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ASSESSMENT OF THE LEVEL OF ADOPTION OF SUSTAINABLE BUILDING PRACTICES IN CONSTRUCTION PROJECTS ACROSS ABUJA

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ABSTRACT

Sustainable building practices can reduce the environmental impacts of construction and improve the long-term performance of buildings. Their adoption, however, depends on practitioners' knowledge, project-level implementation and the conditions that enable or constrain their use. This study assessed the level of adoption of sustainable building practices in construction projects across Abuja, Nigeria. It examined respondents' familiarity with and understanding of the practices, their reported implementation, perceived benefits and barriers, and proposed improvement strategies. A descriptive mixed-methods approach was used. Data were collected through questionnaires and semi-structured interviews. Of the 396 questionnaires distributed, 350 were returned and considered usable, representing an 88.4% response rate. Questionnaire responses were analysed using descriptive statistics, while interview findings were summarised thematically. Respondents reported moderate familiarity (mean = 3.67) and understanding (mean = 3.68) of sustainable building practices. Reported implementation (mean = 3.48) and adoption (mean = 3.47) were comparatively lower. Perceived benefits and barriers both recorded an overall mean of 3.97, while support for proposed improvement strategies was higher (mean = 4.04). High initial costs, limited stakeholder knowledge, weak policy enforcement and restricted availability of sustainable materials were identified as prominent barriers. Financial incentives, professional training and stronger enforcement received substantial support as potential responses. The findings indicate that recognition of the value of sustainable building practices has not translated fully into consistent project-level adoption. Progress will require coordinated measures to improve

access to finance and materials, strengthen professional capacity, and implement relevant policies more effectively. As the study relies on stakeholder reports and descriptive analysis, its results describe reported perceptions and practices; they do not establish causal relationships or independently verify building performance.

KEYWORDS: Sustainable building practices; adoption; construction projects; stakeholder perceptions; implementation barriers; Abuja, Nigeria.

1. INTRODUCTION

The construction and operation of buildings are central to economic development and human well-being, but they also create a substantial climate and resource burden. The latest global assessment reports that buildings and construction account for around 37% of global emissions and nearly half of global material extraction (United Nations Environment Programme [UNEP], 2026). These impacts arise across connected stages: material production and construction generate embodied impacts, while building operation creates continuing demand for energy and water. Sustainable building practice therefore requires decisions across the building life cycle rather than isolated technical additions.

In this study, sustainable building practices refer to design, procurement, construction and operational measures intended to reduce environmental impacts while supporting economic performance and occupant well-being. Relevant measures include passive design, energy and water efficiency, lower-impact material selection, waste reduction, and attention to indoor environmental quality and durability. A life-cycle perspective matters because choices made at project conception and design shape later energy demand, material use, maintenance requirements and opportunities for adaptation. However, the availability and effectiveness of particular measures depend on local climate, markets, professional capacity, finance and institutional arrangements. Strategies developed in high-income settings cannot be assumed to transfer unchanged to Abuja.

This implementation question is significant in Nigeria, where empirical studies have identified constraints spanning professional knowledge, client participation, finance and policy. Nduka and Ogunsanmi (2015), examining Nigerian construction stakeholders' views of green building adoption, reported interest in a range of practices alongside barriers that included limited awareness, expertise and higher cost. More recently, Babalola and Harinarain (2024) analysed policy barriers reported by Nigerian construction professionals and identified linked challenges involving implementation strategies, client inputs,

stakeholder policies, and government and regulatory policy. Together, these studies indicate that adoption is shaped by interacting market and institutional conditions, not simply by whether sustainability is recognised as desirable.

However, national-level evidence does not establish how these conditions combine in Abuja or whether stakeholder awareness is matched by routine project delivery. Abuja's continuing construction activity makes this a practical concern: sustainability goals must be translated into specifications, procurement decisions, site practices and operational arrangements across diverse projects and stakeholder groups. If this translation is weak, broad support for sustainability may coexist with uneven implementation. A city-specific assessment can identify where reported knowledge is strongest, where practice lags, and which barriers stakeholders consider most consequential. This distinction matters because perceived benefits or self-reported adoption do not, on their own, demonstrate measured reductions in emissions, energy use or life-cycle cost.

