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Beyond Concrete: Evaluating the Adoption Potential of Indigenous Building Materials for Sustainable and Affordable Housing in Ado-Ekiti, Nigeria

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HIGHLIGHTS

- Two-thirds of local building material use in Ado-Ekiti is concentrated in laterite/earth blocks and mud bricks combined (74.3%).
- A chi-square goodness-of-fit test shows this concentration is statistically real, not a sampling artefact ($\chi^2 = 68.71$, df = 5, $p < 0.001$).
- Ranked by Relative Importance Index (RII), the price of materials outweighs every other adoption driver (RII = 0.82).
- Poor durability (RII = 0.79) and thin technical skill among artisans (RII = 0.78) remain the biggest obstacles to wider use.
- Practitioners rate direct subsidies (RII = 0.81) and awareness campaigns (RII = 0.79) above regulation as the most workable policy tools.

ABSTRACT: A technical committee set up by Nigeria's Federal Ministry of Housing and Urban Development recently placed the national housing shortfall at 14.925 million units [1] a figure that, however one reads it, still points to a market unable to keep pace with demand. Much of that shortfall traces back to construction costs, and in cities such as Ado-Ekiti, Ekiti State, that cost pressure sits awkwardly alongside deep reserves of laterite, clay and timber that go largely untapped. This paper sets out to measure how far indigenous materials have actually penetrated construction practice in Ado-Ekiti and to identify, in the words of the professionals and artisans who make the buying decisions, what pushes adoption forward and what holds it back. A structured questionnaire was administered to a stratified random sample of 80 respondents 20 Estate Surveyors and Valuers and 60 bricklayers drawn from a population of 200 registered practitioners, of whom 74 returned usable responses (92.5%). Rather than stopping at frequencies and mean scores, the analysis was carried a step further: a Pearson chi-square goodness-of-fit test was run to check whether the observed pattern of material use could plausibly be due to chance, and the Relative Importance Index (RII) was computed to place every rated benefit, challenge, adoption factor and promotion strategy on a common 0–1 scale. Laterite/earth blocks (47.3%) and mud bricks (27.0%) turned out to dominate usage, a pattern the chi-square test confirms is statistically non-random ($\chi^2 = 68.71$, df = 5, $p < 0.001$). Respondents rate lower cost as both the leading benefit (RII = 0.83) and the leading adoption factor (RII = 0.82), while durability (RII = 0.79) and a shortage of technical know-how (RII = 0.78) are flagged as the sharpest constraints. Government subsidy schemes (RII = 0.81) and public enlightenment campaigns (RII = 0.79) are judged the most workable routes to wider adoption. Taken together, the results point toward a policy mix targeted incentives, hands-on artisan training, and formal recognition of local materials in building codes capable of turning Ado-Ekiti's untapped natural resource base into a genuine supply of affordable, low-carbon housing.

KEYWORDS: indigenous building materials; laterite; relative importance index; affordable housing; construction economics; Ado-Ekiti

1. INTRODUCTION

Few statistics track Nigeria's development performance as closely as its housing numbers. For years the figure most often quoted sat somewhere between 17 and 28 million missing units; a technical committee under the Federal Ministry of Housing and Urban Development has since revised that estimate downward, using standardised census and survey data, to 14.925 million units [1]. The lower figure is, if anything, more troubling precisely because it is better grounded and it does nothing to change the fact that building costs keep climbing. Part of the explanation lies in what the country chooses to build with: an estimated 90 percent of the raw materials that go into Nigerian roads and buildings are imported, even though the country sits on ample domestic stocks of clay, laterite, stone, timber and natural sand [2].

