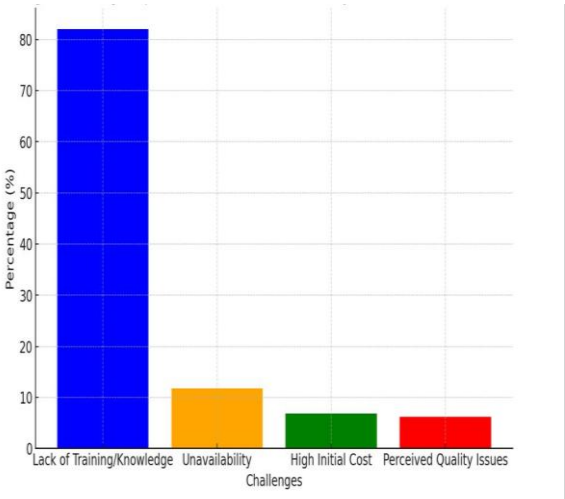

Figure 4: Challenges Hindering Adoption of LCB

Source : Authors' Field Survey (2025)

To quantify the predictive strength of these factors, an ordinal logistic regression analysis was conducted, using respondents' stated likelihood to use LCB as the dependent variable, categorized into 'Likely to Use', 'Indifferent', and 'Not Likely to Use'. Independent variables included cost perception, durability, availability, appearance, technical awareness, and past experience. The model proved statistically significant, with a Likelihood Ratio Chi-square value of 42.76 ($p < 0.001$), confirming its suitability for predicting acceptability outcomes.

The regression coefficients showed that cost perception, durability perception, availability, and technical awareness had statistically significant positive effects on LCB acceptability. For instance, respondents who considered LCB affordable were 3.49 times more likely to accept it, (Table 2) while those who regarded it as durable were 6.05 times more likely to use it. Availability and technical awareness were also significant, with odds ratios of 2.58 and 2.46 respectively. Interestingly, appearance preference and past experience did not significantly influence acceptability, with p-values above the 0.05 threshold. This indicates that practical considerations such as cost, material strength, and ease of access outweigh aesthetic or anecdotal experience when staff evaluate building materials for housing projects.

Table 2: Ordinal Regression Coefficients

Predictor Variable	B	Std. Error	Wald Chi-Square	df	Sig. (p-value)	Exp(B) (Odds Ratio)
Cost Perception (Affordable)	1.25	0.45	7.83	1	0.005**	3.49
Durability (Durable)	1.80	0.50	12.96	1	0.000**	6.05
Availability (Available)	0.95	0.42	5.10	1	0.024*	2.58
Appearance (Good)	0.55	0.37	2.20	1	0.138	1.73
Technical Awareness (Yes)	0.90	0.40	5.06	1	0.024*	2.46
Past Experience (Yes)	0.70	0.38	3.40	1	0.065	2.01

Significance codes: $p < 0.05$, ** $p < 0.01$
Source : Authors' Field Survey (2025)

The overall model fit was strong, with a Likelihood Ratio test p-value of less than 0.001, (Table 3) confirming the reliability of the regression in explaining variations in respondents' acceptability levels based on the identified factors.

Table 3: Ordinal Regression Model Fit

Model Fit Statistic	Value	df	Sig.
-2 Log Likelihood	190.50	—	—

Chi-Square (Likelihood Ratio Test)	42.76	6	0.000**

Source : Authors' Field Survey (2025)

These findings corroborate earlier studies, including those by Afolami and Oyebamiji (2017), which emphasized durability concerns, affordability, and professional endorsement as primary determinants of alternative material acceptance in local construction markets. The data also underscores the importance of targeted technical training, affordable material availability, and practical demonstration projects in improving community acceptance rates. Addressing barriers such as artisan scarcity, inconsistent product quality, and entrenched conservatism through structured interventions would significantly enhance LCB's prospects as a sustainable, cost-effective housing solution in Ede North Local Government and beyond.

Though, although Laterite-Cement Bricks are widely recognized by staff within Ede North Local Government, their acceptance hinges heavily on perceptions of cost, durability, and the professional quality of awareness. Tackling the identified challenges through policy-driven programs, awareness campaigns, and capacity-building workshops would not only improve adoption rates but also contribute meaningfully to affordable housing delivery in the region.

CONCLUSION AND RECOMMENDATIONS

The findings from this study revealed that awareness of Laterite-Cement Bricks (LCB) is generally high among staff of Ede North Local Government, with 96.9% indicating awareness of its use for brick-making and 92.9% aware of its potential application in housing construction .However, while awareness was widespread, the level of willingness to adopt LCB for housing purposes varied considerably, largely influenced by the source of awareness. Professional exposure through formal education, workshops, and technical training was consistently associated with a higher likelihood of acceptance, whereas indigenous knowledge alone was linked to reluctance, often due to traditional biases and concerns about durability.

Furthermore, affordability, durability, availability, and technical awareness emerged as the most critical factors driving the acceptability of LCB, with regression analysis indicating statistically significant positive relationships between these variables and respondents' willingness to use the material .Notably, durability perception exerted the strongest influence, with respondents who viewed LCB as durable being over six times more likely to accept it. In contrast, aesthetic preference and prior experience with LCB were found to have a minimal influence on adoption decisions.

In terms of challenges, the study identified several barriers impeding the widespread use of LCB, including limited numbers of skilled artisans, inconsistent material quality, inadequate promotional campaigns, and scepticism rooted in indigenous knowledge . On a general note, the study demonstrated that while LCB holds significant potential for affordable housing delivery in Ede North Local Government, its successful adoption will depend on addressing both technical and perceptual barriers. The regression model fit further confirmed the reliability of the identified predictors in explaining acceptability levels (see Model Fit Table above). Based on these findings, it is recommended that Ede North Local Government and relevant stakeholders prioritize the integration of professional awareness programs, including structured workshops, technical training sessions, and demonstration projects showcasing completed LCB-based housing. Such initiatives would serve to bridge the awareness–adoption gap and enhance confidence in the material's durability and performance.

Also, strategic investments should be made in training skilled artisans in LCB construction techniques and ensuring consistent material quality through standardized production guidelines. Targeted media campaigns and community sensitization programs should also be introduced to counteract misconceptions and highlight the benefits of LCB in terms of cost-effectiveness, sustainability, and structural resilience.

Furthermore, efforts should be directed toward improving the availability of LCB within the local building material market, coupled with financial

incentives or policy-backed subsidies to encourage its uptake among both public and private developers. By addressing these challenges and reinforcing the identified positive drivers, the adoption of Laterite-Cement Bricks can be significantly improved, contributing to sustainable and affordable housing delivery within the study area.

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