This study assesses sustainable building practices in construction projects across Abuja. It examines construction stakeholders' familiarity with and understanding of sustainability, their reported implementation and adoption of relevant practices, the benefits and barriers they perceive, and the measures they support to improve adoption. Its central analytical focus is the relationship between recognition and reported application, and the financial, technical, market and policy conditions that may help explain any gap between them. The study uses a descriptive mixed-methods design and interprets its findings as stakeholder-reported evidence rather than as audited building performance.

The study contributes a location-specific account that brings these dimensions together in one assessment. It is guided by four questions: What are stakeholders' levels of familiarity and understanding? To what extent are sustainable practices reportedly implemented and adopted? Which benefits and barriers are most salient? Which interventions do stakeholders support? By addressing these questions, the study provides evidence to inform professional capacity-building, project planning and policy design in Abuja, while identifying limits in the available data that future research can address.

2. Literature Review

2.1 Sustainable building as a life-cycle approach

Sustainable building is a life-cycle approach to planning, designing, constructing, operating and maintaining buildings. It includes measures such as passive design, energy and water efficiency, responsible material selection, waste reduction, durability and indoor

environmental quality. These measures address environmental impacts while also considering economic performance and occupant well-being. The *Agenda 21 for Sustainable Construction in Developing Countries* emphasises that sustainable construction must respond to the environmental, economic and social conditions of its setting (International Council for Research and Innovation in Building and Construction [CIB] & United Nations Environment Programme International Environmental Technology Centre [UNEP-IETC], 2002). This is particularly relevant to Abuja, where the feasibility of particular practices may depend on climate, finance, technical capacity, material supply and regulation.

Life-cycle assessment offers a framework for evaluating environmental impacts across a building's stages, while life-cycle costing considers costs over an agreed period rather than only the initial construction outlay (International Organisation for Standardisation [ISO], 2006, 2017). These approaches help explain why an initial-cost focus can complicate adoption: a practice may require greater investment at the outset while offering potential operational savings later. However, such savings should not be assumed without project-level cost and performance evidence. In this study, respondents' views about life-cycle savings are therefore treated as perceived benefits, not verified financial outcomes.

The scale of the sector's environmental impact reinforces the relevance of this life-cycle perspective. The United Nations Environment Programme (UNEP, 2026) reports that buildings and construction account for around 37% of global emissions and nearly half of global material extraction. These global figures establish the importance of improving building practice, but they do not specify which interventions are most feasible in Abuja. Local empirical evidence is needed to assess how stakeholders understand and apply sustainable measures in their own project conditions.

2.2 Factors shaping adoption

Research commonly groups adoption conditions around finance, knowledge and skills, technology and materials, organisational practice, client demand, and policy. These conditions interact: awareness may encourage interest, but implementation can still be constrained by cost, limited technical expertise, unavailable materials, weak client demand or unclear regulation.

International reviews provide a useful framework for examining these interactions. Darko and Chan's (2017) review identifies recurring barriers such as limited information, high costs, inadequate incentives, weak market demand and the absence of effective codes or regulations. Their review offers a broad checklist, but its findings aggregate evidence from different contexts; the relative importance of each barrier must be established locally. In a

separate review of empirical studies, Darko, Zhang, and Chan (2017) classify adoption drivers at external, corporate, property, project and individual levels. Together, these reviews suggest that adoption cannot be explained only by individual awareness or organisational willingness: project decisions are also shaped by wider market and institutional conditions.

Studies from Ghana provide more specific evidence from a developing-country context. Chan et al. (2018) identify higher technology costs and group barriers around government, human capacity, knowledge and information, markets, and cost and risk. Darko et al. (2018), using a model of adoption influences, find that government-related barriers negatively influence adoption, while company-related drivers have a positive influence. Their analysis also identifies regulations, standards, incentives and research support as potential promotion strategies. These studies support examining financial and institutional conditions together, although their findings concern green building technologies in Ghana and should not be transferred directly to Abuja.