That contradiction importing what is abundant at home has drawn growing research attention. National-level reviews confirm renewed interest in laterite, compressed earth blocks and bamboo, though they equally note that cost perception, patchy urban availability and thin institutional backing keep adoption in check [3]. Zooming into specific cities tells a similar story: in Akure, Ondo State, awareness of laterite, bamboo and timber runs high, yet whether these materials can scale into mainstream urban use is still contested, and stabilisation technology together with material standardisation come out as the two innovation priorities most likely to change that [4]. A comparable case from Abuja shows locally sourced, technologically upgraded construction cutting both cost and environmental footprint at once [5]. Laboratory evidence adds further weight to the argument: laterite blended with cement and bone-ash powder in Ondo State [6], compressed earth bricks reinforced with cullet and recycled PET [7], and cement-stabilised lateritic soils drawn from several geological formations around Awka in the southeast [8] all reach compressive strengths that rival conventional sandcrete once properly treated. The implication is worth stressing: durability concerns are genuine for untreated material, but the science suggests they are fixable rather than fixed.

Ado-Ekiti offers a fitting lens through which to view this gap between resource and practice. Deep lateritic soils sit beneath the city, clay and timber are within easy reach, and yet, much as elsewhere in urban Nigeria, factory-made alternatives are gaining ground in everyday building work. What has not been well captured in the literature is how the people actually choosing materials on site estate surveyors, builders, contractors weigh cost against durability, skill against policy. Earlier Nigerian studies have tended to stop at descriptive numbers, frequencies and averages, which leaves two questions unanswered: whether the usage patterns reported are statistically meaningful rather than incidental, and how the many drivers and obstacles named across the literature stack up against one another on a common scale.

This paper responds to both gaps. It sets out to: (i) measure the extent of local building material use among construction professionals and artisans in Ado-Ekiti; (ii) apply a chi-square goodness-of-fit test to check whether the observed usage pattern departs meaningfully from what chance alone would produce; (iii) use the Relative Importance Index to rank the perceived benefits, challenges, adoption factors and promotion strategies on a standardised basis; and (iv) turn these rankings into a set of prioritised, evidence-backed recommendations for Ado-Ekiti and similarly placed Nigerian secondary cities.

2. MATERIALS AND METHODS

2.1 Study area

Fieldwork was carried out in Ado-Ekiti (latitude 7°37′N, longitude 5°13′E), the seat of government and commercial hub of Ekiti State in southwestern Nigeria. The city experiences a tropical climate with clearly marked wet and dry seasons, and its subsoil holds substantial deposits of laterite, clay and timber conditions that make it a reasonable proxy for how indigenous-material adoption plays out in a fast-growing Nigerian secondary city.

2.2 Research design, sampling and instrumentation

The study followed a descriptive, cross-sectional survey design. Its target population totalled 200 practitioners actively involved in developing, valuing or constructing buildings within Ado-Ekiti: 50 registered Estate Surveyors and Valuers [12] and 150 practising bricklayers [13]. Using stratified random sampling, 40 percent of each stratum was drawn into the study, producing a sample of 80 (20 surveyors and 60 bricklayers). Data collection relied chiefly on a structured questionnaire covering material usage together with four Likert-rated blocks perceived benefits, challenges, adoption factors and promotion strategies backed up by semi-structured interviews and first-hand observation at active building sites. Of the 80 questionnaires distributed, 74 came back correctly completed, a response rate of 92.5 percent.

2.3 Analytical technique

Frequencies, means and standard deviations formed the descriptive backbone of the analysis, but two further procedures were layered on top to sharpen the evidence.

The first is a Pearson chi-square goodness-of-fit test, used to check whether the pattern of material usage recorded in the survey departs significantly from an equal-frequency baseline across categories. The test statistic is $\chi^2 = \Sigma(Oi - Ei)^2/Ei$, where Oi denotes the observed count in category i and Ei the count that would be expected under a null hypothesis of uniform usage (Ei = N/k, k being the number of categories). In effect, the test asks whether laterite and mud brick's apparent dominance in the descriptive tables is a genuine feature of the data or could just as easily be sampling noise.