Evidence from Ghana also shows that adoption challenges can extend beyond cost and regulation. Ametepey et al. (2015) identify resistance to change, limited government commitment, perceived investment costs, inadequate professional knowledge and lack of legislation as challenges to sustainable construction implementation. Their results reinforce the importance of capacity and institutional support, but their sample and national context differ from the present study. The Abuja survey can therefore contribute by showing whether respondents report a comparable combination of knowledge, cost, supply and enforcement constraints in their project environment.

2.3 Evidence from Nigeria and Abuja

Nigerian studies identify several recurring barriers while differing in their scope and analytical focus. Nduka and Ogunsanmi (2015) report that stakeholders considered practices such as energy conservation, material and resource conservation, water conservation, waste reduction and occupant health adoptable. They also identify limited awareness, expertise and higher cost as constraints. Akinshipe et al. (2019), in a study of built-environment professionals in Ondo State, identify inadequate knowledge and lack of expertise as major constraints to sustainable construction. These studies point to capacity as a persistent concern, though their findings arise from different locations and do not establish how knowledge relates to project-level implementation in Abuja.

More recent Nigerian research broadens the analysis beyond professional knowledge. Akindele et al. (2023) group barriers around technical and political conditions, awareness and perception, and sociocultural factors; they identify education and training as a prominent

strategy. Babalola and Harinarain (2024), examining policy barriers, identify challenges related to implementation strategies, client inputs, stakeholder policies, and government and regulation. Together, these studies portray adoption as a system-level issue: training may strengthen capability, but it cannot by itself resolve financing, procurement, client or regulatory constraints. Their national scope is informative, but it does not show how these factors are experienced together across Abuja's construction stakeholders.

The closest location-specific evidence is Jimoh et al. (2021), who examined awareness and reported use among construction professionals in Abuja. They found variation across specific practices and no statistically significant difference between the overall awareness and usage measures. This result cautions against assuming that awareness necessarily exceeds use or that a difference in scale means proves an adoption gap. The present study similarly reports higher mean scores for familiarity and understanding than for implementation and adoption, but does not test whether those differences are statistically significant. Its contribution is to assess these dimensions alongside perceived benefits, barriers and improvement strategies, rather than to claim a statistically established knowledge-to-practice gap.

2.4 Synthesis and research gap

The literature establishes sustainable building as a life-cycle concern and identifies adoption as the product of interacting individual, organisational, project, market and institutional conditions. International reviews provide useful categories for organising these factors, while evidence from Nigeria and Ghana highlights the recurring roles of cost, knowledge, technical capacity, material availability and policy support. However, studies vary in location, stakeholder group, practice definitions and analytical method. Results from national samples or Ghanaian technology-adoption studies cannot be assumed to represent project conditions in Abuja.

Existing Abuja research has compared awareness with reported use, while Nigerian studies have examined barriers, policy conditions or strategies at broader scales. The remaining gap is an integrated, location-specific account that considers familiarity and understanding alongside implementation, adoption, perceived benefits, barriers and proposed interventions. This study addresses that gap through a descriptive assessment of stakeholder reports in Abuja. Its findings can indicate which conditions respondents regard as important, but they cannot establish causal relationships or verify buildings' environmental performance or life-cycle costs.

3. METHODOLOGY

3.1 Research design

The study used a descriptive mixed-methods survey to examine sustainable building practices among construction stakeholders in Abuja. A structured questionnaire provided quantitative data on respondents' familiarity and understanding, reported implementation and adoption, perceived benefits and barriers, and strategies for improvement. Semi-structured interviews were used to obtain additional stakeholder perspectives on adoption and its constraints. The design supports a descriptive account of reported practices and perceptions; it does not measure building performance or establish causal relationships.

3.2 Study area and study population

The study was conducted in Abuja, Nigeria, within the Federal Capital Territory (FCT). The main document identifies two different sets of study locations: Garki, Wuse, Asokoro, Maitama, Jabi, Kubwa and Katampe Extension in the scope description; and Central Area, Maitama, Wuse, Gwarinpa, Lokogoma and Kubwa in the sampling section. Because the lists do not fully correspond, the specific districts should be verified against the locations where data were collected before individual districts are named as study sites. Pending verification, the study area is described as Abuja, FCT.

The study population comprised 4,010 construction-industry professionals, based on 2024 membership or registration records from the relevant professional associations. These included the Nigerian Institute of Building (NIOB, 2024), the Nigerian Society of Engineers (NSE, 2024), the Nigerian Institute of Architects (NIA, 2024) and the Nigerian Institute of Quantity Surveyors (NIQS, 2024). The population also included contractors and other practitioners identified in the sampling frame. Clients, facility managers and academics or consultants should be included only if they were represented in the source records used to establish the total population of 4,010.

3.3 Sampling and sample size

The study population comprised **4,010 construction professionals** in Abuja. The required sample size was estimated using Yamane's (1967) formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = Sample size

N = Total population

e = Level of precision (0.05)

$$\frac{4,010}{1 + 4,010(0.05)^2}$$
$$n = \frac{4,010}{1 + 4,010(0.0025)}$$
$$n = 363.72 \approx 364$$

The main document states the population as 4,010 but uses 40,010 in its original calculation. The estimate above uses the stated population of 4,010. This calculated sample size is separate from the fieldwork figures: 396 questionnaires were distributed, and 350 were returned and usable, giving a response rate of 88.4%.

Respondents were selected through purposive sampling across the relevant professional groups. Accordingly, the sample was not a probability sample and should not be described as statistically representative of the full population. The findings reflect the participating respondents and should be generalised to the wider population with caution.

3.4 Instruments and data collection

The questionnaire covered respondent characteristics and the study's main themes: familiarity, understanding, implementation, adoption, benefits, barriers and improvement strategies. Items used a five-point Likert scale. The source reports that experts reviewed the instruments and that a pilot test involved 30 respondents outside the main study area. It does not provide the resulting reliability coefficient.

Semi-structured interviews were also conducted with selected key informants. The source reports that interviews took place face-to-face or remotely, with consent for recording. It does not specify the number of interviewees, their selection criteria, interview dates or duration; these details should be verified from the research records.

3.5 Data analysis

Questionnaire responses were summarised using descriptive statistics. Frequencies and percentages were used for respondent characteristics and categorical responses, while means and standard deviations were used to summarise responses to the five-point items. The mean for each item was calculated by summing the weighted response scores and dividing by the number of valid responses. Standard deviations describe the spread of responses around the mean. Because individual Likert-type items are ordinal, their means should be interpreted cautiously and, where available, read alongside response frequencies (Boone & Boone, 2012; Sullivan & Artino, 2013).

The study used 3.00 as the criterion midpoint of the five-point scale. Scores above 3.00 were interpreted as above the midpoint, scores below 3.00 as below it, and a score of 3.00 as the midpoint. This rule describes the direction of the average response; it does not establish statistical significance. The manuscript does not provide verbal labels for the response options or define additional score bands. Therefore, the results are reported as means and standard deviations rather than categorised as “low,” “moderate” or “high.”

Interview findings were reported as thematic summaries. Thematic analysis generally involves systematic coding and the development and review of patterns across qualitative data (Braun & Clarke, 2006). However, the manuscript does not document how the interview material was coded, how candidate themes were developed or reviewed, or whether coding was checked by another researcher. It also does not report the number or roles of interview participants. These details cannot be supplied reliably without the transcripts and analysis records; the thematic summaries are therefore treated as reported findings, not as a fully documented coding procedure.

For interpretation, the reported interview themes were considered alongside relevant questionnaire results, for example, accounts of uneven knowledge were compared with familiarity, understanding and training scores, while comments about cost and procurement were considered alongside the corresponding barrier scores and project-stage responses. This is an interpretive integration of the findings at the discussion stage. It is not a statistical combination of the datasets or a formal joint-display analysis (Fetters et al., 2013).