The second is the Relative Importance Index (RII), a ranking device widely used in construction management research [9] and applied here to every Likert-rated item. It is calculated as $RII = \Sigma W/(A \times N)$, with W the weighting a respondent assigns (on a 1–5 scale), A the maximum possible weighting (5), and N the number of respondents. Since ΣW/N is nothing more than the mean score already reported, RII simplifies to (mean score)/5 a standardised index running from 0 to 1 that allows direct comparison across items and thematic groups. Following convention [9], indices were sorted into three bands: High ($RII \geq 0.80$), High-Moderate ($0.60 \leq RII < 0.80$) and Moderate ($0.40 \leq RII < 0.60$).

3. RESULTS AND DISCUSSION

3.1 Respondent profile

Among the 74 usable responses, 67.6 percent were male, and 54.1 percent held at least an HND or BSc. Builders and contractors made up the largest occupational group (54.1%), ahead of estate surveyors (27.0%) and resident/homeowner respondents (18.9%); close to six in ten respondents (59.4%) had spent over a decade living or working in Ado-Ekiti, and 81.1 percent described themselves as familiar with local building materials a profile that lends reasonable authority to their views on material practice in the city.

3.2 Material usage: what the numbers show, and whether they hold up statistically

Laterite/earth blocks led usage at 47.3 percent, trailed by mud bricks (27.0%), timber (13.5%), stone (6.8%), palm thatch/raffia (4.1%) and bamboo (1.4%) (Table 1). Testing this distribution against an equal-frequency null (Ei = 12.33 per category) rules out chance as an explanation: $\chi^2 = 68.71$, df = 5, $p < 0.001$, well past the critical value of $\chi^2_{0.05,5} = 11.07$. A second test, run on how respondents rated the commonness of red clay blocks, points the same way ($\chi^2 = 54.65$, df = 3, $p < 0.001$) reinforcing laterite-based products as the statistically dominant material category in the city's construction sector, a conclusion that sits comfortably with recent findings positioning laterite as the most technically developed and locally accepted indigenous material in southwestern Nigeria [6].

Table 1. Material usage frequencies and chi-square goodness-of-fit test (N = 74)

Material	Observed (O)	Expected (E)	$(O-E)^2/E$
Laterite/Earth Blocks	35	12.33	41.66
Mud Bricks	20	12.33	4.77
Timber	10	12.33	0.44
Stones	5	12.33	4.36
Palm Thatch/Raffia	3	12.33	7.06
Bamboo	1	12.33	10.42
Total ($\chi^2 = 68.71$, df = 5, $p < 0.001$)	74	74.00	68.71

Source: Field survey, 2025 (author's computation).

3.3 Ranking benefits, challenges, adoption factors and promotion strategies by RII

Table 2 sets out the RII for every item across the four thematic blocks. Cost saving tops the list of benefits (RII = 0.83, High band), ahead of environmental sustainability (0.81) and ease of access (0.78) a ranking that fits recent Nigerian evidence suggesting affordability, rather than sustainability messaging on its own, is what actually moves material choice in price-sensitive housing markets [3,5]. Turning to challenges, durability (RII = 0.79) and a shortage of technical knowledge (RII = 0.78) sit at the top, which lines up closely with laboratory findings showing that raw, untreated indigenous materials do underperform, but that inexpensive stabilisation cement, lime, or bone-ash blending narrows that gap substantially [6,7,8]. Read this way, the durability problem looks less like an inherent flaw in the materials and more like a gap in dissemination and training. Cost of materials likewise tops the adoption-factor ranking (RII = 0.82), ahead of availability (0.78) and builder skill (0.77), with government policy (0.72) and cultural acceptance (0.68) trailing behind suggesting that practitioners in Ado-Ekiti are, first and foremost, making economic calculations at project level rather than responding to regulatory pressure. Finally, government incentives and subsidies (RII = 0.81) and public awareness campaigns (RII = 0.79) are rated the most effective promotion strategies, ahead of artisan training (0.77) and formal building-code integration (0.74) a ranking that echoes the emphasis on upgraded production technology and material standardisation found in comparable Ondo State research [4].