4. RESULTS AND DISCUSSION

4.1 Respondent profile and response rate

Of the 396 questionnaires distributed, 350 were returned as usable, giving a response rate of 88.4%. Engineers represented 25.1% of respondents, architects 22.6%, builders 17.4%, quantity surveyors 15.1%, contractors 12.6%, and other professionals 7.1%. Most respondents had six to ten years of experience (35.1%), and 92.6% reported having worked on projects in Abuja.

The professional mix provides perspectives from several groups involved in building projects. However, the study used stratified purposive sampling and does not report the numbers approached in each group. The respondent profile should therefore be read as a description of the participating sample, not as evidence that the sample proportionally represents all construction stakeholders in Abuja.

4.2 Familiarity, understanding and reported adoption

Table 1 summarises respondents' mean scores for the principal study dimensions. All seven means were above the study's criterion midpoint of 3.00. Support for improvement strategies had the highest mean (4.04), followed by perceived benefits and challenges to adoption (both 3.97). Familiarity and understanding scored 3.67 and 3.68, while reported implementation and adoption had the lowest means, at 3.48 and 3.47.

Table 1. Descriptive statistics for study dimensions.

Study dimension deviation	Mean	Standard
Familiarity	3.67	1.17
Understanding	3.68	1.18
Implementation	3.48	1.23
Adoption	3.47	1.23
Perceived benefits	3.97	1.07
Challenges to adoption	3.97	1.09
Support for improvement strategies	4.04	1.06

Source: Fieldwork (2026).

The mean differences suggest that respondents rated their familiarity and understanding somewhat higher than their reported implementation and adoption. Familiarity exceeded implementation by 0.19 points, while understanding exceeded adoption by 0.21 points. These are descriptive differences; the study did not conduct a statistical test comparing the means, so they do not establish a statistically significant knowledge-to-practice gap.

The standard deviations provide another perspective. Implementation and adoption each had a standard deviation of 1.23, higher than those for familiarity (1.17) and understanding (1.18). This indicates greater variation in respondents' reported experience of practice than in their ratings of knowledge. It may reflect different project, organisational, or professional contexts, although the study did not test which factors account for that variation.

The pattern is relevant to Jimoh et al.'s (2021) Abuja study, which found no statistically significant difference between overall awareness and reported use. That finding cautions against treating the current mean differences as proof of a measurable awareness–practice gap. The present results add comparisons across familiarity, understanding, implementation and adoption, but, because no inferential test was performed, cannot establish whether the differences are systematic beyond this sample.

Figure 1 presents these scores in descending order. Its highest values are support for improvement strategies (4.04), perceived benefits and challenges (both 3.97), while implementation and adoption are lowest. The figure is descriptive: it makes the relative ordering visible but does not show statistical differences between dimensions.

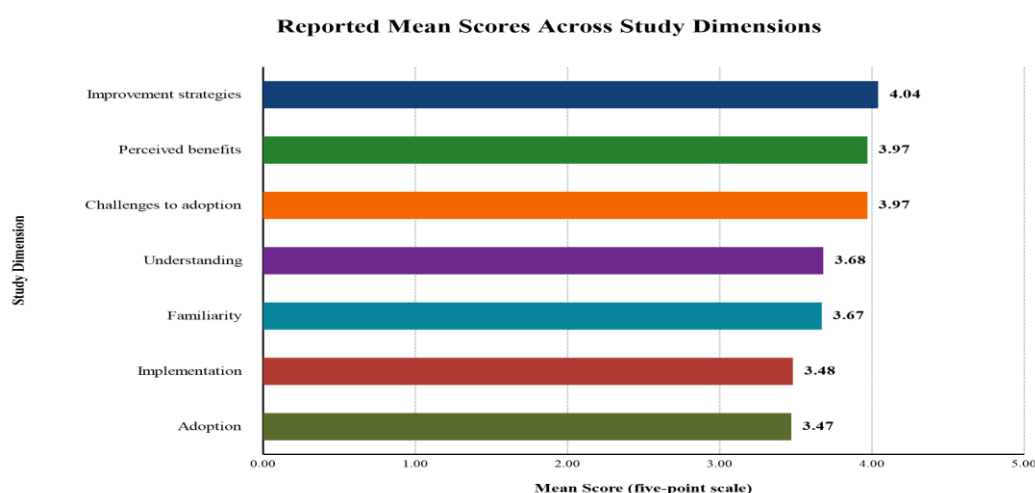


Figure 1. Reported mean scores across study dimensions (five-point scale).

Source: Fieldwork (2026).

The item-level results help explain the aggregate scores. Familiarity with the general concept of sustainable building scored 3.91, and understanding of sustainability principles scored 3.94. By comparison, formal training scored 3.28 and knowledge of assessment and certification systems scored 3.26. This contrast suggests that general awareness may be more established than technical preparation or familiarity with formal assessment tools. It is consistent with Nigerian studies that identify professional knowledge and expertise as constraints (Akinshipe et al., 2019; Akindele et al., 2023; Nduka & Ogunsanmi, 2015). However, the current descriptive results do not show that limited training caused lower implementation.

Differences also appear across reported practices. Integration into planning and design scored 3.68, while allocating adequate organisational funds scored 3.17. Energy-efficient design scored 3.60, compared with 3.34 for renewable energy adoption. Respondents therefore reported stronger uptake of some design-related practices than of organisational funding or renewable energy measures. This pattern points to uneven adoption across practice types rather than a single, uniform level of implementation.

Implementation and adoption recorded nearly identical means (3.48 and 3.47). This similarity could reflect overlap in how respondents understood the two concepts or in how the questionnaire items measured them. The available results do not allow these explanations to be distinguished. The manuscript should therefore define these constructs clearly and avoid treating them as separate outcomes unless their questionnaire items demonstrate that distinction.

4.3 Perceived benefits and barriers

Respondents rated perceived benefits and challenges to adoption equally, with an overall mean of 3.97 for each. This indicates strong average endorsement of statements in both categories; it does not mean that benefits and barriers cancel each other out. The highest-ranked benefits are shown in Table 2.

Table 2. Highest-ranked perceived benefits.

Rank (%)	Perceived benefit	Mean	Respondents agreeing, N
1	Reduced life-cycle operating costs	4.28	334 (95.4)
2	Environmental protection and resource conservation	4.21	327 (93.4)
3	Improved building performance and durability	4.15	319 (91.1)

Source: Fieldwork (2026).

Respondents recognised substantial benefits and challenges associated with sustainable building practices; both dimensions recorded an overall mean of **3.97**. Reduced life-cycle operating costs ranked highest among the benefits (**4.28**), followed by environmental protection (**4.21**) and improved building performance and durability (**4.15**). This suggests that respondents valued both the long-term economic and environmental gains of sustainable construction.

The findings align with Olanipekun et al. (2015), who identified financial constraints as a major barrier to green building adoption in Abuja, and Adebayo (2012), who found that awareness did not always translate into implementation. The present study highlights this tension: respondents recognised potential life-cycle savings but still rated upfront cost as a major obstacle.

The cost figures refer to different results: 4.14 is the mean for the specific item on the high initial cost of sustainable materials and technologies, while 4.24 is the score in the separate ranking of challenges. The 4.08 figure in the concluding summary conflicts with these table

values and should be corrected or removed. Other highly rated barriers were limited awareness and technical knowledge (4.17), weak policy implementation (4.09) and limited material availability (4.01).

This pattern is consistent with Ayarkwa et al. (2014) on cost and material availability, and Ajayi et al. (2017) and Eze and Okoye (2018) on training and policy enforcement. Taken together, the results suggest that adoption depends on addressing financial constraints alongside gaps in professional capacity, material supply and regulatory implementation.