Table 2. Relative Importance Index (RII) ranking across four thematic blocks

Theme	Item	Mean (1–5)	RII	Band
Benefits	Reduces construction cost	4.16	0.832	High
Benefits	Environmentally sustainable	4.03	0.806	High
Benefits	Easy access/transport	3.92	0.784	High-Moderate
Benefits	Cultural preservation	3.82	0.764	High-Moderate
Challenges	Durability issues	3.96	0.792	High-Moderate
Challenges	Lack of technical knowledge	3.88	0.776	High-Moderate
Challenges	Poor public perception	3.68	0.736	High-Moderate
Challenges	Weather vulnerability	3.61	0.722	High-Moderate
Challenges	Limited availability	3.45	0.690	High-Moderate
Challenges	Weak building-code support	3.23	0.646	High-Moderate
Adoption factors	Cost of materials	4.11	0.822	High
Adoption factors	Availability of materials	3.88	0.776	High-Moderate

Theme	Item	Mean (1–5)	RII	Band
Adoption factors	Builder's skill/knowledge	3.83	0.766	High-Moderate
Adoption factors	Client preference	3.68	0.736	High-Moderate
Adoption factors	Government policy	3.61	0.722	High-Moderate
Adoption factors	Cultural acceptance	3.42	0.684	High-Moderate
Strategies	Government incentives/subsidies	4.03	0.806	High
Strategies	Public awareness campaigns	3.95	0.790	High-Moderate
Strategies	Artisan training programmes	3.84	0.768	High-Moderate
Strategies	Building-code integration	3.70	0.740	High-Moderate

Source: Field survey, 2025 (author's computation). RII = mean score / 5; bands per [9]: High ≥ 0.80, High-Moderate 0.60–0.79.

3.4 Bringing the findings together

Placed side by side, the chi-square and RII results tell a consistent story. Material choice in Ado-Ekiti clusters statistically around laterite and mud-based products (Table 1) precisely because these deliver the single most valued benefit lower cost while asking the least of builders in terms of technology. Durability, the top-ranked concern, shows up clearly in respondents' lived experience, yet the material-science literature [6,7,8] does not treat it as a fixed limitation; it reads instead as a training-and-stabilisation shortfall. That distinction matters for policy: pouring resources into raw material supply while leaving stabilisation training untouched is unlikely to shift adoption much, since availability already ranks below cost and skill among both challenges and adoption factors. The RII ordering of promotion strategies incentives ahead of awareness, awareness ahead of training, training ahead of codes offers a workable sequence for policymakers, favouring demand-side subsidy as a first move before supply-side regulation follows.

4. CONCLUSIONS

By pairing descriptive statistics with a chi-square goodness-of-fit test and a Relative Importance Index ranking, this study puts the adoption of indigenous building materials in Ado-Ekiti on firmer statistical footing than earlier, purely descriptive accounts. Laterite/earth blocks and mud bricks are shown to statistically dominate local usage ($\chi^2 = 68.71$, $p < 0.001$), pulled forward chiefly by cost savings (RII = 0.83) and held back chiefly by durability worries and skill shortages (RII = 0.79 and 0.78) constraints that recent material-science evidence suggests are more about inadequate stabilisation than any inherent weakness in the materials themselves. Government incentive schemes and public enlightenment campaigns emerge as the two levers practitioners rate most highly for expanding adoption. Given how much laterite, clay and timber Ado-Ekiti still has to draw on, a coordinated push fiscal incentives, hands-on stabilisation training for artisans, and formal building-code recognition offers a statistically grounded and practically sequenced route toward housing that is affordable, sustainable and locally rooted. Because the study rests on a single-city, cross-sectional sample, its conclusions would benefit from replication across other cities and from laboratory durability testing of stabilised local composites before being generalised more broadly.

Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT Authorship Contribution Statement

Oladejo, Samuel Olugbemiga: Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Writing original draft, Writing review & editing.

Data Availability

The survey data supporting this study are available from the corresponding author upon reasonable request.

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