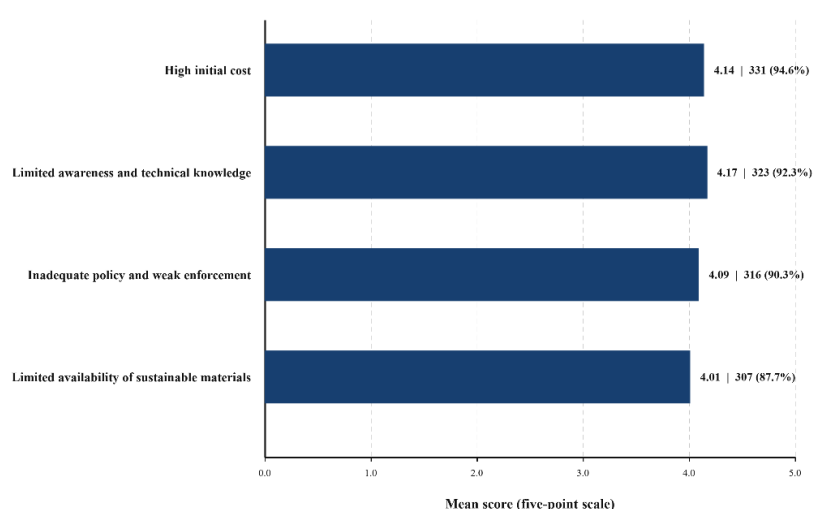


Figure 2: Principal Barriers to Sustainable Building Practice Adoption.

Source: Fieldwork, 2026

The leading perceived benefit and leading barrier reveal an important tension: respondents endorsed the potential for lower life-cycle operating costs while identifying high initial cost as the most prominent constraint. One interpretation is that project decisions may be influenced more by immediate capital requirements than by anticipated long-term savings. The study does not include financial records, however, so it cannot determine whether this explains the responses or whether sustainable buildings in Abuja deliver the perceived savings.

The ranking of barriers also reflects the interaction of market, professional and institutional conditions. Cost and material availability constrain what can be specified and procured; limited knowledge can affect the capacity to evaluate alternatives; and weak enforcement may reduce the practical force of sustainability requirements. Nigerian studies similarly identify cost, expertise and policy-related constraints (Akinshipe et al., 2019; Akindele et al., 2023; Babalola & Harinarain, 2024; Nduka & Ogunsanmi, 2015). Evidence from Ghana also

identifies cost, knowledge and government-related conditions as important barriers to adoption (Ametepey et al., 2015; Chan et al., 2018; Darko et al., 2018). This convergence supports treating adoption as a system-level issue. Because these studies differ in setting and design, however, they do not establish that the same mechanisms operate with equal strength in Abuja.

4.4 Project timing and improvement strategies

The results show that sustainable building practices were reported across all six project-stage categories. Application was highest during architectural and engineering design (28.9%) and conception and feasibility (26.3%), followed by construction (17.4%), procurement (13.7%) and operation and maintenance (8.9%). The remaining 4.8% reported that such practices were rarely or never applied. Together, the categories account for 100% of responses.

The concentration in early project stages suggests that sustainability is more often considered during planning and design than carried through to building operation. This pattern is consistent with Adebayo (2012), who found that awareness among construction professionals did not necessarily translate into sustained implementation. The present results extend that finding by showing where reported application is concentrated across the project cycle. The operation-and-maintenance share indicates that attention to sustainability after construction remains comparatively limited, although the study does not measure the quality or continuity of practices at each stage.

For improvement, respondents gave the highest ratings to financial incentives (mean = 4.19), training and education (4.12) and stronger policy enforcement (4.08). These priorities align with Olanipekun et al. (2015), who identified financial constraints and insufficient government incentives in Abuja, and with Ajayi et al. (2017) and Eze and Okoye (2018), who emphasised professional training and enforcement. Taken together, the findings indicate that extending sustainable practices across the project cycle will require financial support, practitioner capacity and effective implementation of policy.

4.5 Interview findings and integrated interpretation

The interview summaries provide context for four areas raised in the questionnaire: uneven knowledge and capability, continuity from design into delivery, financial and material constraints, and policy enforcement. The reported accounts of uneven awareness align with the difference between general familiarity and the lower scores for formal training and assessment knowledge. Accounts of cost and procurement difficulties are consistent with the high initial-cost ranking and the lower reported scores for organisational funding and

procurement-stage integration. References to policy enforcement also correspond with the high barrier score for weak enforcement and the strong support for stronger enforcement.

Taken together, the questionnaire and interview summaries portray adoption as dependent on connected professional, financial, supply and institutional conditions. This interpretation is consistent with the reviewed Nigerian literature, which identifies barriers across these areas rather than a single obstacle (Akindele et al., 2023; Babalola & Harinarain, 2024). The integration here is interpretive: it identifies convergence between the reported survey patterns and interview summaries, but does not establish that one set of findings validates or explains the other.

The qualitative evidence has important limits. The manuscript does not report the number or roles of interview participants, the coding process, or verbatim quotations. The interview summaries can therefore provide context, but readers cannot independently assess how the themes were developed or how representative they were of interviewees' accounts.

Respondents expressed positive views of sustainable building and its potential benefits, while reporting more moderate implementation and adoption. The results point to unevenness across practice types and possible constraints in moving from design intentions to procurement and construction. These findings remain self-reported and descriptive. They do not establish statistically significant gaps, causal relationships, or verified environmental, operational or financial outcomes for buildings in Abuja.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study assessed awareness, implementation, perceived benefits, barriers and improvement strategies relating to sustainable building practices in construction projects across Abuja. Respondents reported familiarity with and understanding of sustainable building practices, with mean scores of 3.67 and 3.68, respectively. Implementation and adoption received lower mean scores of 3.48 and 3.47. This descriptive difference suggests that awareness has not translated fully into practice; it should not be interpreted as statistically significant because no inferential comparison was reported.

Respondents rated both the benefits and challenges of sustainable building practices highly, each with an overall mean of 3.97. Reduced life-cycle operating costs, environmental protection and improved building performance were among the leading perceived benefits. High initial costs, limited technical knowledge, weak policy support and restricted material

availability were prominent barriers. Financial incentives, training and education, and stronger policy enforcement were identified as important strategies for improving adoption. Overall, the findings indicate that sustainable building practices are recognised by construction stakeholders in Abuja, but their implementation remains constrained by financial, technical, material and institutional conditions. Because the study used purposive sampling and descriptive analysis, the findings describe the participating respondents and should not be treated as statistically representative of the entire study population.

5.2 Recommendations

- 1. Introduce targeted financial incentives.** Government agencies should work with financial institutions and construction-industry stakeholders to develop tax relief, grants, subsidies and low-interest green loans for projects that incorporate sustainable materials and technologies. Incentive criteria should be clearly defined and linked to verifiable project measures, such as energy-efficient systems, water conservation and responsible material use. This would help reduce the effect of high initial costs on project decisions.
- 2. Expand practical training and professional development.** Professional associations, universities and construction firms should provide continuing training for architects, engineers, builders, quantity surveyors, contractors and other relevant practitioners. Training should address sustainable design, life-cycle costing, material selection, energy and water efficiency, and building operation and maintenance. Practical case studies from Nigerian projects would help participants apply these principles to local budgets, climate conditions and supply constraints.
- 3. Strengthen policy implementation and compliance monitoring.** Relevant authorities should clarify sustainability requirements in building approval and construction processes, assign responsibility for monitoring compliance, and apply requirements consistently across projects. Monitoring should cover project planning, design, procurement and construction, with follow-up during building operation where feasible. Coordination with professional bodies can support guidance to practitioners and improve awareness of applicable requirements.
- 4. Improve access to sustainable materials and extend attention to building operation.** Public agencies and industry organisations should support reliable local production and distribution of sustainable building materials, while providing practitioners with accessible information on material performance, cost and availability. Project clients and facility managers should also be encouraged to maintain sustainable features after construction

through routine monitoring of energy, water and maintenance performance. This would help carry sustainability commitments from design and construction into the operational stage.

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